ASTRO news
WINTER 2022

BEST OF ASTRO 2021

Best™ medical international

TEAMBEST GLOBAL®
One World • One Source • The Best!
healthcare for everyone
TeamBest®
Your True Partner
www.teambest.com

Best™ Integrated Radiotherapy Solutions

Best GammaBeam™ 100/300 Equinox Teletherapy System with IMRT & IGRT

With NEW Multi-Leaf Collimator for 80 and 100 cm SAD units — IMRT, IGRT, SRS, SBRT and Tomotherapy capable with ActiveRx

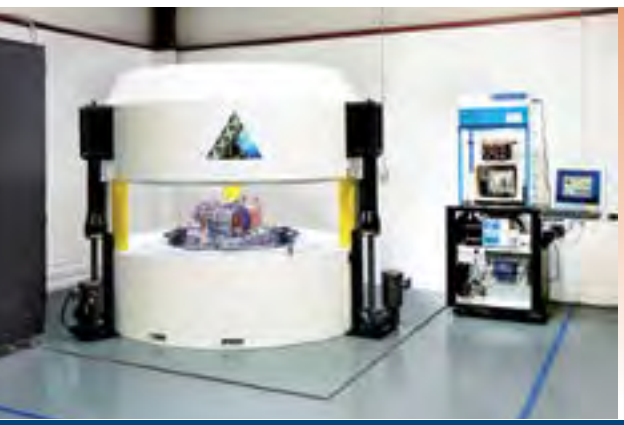
Best Avanza™ 6D Patient Positioning Table

The new Avanza 6D table provides adjustment in all 6 dimensions, including pitch and roll. This option will greatly improve the patient set-up for all treatments.

Best HDR Remote Afterloader

Best Treatment Planning Systems for LDR, HDR Brachytherapy, SRS, SBRT, Tomotherapy and Teletherapy with ActiveRx for IMRT

Best Sonalis™ Ultrasound Imaging System



NEW! Best Sub-Compact Model 200 Self-Shielded Cyclotron with Optional Second Chemistry Module (Patent Pending)

- Low energy compact system — can be placed next to PET/CT
- Integrated self-shielded cyclotron and chemistry module
- Easy to operate push-button graphic interface
- Capable of producing: ^{18}FDG, Na^{18}F, ^{18}F-MISO, ^{18}FLT, ^{18}F-Choline, ^{18}F-DOPA, ^{18}F-PSMA, ^{11}C, ^{13}N, ^{68}Ga and more!
- Ideal for Nuclear Cardiology and other Medical Applications

Best Medical International, Inc. 7643 Fullerton Road, Springfield, VA 22153 USA
tel: 703 451 2378 800 336 4970 www.besttotalsolutions.com www.teambest.com

AFRICA | ASIA | EUROPE | LATIN AMERICA | MIDDLE EAST | NORTH AMERICA

* Certain products shown are not available for sale currently.

In This Issue

10

Features

Society News

Departments

VOLUME 25 • NUMBER 1

ASTRO news

AMERICAN SOCIETY FOR RADIATION ONCOLOGY

ASTROnews (ISSN 1523-4185) is published quarterly at 251 18th Street South, 8th Floor, Arlington, VA 22202. Dues for individual membership in the American Society for Radiation Oncology are $705 (U.S.), which includes $38 for an *ASTROnews* subscription. Periodicals Postage Paid at Arlington, 22210-9998 and at additional mailing offices.

POSTMASTER: Send address changes to *ASTROnews*, 251 18th Street South, 8th Floor, Arlington, VA 22202.
Telephone: 703-502-1550; Fax: 703-502-7852; Website: www.astro.org/astronews
Printed in the U.S.A., by Quad Graphics in West Allis, WI.

For all of the most recent news from ASTRO, please visit www.astro.org.

EDITOR'S*notes*

BY NAJEEB MOHIDEEN, MD, FASTRO
SENIOR EDITOR, *ASTRONEWS*

TIME FOR A **RESET**

IT'S BEEN 50 YEARS since the transformative National Cancer Act of 1971 was signed into law by President Richard Nixon. Death rates for all cancers combined have declined in that period.[1] The reasons include increased investment in cancer prevention, early detection, research and improved treatments. In this half century, radiation oncology has traveled a great distance as showcased at the hybrid 2021 ASTRO Annual Meeting — the theme of this issue.

On the other hand, the cost of cancer care has ballooned — it's over $200 billion now and expected to jump to $246 billion by 2030. Medicare responded with an Alternative Payment Model for Oncology, the Oncology Care Model (OCM), a voluntary total cost of care model for six-month episodes of care for beneficiaries undergoing chemotherapy. A recent analysis in JAMA[2] showed the OCM resulted in an overall loss to Medicare of $315.6 million between 2016 and 2019 with no significant difference in the use of most services, quality or patient experience.

The Radiation Oncology Model differs from the OCM in important ways, chiefly that it's mandatory and only covers radiation therapy for a 90-day episode of care. The anticipated savings over the five-year period of the model are $150 million. Thanks to our heroes in Government Affairs and Health Policy and their relentless pressure on Congress, there's been a partial rollback of payment cuts due January 1, and a one-year delay in the implementation of the RO Model.

Do payment cuts for radiation therapy services actually address the issue of rising cancer costs? In 2020, all of radiation oncology cost Medicare (MPFS and HOPPS) $4.1 billion. On the other hand, four oncology drugs and a bone marrow support medication figured into the top 10 drugs in terms of total Medicare Part B drug expenditure in 2019, with this group alone accounting for nearly $9 billion,[3] while oncologist-prescribed drugs in total accounted for $12.8 billion in Part D costs.[4]

While many of these drugs provide meaningful clinical benefits, at times they are administered without confirmatory evidence of usefulness.[5] Now consider the benefits that radiation therapy provides in both cures and palliation, all for a fraction of the cost to the Medicare system. And think of all the ongoing trials, advances in research and technology, potential for improving outcomes based on integrated molecular, imaging and technological data and the impact this could have on patient care (see Sewit Teckie's fascinating interview with Gaorav Gupta, inventor of the NavDx Assay, on page 26).

Granted, we are living in unprecedented times. National health spending surged 9.7% to $4.1 trillion in 2020 due mainly to the pandemic, and payers are looking to reduce costs. But cuts of this nature on a specialty that's not the cause of the excessive spending can inflict serious damage on patient care, reduce access, worsen disparities and crush innovation. This at a time when it's clear that to build on the gains of the past 50 years, in addition to investing in research, we also have to improve equity and reduce disparity in care. Patients put their faith in us and they should be able to trust the system they paid into to support their care. I hope our leaders in Congress will continue to stand with the specialty in preserving access to high-quality radiation therapy.

ASTRO recognizes that it is time for a reset; an opportunity to establish diversity, equity and inclusion (DEI) as a priority. I encourage you to read Laura Dawson's enlightening update on ASTRO's plans, including the addition of a new DEI council to the Board and also read about the focus on this at the Annual Meeting (page 18).

Like the year that preceded it, the pandemic loomed over 2021. And just as the world seemed to be turning a corner, the Omicron variant is upon us. But we now have tools to fight the scourge that we didn't have a year ago. All the more reason to welcome 2022 with hope and a renewed sense of optimism. Yes, we do live in uncertain times, but here's to the conviction that we are now closer to light at the end of the tunnel than we were in 2021.

See reference list at www.astro.org/Winter22News.

CHAIR'S*update*

BY LAURA A. DAWSON, MD, FASTRO, CHAIR, BOARD OF DIRECTORS

ASTRO 2021: THE TIME FOR CHANGE IS NOW

I HOPE YOU ENJOYED THE ASTRO ANNUAL MEETING as much as I did. I will never again take for granted seeing friends and colleagues and hearing inspiring talks, live and in person. Although I expect that virtual education will have a big role moving forward, there will always be a place for in-person meetings, to facilitate connections and simply enjoy each other's company. The ASTRO 2021 Annual Meeting theme, Embracing Change, Advancing Person Centered Care, continues to be relevant as we navigate the unpredictable future of the ongoing pandemic, as well as other substantial challenges for the field of radiation oncology.

There are many goals for the ASTRO Board of Directors in 2022. An immediate threat is the Radiation Oncology Alternative Payment Model (RO Model) that will be mandatory for practices in pre-specified ZIP codes, and thanks to last minute ASTRO-led advocacy, Congress pushed back its start to January 1, 2023. In its present form, the RO Model lacks changes proposed by ASTRO to address health disparities. It will likely lead to losses of revenue and jobs, and most importantly, have a negative impact on patient access to radiation therapy, which will disproportionately affect vulnerable patient populations and patients living in rural areas. Properly designed, the Model could help close the gap in disparities in care and provide stability to the profession. ASTRO has been lobbying and advocating for the mitigation of Medicare cuts to better protect patients' access to cancer care. Your participation in advocacy efforts is appreciated. We are also having ongoing discussions with key stakeholders, including the American Cancer Society and patient advocates.

An exciting and positive change for 2022 is the new ASTRO Health Equity, Diversity and Inclusion (HEDI) Council, with two Board positions to represent the Council. The bylaws vote to formalize a HEDI Council was approved in December. There is now a search for a senior-level ASTRO Director of Diversity, Equity and Inclusion. ASTRO recently supported the Diversifying Investigations Via Equitable Research Studies for Everyone (DIVERSE) Trials Act (H.R. 5030/S. 2706) that is geared to reimburse patients for ancillary costs associated with clinical trials to increase enrollment and participation from underrepresented groups. The number of funded ASTRO Minority Summer Fellowship Awards, which introduces radiation oncology to early career medical students from backgrounds that are underrepresented in medicine, was increased from four to 10. Five new protégés were recently selected and four others have entered their second year of the ASTRO Leadership Pipeline Program (formerly known as the Pipeline Protégé Program), a career development program aimed at increasing diversity among ASTRO leadership. The protégés, along with present and past ARRO leadership, will conduct an environmental scan and survey early career ASTRO members to help develop an Early Career ASTRO Committee. Please respond to ASTRO surveys. We want your opinion!

ASTRO continues to develop initiatives to improve the profile of radiation oncology to medical students, and we are working on efforts to share more educational materials about radiation oncology with them. Regarding the workforce, ASTRO has also interviewed third-party companies, one of which will conduct a workforce study and provide recommendations to leadership.

In late January, the ASTRO Board of Directors will meet and set aside a day to take a fresh look at the ASTRO strategic plan, as we recognize that the world has changed substantially since it was last updated five years ago. We will consider threats and mitigation strategies and think big and long term. To prepare for this, ASTRO conducted an environmental scan. Thanks to those who participated.

Finally, with so much going on and the ongoing pandemic, please remember to take time for yourself, your families and each other. Happy 2022!

SPECIAL*report*

BY LAURA I. THEVENOT,
ASTRO CHIEF EXECUTIVE OFFICER

ASTRO'S 2021 YEAR IN REVIEW

I DON'T THINK MANY OF US THOUGHT we would be ending 2021 still in the middle (near the end?) of the COVID-19 pandemic. I certainly did not think I'd still be writing about it in my year-end report! Many of us entered 2021 feeling slightly hopeful that, with the availability of vaccines, the end of COVID-19 was near. But here we are, two years later still battling this pandemic. Before I review our 2021 accomplishments, I first want to acknowledge the toll this public health emergency has had. Research shows patients are presenting with more advance disease, inequities in health care are becoming more exacerbated and physician burnout is higher than ever. There is not one person that hasn't been affected in some way by the pandemic. Your dedication to ASTRO, despite these challenges, continues to be strong and contributes to the many accomplishments I will detail. For that, I thank you. Now, on to the high points!

One of our biggest accomplishments in 2021 was returning in person for the 63rd Annual Meeting. More than 6,000 professional attendees and exhibitors attended the live meeting in Chicago. Additionally, we were pleased to offer Digital XP for members who were unable to travel this year. Nearly 1,200 Digital XP participants enjoyed livestreamed access to the general sessions, as well as onDemand access to select in-person programming and exclusive Digital XP programming.

In addition to the many virtual meetings held in 2021, including the Coding and Coverage Seminar in December and the virtual Advocacy Day in July, where more than 100 radiation oncologists and medical physicists participated in more than 150 virtual meetings with lawmakers and staff, we hosted the Multidisciplinary Thoracic Cancers Symposium, learning and networking alongside 250 attendees in person.

ASTRO introduced many new digital learning opportunities in 2021. The Research-Oriented Career Knowledge and Support (ROCKS) web sessions were designed to equip more radiation oncology researchers for successful careers. The DEIinRO social education series hosts discussions focused on key issues in diversity, equity and inclusion within the field. Additionally, a three-part multidisciplinary webinar series on the continuum of care for non-resectable NSCLC was offered. And, we continue to add new courses weekly to the ASTRO Academy.

In addition to education, ASTRO has been active on many fronts, including being a vocal force on multiple workforce issues, from advocating for parental leave for residents to increasing medical student awareness of the field to forming a taskforce to study the supply and demand of radiation oncologists. ASTRO continues to work alongside ARRO, SCAROP and ADROP to ensure a strong workforce for the future of the field.

Our government relations and health policy staff and volunteers have fought hard to protect physician reimbursement and patient access to cancer care. While the MPFS and HOPPS final rules have been released, ASTRO continues to advocate to reduce Medicare cuts and correct the deficiencies in the RO Model. Through ASTRO's advocacy, we were able to secure a one-year delay in the Model.

ASTRO published two clinical practice guidelines in 2021, one on soft tissue sarcomas and the other on primary liver cancers. ASTRO endorsed the ABS guideline on low-dose-rate treatment for localized prostate cancer and is collaborating with ASCO, ESTRO, SSO and other sister societies on more than a dozen guidelines. On the research front, ASTRO awarded more than $1 million across nine research grants and fellowships. ASTRO expanded its funding opportunities for 2022 to include five ASTRO-industry research training fellowships, four seed grants and two career development awards.

The ASTRO Board of Directors is actively working to address ways we can make the field more attractive and welcoming to people of diverse backgrounds. I am pleased to say that a bylaws change to add a new DEI council to the Board passed at the end of 2021.

Lastly, a huge thank you to our members. These initiatives would not be possible without your participation in the Society. On behalf of ASTRO staff, we look forward to serving you in 2022 and beyond!

ASTRO risks losing seat at AMA table; take action now

BY THOMAS EICHLER MD, FASTRO, IMMEDIATE PAST CHAIR; SHANE HOPKINS, MD; ANKIT AGARWAL, MD, MBA; SHILPEN PATEL MD, FASTRO

THE AMERICAN MEDICAL ASSOCIATION (AMA) has served as a partner to ASTRO on advocacy efforts related to reimbursement changes, the RO Model and the increasing burden of prior authorization. These advocacy efforts have led to reimbursement changes and simplification of administrative requirements that have directly benefited every radiation oncologist practicing in the United States.

As the AMA prepared to meet in November, ASTRO was disheartened to learn that we may lose our representation at the AMA's House of Delegates. The "federation of medicine" includes delegations representing states and specialties, but membership in the House of Delegates requires a certain percentage of each society's membership to also be members of the AMA. Unfortunately, ASTRO has fallen short in that measure, and we are currently in a one-year probation period after which ASTRO's voice will be silenced in the AMA House of Delegates. **It is absolutely critical that we continue to have ASTRO delegates at the table to advocate and testify at the AMA in support of radiation oncology interests.**

The AMA is one of the largest lobbying groups in the country, and the value of having them go to bat for us simply can't be replaced. For example, the AMA sent a detailed letter to the Centers for Medicare and Medicaid Services regarding the RO Model reflecting ASTRO's concerns, albeit with the weight of the whole of organized medicine behind it. The AMA was instrumental in combatting SGR cuts for two decades until its repeal in 2015. In addition, the AMA has successfully fought insurance mergers, such as the Anthem-Cigna merger that would have cost physicians $500 million dollars in payments annually. In short, the AMA has fought against perennial challenges to our autonomy as physicians, including scope of practice issues, with major successes benefiting every one of us, even if many of us are unaware.

In order for ASTRO to maintain their seat at the AMA table with the ability to testify and vote on issues that affect us all, we need you to join the AMA in addition to renewing your ASTRO membership. Consider your AMA dues a sound investment with a proven track record. Threats to reimbursement and physician autonomy are, and will remain, ongoing, and although the AMA is just one stakeholder, they remain the single most powerful voice advocating on behalf of *all* physicians. Act now: Join or renew your AMA membership today at https://member.ama-assn.org/join-renew/member-search. It is imperative that ASTRO maintain their voice within the AMA House of Delegates. Please help us meet this challenge!

ASTRO MEMBERS: DEMOGRAPHICS, SATISFACTION AND ENGAGEMENT WITH ASTRO, CAREER AND FIELD

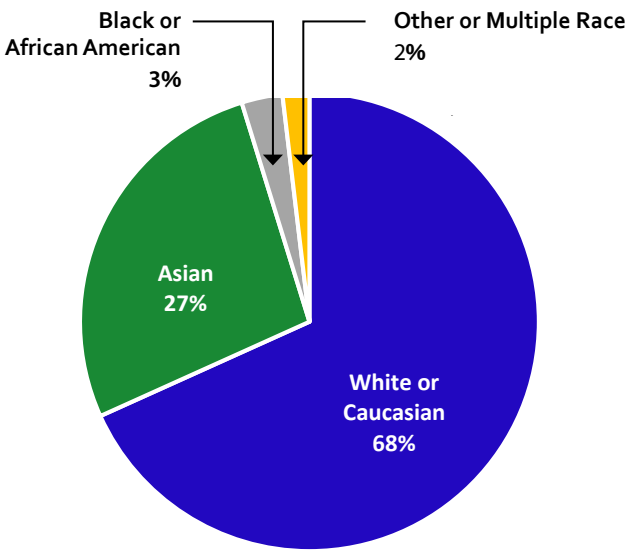
Results of the 2021 ASTRO Member Survey

EACH YEAR, ASTRO CONDUCTS A MEMBER SURVEY to learn more about our members' needs and concerns and how, as a Society, we can serve them better. This year's survey also delved into member job satisfaction and the future of the field. The Member Survey was emailed to ASTRO Active, Affiliate, Associate, International and Member-in-Training members and was in the field for eight weeks, May 25 through July 26. Nearly 15% of those surveyed responded, representing a slight decrease from 2020.

Let's start with the basic demographics

Of the 1,134 members who completed the survey, three-quarters (77%) practice in the United States. Primary respondent occupations are radiation oncologist (70%), medical physicist (15%) and resident (10%). Seventy-one percent identify as male and 29% as female. (Excludes respondents who selected "non-binary" n=2 and "prefer not to specify" n=60). Sixty-eight percent are white or Caucasian, 27% are Asian, 3% are Black or African American, 2% are other. (Excludes respondents who selected "prefer not to identify" n=136). Please refer to the online report for more detailed demographic information.

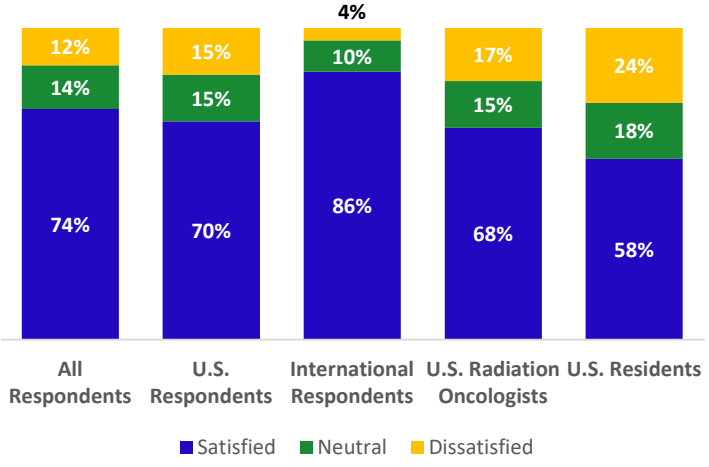
Figure 1: Respondent demographics (Race)



Satisfaction with membership in ASTRO

Satisfaction among all respondents has remained steady and high over the past years. In 2021, while satisfaction with ASTRO is high, a slight decrease was noted among U.S. radiation oncologists and U.S. residents. When asked about the reasons for dissatisfaction, responses focused on the job market, residency expansion and politics. Nonetheless, respondents overall agree that participation in ASTRO is a good use of their time.

Figure 2: Satisfaction with ASTRO Membership



Importance of the functions ASTRO provides

Radiation oncologist members were asked to rate the importance of ASTRO's core functions on a scale of one to seven. A list of 16 functions, ranging from Advocacy to Professional Development were provided. In 2021, U.S. radiation oncologists rate advocacy for appropriate reimbursement as the top function ASTRO performs. International radiation oncologists rate publishing scientific and practice journals as the top function. All functions were highly rated. Please refer to the online report for the complete list.

Feelings about radiation oncology: Career and field

In the 2021 survey, members were asked to share feelings about their careers and the field. Overall, respondents are satisfied with their current job. Most radiation oncologists (89% U.S., 92% International) are satisfied with their current job. U.S. radiation oncologists and U.S. residents are most concerned

about payment reform and prior authorization. U.S. and international respondents share the concern about the lack of influence of radiation oncologists as leaders in cancer care and the dependence on other medical specialists for referrals. However, looking at the future, U.S. and international respondents are excited about radiation for oligometastatic disease, ongoing technical innovation that improves the therapeutic ratio of external beam radiation and artificial intelligence and Big Data improving automations and facilitating clinical decision making.

Overall, respondents cite payor issues as the greatest challenge over the next three years followed by government issues and practice issues. Respondents zero to three years out of residency cite personal issues as the greatest challenge.

Primary reason for being a member

Both domestic and international members cite access to ASTRO journals as the primary reason for being a member of ASTRO, followed by premier society for radiation oncology and professional development for domestic members and professional development and discounted rates for scientific meetings and educational programs by international members.

What else can ASTRO do to support members?

Thank you to members who wrote in suggestions of ways that ASTRO can serve members. Academic setting respondents suggest increasing educational resources and opportunities, providing more funding opportunities for research, increased involvement in workforce issues, opening volunteer and engagement opportunities to a wider array of members, and expanding mentorship programs. Private practice suggestions include advocating against prior authorization and for fair reimbursement, developing resources that provide clinical practice guidance, greater representation on committees and access to ASTRO leadership.

Summary

ASTRO will continue to use your valuable feedback to inform and improve your membership experience and enhance our member services. The ASTRO Member Survey is sent out every May, so please don't miss it in 2022. *Thank you!*

Visit **www.astro.org/Winter22News** for the complete results of the 2021 ASTRO Member Survey.

Newly elected companies to serve on ASTRO's Corporate Advisory Council

ASTRO'S CORPORATE MEMBERSHIP has elected the following companies to serve on the 2022 Corporate Advisory Council: Accuray Incorporated, C-RAD AB; MIM Software Inc., all newly elected, and Elekta, who was re-elected for another term. We are also pleased to announce AstraZeneca will serve a third term of one year. The addition of a pharmaceutical company is designed to help serve as another category of industry perspective to the work of the Council.

The Council is a smaller, representative group of the Corporate Membership-at-large, with a proportional mix of large and small companies from the Corporate Membership base. Seats on the Council are held by high-level decision makers within the corporations and represent a broad cross section of the industry.

2021 Corporate Advisory Council

The Council allows for collaboration between ASTRO and its Corporate Members by focusing on issues and initiatives of mutual concern in radiation oncology. Priorities include increasing awareness of radiation therapy and advancing the science and practice of cancer treatment and patient care. In cooperation with ASTRO leadership, the Council convenes several times a year via conference call and holds an in-person meeting at ASTRO's Annual Meeting. In 2021, the following topics were brought to the forefront: Industry support for new approaches to patient treatment and patient education; a report on ASTRO's Research Agenda; advancing the field of radiation oncology and making a greater impact

Continued on page 9

The SunCHECK™ Platform powers Quality Management in radiation therapy.

Scalable to meet the needs of any clinic or network, SunCHECK helps:

- **Reduce risks**
- **Control costs**
- **Improve treatment quality**

Visit sunnuclear.com to learn how SunCHECK fits into your clinic.

Patient Safety Starts Here

SUN NUCLEAR corporation

on science; RO-ILS: Radiation Oncology Incident Learning System and its continued growth; and ASTRO's Advocacy division reported on the many changes in health care legislation, including coding and payment freezes.

All corporate members can nominate their company to serve on the Council. Nominations are accepted every fall with elections conducted during the winter. For more information about the Council and/or Corporate Membership, please contact Joanne DiCesare at joanne.dicesare@astro.org.

2022 Corporate Advisory Council

Accuray • AstraZeneca
CIVCO Radiotherapy • C-Rad AB
Elekta • GE Healthcare
IBA (Ion Beam Applications SA)
MIM Software Inc. • Standard Imaging
Sun Nuclear Corporation
Varian, A Siemens Healthineers Company
ViewRay Inc. • Xstrahl

In Memoriam

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

Walter Lawrence Jr., MD
2020 Honorary Member
Richmond, Virginia

Gordon Watson, MD, PhD
Indianapolis, Indiana

J. Peter Veerling, MS
Gray, Tennessee

The Radiation Oncology Institute (ROI) graciously accepts gifts in memory of or in tribute to individuals. For more information, visit **www.roinstitute.org**.

Statement for U.S. Postal Service: Statement of Ownership, Management and Circulation

1. **Publication Title:** *ASTROnews*
2. **Publication number:** 1523-4185
3. **Filing Date:** 9/28/2021
4. **Issue Frequency:** Quarterly
5. **Number of Issues Published Annually:** 4
6. **Annual Subscription Price:** $38.00
7. **Complete Mailing Address of Known Office of Publication:** 251 18th Street South, 8th Floor, Arlington, VA 22202-3531
8. **Complete Mailing Address of Headquarters or General Business Office of Publisher:** 251 18th Street South, 8th Floor, Arlington, VA 22202-3531
9. **Full Names and Complete Mailing Addresses of Publisher, Editor and Managing Editor:** Publisher - Laura Thevenot, 251 18th Street South, 8th Floor, Arlington, VA 22202-3531
   Editor - Anna Arnone, 251 18th Street South, 8th Floor, Arlington, VA 22202-3531
   Managing Editor - Diane Kean, 251 18th Street South, 8th Floor, Arlington, VA 22202-3531
10. **Owner:** American Society for Radiation Oncology (ASTRO), 251 18th Street South, 8th Floor, Arlington, VA 22202-3531
11. **Known Shareholders, Mortgagees 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 Below:** 9/22/2021
15. **Extent and Nature of Circulation: Informational/Educational**
    - **a. Total Number of Copies:** 7,000; 6,270
    - **b. Paid Circulation**
      1. **Mailed Outside-County Paid Subscriptions Stated on PS Form 3541:** 6,944; 5,920
      2. **Mailed In-County Paid Subscriptions Stated on PS Form 3541:** 6; 6
      3. **Paid Distribution Outside the Mails, Including Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid Distribution Outside USPS:** 0; 0
      4. **Paid Distribution of Other Classes of Mail Through the USPS:** 0; 0
    - **c. Total Paid Distribution:** 6,950; 5,926
    - **d. Free or Nominal Rate Distribution**
      1. **Free or Nominal Rate Distribution Outside-County Copies Included on PS Form 3541:** 0; 0
      2. **Free or Nominal Rate In-County Included on PS Form 3541:** 0; 0
      3. **Free or Nominal Rate Copies Mailed at Other Classes Through the USPS:** 5; 7
      4. **Free or Nominal Rate Distribution Outside the Mail:** 20; 312
    - **e. Total Free or Nominal Rate Distribution:** 25; 319
    - **f. Total Distribution:** 6,975; 6,245
    - **g. Copies not Distributed:** 25; 25
    - **h. Total:** 7,000; 6,270
    - **i. Percent Paid:** 99.6; 94.9
16. **Electronic Copy Circulation**
    - **a. Paid Electronic Copies:** 0, 0
    - **b. Total Paid Print Copies + Paid Electronic Copies:** 6,950; 5,926
    - **c. Total Print Distribution + Paid Electronic Copies:** 6,975; 6,245
    - **d. Percent Paid (Both Print and Electronic Copies):** 99.6; 94.9
17. **Publication of Statement of Ownership:** The Winter 2022 issue of *ASTROnews*.
18. I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits materials or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).




A **Recap** of the Annual Meeting's **Plenary** and **Clinical Trials** and **Innovation Sessions**

This year's Plenary and Clinical Trials and Innovation sessions, moderated by Andrea Ng, MD, MPH, FASTRO, and Felix Feng, MD, chair and co-chair of the Annual Meeting Scientific Committee, respectively, provided robust and varied presentations of the latest science.

PLENARY

The Plenary Session featured four phase III randomized trials.

Daniel J. Krauss, MD, presented highly anticipated results of the NRG Oncology/RTOG 0815 randomized trial. Dr. Krauss tested the role of adding short-term androgen deprivation therapy (ST-AD) to dose-escalated radiation therapy for intermediate-risk prostate cancer. While the primary endpoint of overall survival at five years was not met, ST-AD was associated with a small but statistically significant reduction in PSA failure, distant metastases, initiation of salvage therapy and prostate cancer-specific mortality. Patient-reported outcomes revealed that ST-AD caused declines in EPIC questionnaire hormone and sexual domains, but these returned to baseline levels within one year. This trial adds to the body of evidence demonstrating the value of ST-AD for intermediate-risk prostate cancer, importantly with quality of life data to help direct individualized patient care.

Mark K. Buyyounouski, MD, MS, presented results from the NRG Oncology GU003 trial, comparing hypofractionated versus conventional post-prostatectomy radiation therapy. Dr. Buyyounouski and colleagues tested conventional fractionation (COPORT, 66.6 Gy in 37 fractions) versus moderate hypofractionation (HYPORT, 62.5 Gy in 25 fractions) to the prostate bed after radical prostatectomy. There was no significant difference in patient-reported GI or GU symptoms at two years after treatment, which was the primary endpoint. It remains to be seen whether longer term follow up will be needed before HYPORT is routinely adopted in clinical practice, but the early results appear promising.

Yong Bae Kim, MD, reported on the results of the Korean Radiation Oncology Group (KROG 08-06) trial evaluating elective internal mammary nodal irradiation (IMNI) in women with node-positive breast cancer. Led by Dr. Kim, the randomized phase III trial team concluded that including IMNI in regional nodal irradiation did not significantly improve disease-free survival (DFS) for unselected women with node-positive breast cancer. Women with medially or centrally located tumors can be considered for applying IMNI when performing regional nodal irradiation. These results added to the body of literature surrounding this historically debated topic.

Daniel J. Ma, MD, presented the results of the MC1675 randomized phase III trial. Dr. Ma and team assessed the impact of de-escalated adjuvant radiation therapy (DART) on toxicity, quality of life (QOL) and treatment efficacy when compared with standard adjuvant treatment in patients with HPV-associated oropharyngeal squamous cell carcinoma. The results concluded that DART demonstrated less toxicity

and improved swallowing function and QOL when compared to SOC. DART also had excellent LRC, PFS and OS rates, particularly in the ENE negative cohort.

CLINICAL TRIALS AND INNOVATION

The Clinical Trials and Innovation Session featured eight scientifically significant trials.

Benjamin Movsas, MD, FASTRO, presented the patient reported outcomes (PROs) from the NRG Oncology/RTOG 0815 trial, the phase III randomized trial evaluating total androgen suppression (TAS) combined with dose-escalated RT for patients with intermediate risk prostate cancer. The addition of TAS to dose-escalated RT demonstrated significant clinically meaningful declines in the EPIC hormonal and sexual domains and increases in the PROMIS-fatigue scores compared to RT alone. Beyond the clinical outcomes, these PROs provide added value to help patients make informed decisions among treatment options.

Casey Liveringhouse, MD, presented results from a prospective phase I/II study combining chemoradiation therapy (chemo-RT) with ipilimumab (1mg/kg) followed by adjuvant nivolumab (480mg iv q4 weeks) in patients with unresectable stage 3 NSCLC. The primary endpoints were the safety and tolerability in the phase I part of the study. After enrollment of 19 patients for phase I, the trial was discontinued due to excess toxicity. Ten out of 19 patients experienced grade 2+ pneumonitis (8/19 (42%) grade 3+ pneumonitis). Five patients had possibly treatment-related grade 5 toxicity (3/19 (16%) grade 5 pneumonitis). There was also no signal for efficacy with a one-year progression-free survival (PFS) of 54% and overall survival of 60%. The authors concluded that the concurrent administration of ipilimumab and chemo-RT followed by adjuvant nivolumab was too toxic and not warranted. This study demonstrates that concurrent ipilimumab is more toxic than what is known thus far about concurrent anti-PD-1/PD-L1 therapy.

Robert A. Olson, MD, MS, presented the preliminary results of the SABR-5 trial. Dr. Olson and team examined concerns that were raised over toxicity of SABR for oligometastases after the publication of the landmark SABR-COMET trial. Their population-based study was designed as a bridge from phase II to phase III trials with a primary goal to establish better estimates of toxicity in preparation for eventual phase III randomized trials. The incidence of grade 2+ SABR toxicity on this population-based study was 16.5%, which is lower than that reported on SABR-COMET (29%). Importantly, there were no grade 5 toxicities attributed to SABR in this study to date. Severe (grade 3 or higher) toxicities were uncommon (5.0%).

Increasing dose of chemoradiation therapy in locally advanced esophageal cancer unsuitable for surgery has been a matter of debate in the last two decades. **Gilles Crehange, MD, PhD**, reported the results of the phase II/III CONCORDE (PRODIGE-26) trial, where they investigated whether 50 Gy or 66 Gy of ionizing radiation was superior as part of exclusive chemo-RT for stage 1-3 esophageal cancer. Results concluded that dose escalated chemo-RT delivering 66 Gy is not more toxic than 50 Gy but did not improve locoregional PFS.

Amar U. Kishan, MD, and team conducted the first global Individual Patient Data Meta-Analysis of Randomized Trials in Cancer of the Prostate (MARCAP) to assess the impact of androgen

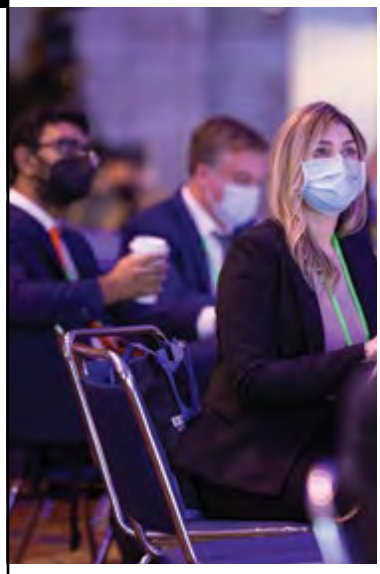
Continued on the following page

deprivation therapy (ADT) use and duration with definitive radiation therapy (RT) in localized prostate cancer. Dr. Kishan presented the results of the MARCAP consortium study, which represented the strongest evidence to support ADT use and prolongation of adjuvant ADT to at least 18 months in localized prostate cancer in conjunction with definitive RT. The relative benefit of ADT use and adjuvant ADT prolongation was consistent irrespective of RT dose-escalation.

In their abstract titled Identification of De Novo Pyrimidine Synthesis as a Targetable Vulnerability in a Novel IDH1 Mutant Engineered Astrocytoma Model, **Diana D. Shi, MD**, and team sought to identify tumor-specific vulnerabilities induced by the IDH1-R132H oncogene and test the translational relevance of targeting them using a new genetically engineered mouse model of IDH1 mutant anaplastic astrocytoma. Dr. Shi presented that in addition to supporting evaluation of BAY2402234 as a potential tumor-selective radiosensitizer, the findings establish IDH1 mutations as predictive biomarkers of DHODH inhibitor efficacy in gliomas across tumor grade, highlight BAY2402234 as a candidate glioma therapeutic and unveil new genetically faithful mouse models of IDH1 mutant glioma.

David A. Palma, MD, PhD, presented results of the phase II randomized ORATOR2 trial. Dr. Palma and team examined the rapid increase in the incidence of oropharyngeal squamous cell carcinoma (OPSCC) attributed to widespread oral human papillomavirus (HPV) infections. The goal of the study was to assess outcomes with two de-escalation approaches: Primary reduced-dose RT versus primary transoral surgery plus neck dissection with reduced-dose adjuvant therapy. They concluded that the primary RT approach achieved excellent oncologic outcomes in treatment de-escalation with a moderate toxicity profile.

C. Jillian Tsai, MD, PhD, shared interim analysis results of the first randomized trial to test the use of stereotactic body radiation therapy (SBRT) to treat oligoprogressive metastatic lung and breast cancer with one to five progressive lesions. Dr. Tsai and team hypothesized that there is an oligoprogressive state in metastatic cancer in which disease control can be improved with local therapy to progressive lesions only. This late breaking abstract demonstrated the benefit of SBRT to sites of oligoprogression on overall PFS, meeting the primary endpoint.



See these abstracts in the Red Journal Proceedings of the 2021 ASTRO Annual Meeting at **www.redjournal.org**, and read expert commentary on many of them at **www.astro.org/DailyNews**.

Science HIGHLIGHTS

Gastrointestinal

By Sunil Krishnan, MBBS, MD,
Chair of the GI Track on the
Annual Meeting Scientific Committee

AT THIS YEAR'S ASTRO ANNUAL MEETING, the GI sessions included a number of noteworthy clinical and translational studies in esophageal, gastric, hepatobiliary, pancreatic, colorectal and anal cancer. I highlight two of these here.

The first was a multicenter French phase II/III randomized clinical trial (CONCORDE) comparing FOLFOX-4 and 40 Gy extended field radiotherapy with a sequential 10 Gy boost to FOLFOX-4 and 40 Gy extended field radiotherapy with a 26 Gy sequential boost in unresectable esophageal cancer. Most (88%) of the randomized 217 patients had squamous cell cancer and most of them (80%) were treated with IMRT. With a median follow up of nearly three years, the primary endpoint of two-year locoregional progression-free survival (LRPFS) using RECIST criteria was no different between the two groups (42.7% standard dose vs. 43.8% high dose). While dose escalation was not more toxic, the lack of a LRPFS or overall survival (OS) benefit (25.2 months vs. 23.5 months, P=0.88) argue for continued use of 41.4-50.4 Gy as the recommended radiation dose for esophageal cancers.

The CONCORDE results dovetail those of the pre-IMRT era Intergroup INT 0123 study (Minsky, 2002) comparing 5FU/cisplatin and 50.4 Gy radiation to 5FU/cisplatin and 64.8 Gy radiation in unresectable esophageal cancer (85% squamous cell, median OS 18.1 months vs. 13.0 months, not statistically significant) and the more contemporary IMRT/VMAT treated PET-staged Dutch ARTDECO study (Hulshof, 2021) comparing carboplatin/paclitaxel and 50.4 Gy (1.8 Gy/fraction to carboplatin/paclitaxel and 61.6 Gy (2.2 Gy/fraction) (61% squamous cell, three-year LRPFS 52% vs. 59%, p=0.08). Collectively, these studies confirm that across-the-board radiation dose escalation for all esophageal cancer patients should be abandoned. Efforts to improve toxicity burden by using proton therapy (Lin, 2020) based on a randomized phase II study or PET-response guided tailoring of choice of concurrent chemotherapy used with radiation therapy after induction chemotherapy based on CALGB 80803 (Goodman, 2021) are avenues worth pursuing, as are ongoing with NRG-GI006 and the United Kingdom SCOPE-2 trials, respectively. There is a clear unmet need for better understanding of the molecular mechanisms that drive local failures after chemoradiation therapy. Armed with this information, future studies could then be enriched for patients who are likely to fail locally and evaluate the potential benefit of intensification of local therapy.

As an example of how this might look in the future, the report of a retrospective analysis of the RTOG 9704 randomized postoperative pancreatic cancer study comparing two chemoradiation regimens serves as a case study. Terence Williams, MD, PhD, and colleagues retrospectively analyzed SMAD4 (DPC4), a transcription factor that mediates TGF-β signal transduction, expression levels by immunofluorescence in a tissue microarray of tumor samples. Earlier studies had shown that, contrary to the notion that death from pancreatic cancer universally results from metastatic progression, nearly 30% of patients in an autopsy series died of locally destructive disease and loss of SMAD4 expression was associated with progression with widespread metastasis rather than local destruction (Iacobuzio-Donahue, 2009). The current RTOG

Continued on the following page

analysis confirmed that higher expression of SMAD4 in the tumor specimen was associated with a 30% reduction in the development of distant metastases, arguing for SMAD4 as a prognostic biomarker in pancreatic cancer that could be incorporated into biomarker-driven trials in the future.

In parallel, other data presented this year suggest that SMAD4 status may identify patients who benefit from neoadjuvant chemoradiation therapy (AlMasri, 2021) and that higher expression levels of transcriptionally inactive cytoplasmic β-catenin portend a better prognosis in pancreatic cancer patients treated on RTOG 9704 (Ben-Josef, 2021).

Overall, this year's GI sessions were replete with insightful clinical and translational studies defining strategies to improve the therapeutic ratio in GI cancers and chart a path forward for future investigations.

Genitourinary

By Rahul D. Tendulkar, MD,
Chair of the GU Track on the
Annual Meeting Scientific Committee

THE ASTRO 2021 ANNUAL MEETING WAS NOTABLE for two Plenary presentations of eagerly awaited randomized trials in genitourinary cancers: RTOG 0815 and NRG GU003. The RTOG 0815 trial, presented by Daniel Krauss, MD, tested the role of adding short-term androgen deprivation therapy (ST-AD) to dose-escalated radiotherapy for intermediate-risk prostate cancer.

The NRG GU003 trial, presented by Mark Buyyounouski, MD, tested conventional fractionation (COPORT, 66.6 Gy in 37 fractions) versus moderate hypofractionation (HYPORT, 62.5 Gy in 25 fractions) to the prostate bed after radical prostatectomy. Read more on these trials on page 10 in the Plenary article.

In addition to these Plenary abstracts, the following were notable in GU cancer research. Almudena Zapatero, MD, PhD, presented the long-term results of the GICOR DART 01/05 trial. This was a randomized trial testing the duration of androgen deprivation, either short-term (ST-AD, four months) or long-term (LT-AD, 28 months), in the setting of dose-escalated radiation therapy (median dose 78 Gy) for intermediate-risk (47%) and high-risk (53%) prostate cancer. This trial had previously reported its primary endpoint and demonstrated that LT-AD had superior five-year rates of biochemical disease-free survival, in addition to overall survival and metastases-free survival. The 10-year update failed to demonstrate maintenance of a statistically significant difference in these endpoints over time, but the study was not sufficiently powered to account for potential losses to follow-up beyond five years. The authors did note that in the high-risk subset, the 10-year rates of biochemical disease-free survival, overall survival and metastases-free survival were numerically 12% better with LT-AD than with ST-AD. Notably, only 3% of patients died of prostate cancer, all in the high-risk subgroup. This trial demonstrated that LT-AD appears to be most appropriate for patients with high-risk prostate cancer, while ST-AD may be sufficient for those with intermediate-risk prostate cancer treated with dose-escalated radiotherapy.

Finally, presentations by Paul Nguyen, MD, and Alan Dal Pra, MD, examined the impact of the Decipher genomic classifier (GC) in the intact and post-operative settings, respectively. A combined analysis of biopsy tissue samples from patients with high-risk prostate cancer treated on the RTOG 9202, 9413 and 9902 trials found that those with a high or intermediate GC score had a 29% rate of distant metastases at 10 years, while those with a low GC score had only a 13% risk. Dr. Nguyen and colleagues observed an independent association of GC score with distant metastases, prostate cancer-specific mortality and overall survival.

Likewise, radical prostatectomy samples from a subset of patients treated on the SAKK 09/10 trial were analyzed. Dr. Dal Pra and colleagues revealed that a high GC score was associated with a higher hazard of freedom from biochemical progression, clinical progress-free survival and salvage androgen deprivation therapy. These are among the first validation studies of gene expression biomarker on tissue samples from prospective trials in prostate cancer.

Gynecologic



By Eric Leung, MD, Kathy Han, MD, MS, and Jyoti Mayadev, MD, Vice-chair of the GYN Track on the Annual Meeting Scientific Committee

AT ASTRO 2021, WE HAD AN AMAZING GROUP of pre-clinical, translational and clinical trial research presentations. Here we highlight two presentations that are impactful for the field of gynecology oncology and radiation.

The SPARTACUS prospective trial by Eric Leung, MD, and colleagues examines the use of hypofractionated radiation in the pelvis with reported acute and patient reported toxicities.

Adjuvant pelvic radiation is important in reducing locoregional recurrences in uterine cancers. Standard treatment consists of daily radiation for five weeks, which can be challenging for patients and the health care system, especially during the COVID-19 pandemic. Hypofractionation radiation therapy (RT) has been evaluated and established in other pelvic malignancies but not prospectively studied in uterine cancers. The SPARTACUS trial evaluated the acute bowel and urinary toxicities and patient reported outcomes following stereotactic hypofractionated adjuvant radiation for endometrial cancer. Patients planned for adjuvant radiation received 30 Gy in 5 fractions, every other day or once weekly. Toxicity assessment, outcomes and patient reported quality of life (QOL, EORTC core QLQ-C30 and endometrial EN24) were collected at baseline, fractions (F) 3 and 5, and at regular follow-up intervals. The median age of the 61 enrolled patients was 66. Tumor histology included 39 endometrioid adenocarcinoma, 15 serous/clear cell, three carcinosarcoma and four dedifferentiated. Fifteen patients received sequential chemotherapy and nine had additional vault brachytherapy. Median follow-up was nine months, with worst GI/GU toxicity of grade 1 and 2 in 56%/41% and 13%/3% respectively. One patient (1.6%) had a grade 3 GI toxicity of diarrhea at F5 that resolved at follow-up. Patient-reported diarrhea scores was the only QOL item that was both clinically (≥ 10) and statistically significantly worse at F5 ($p<0.0001$) but improved at six weeks and three months follow-up. There were no clinically significant changes in all other scores, including gastrointestinal, urinary symptoms and global health status. Stereotactic hypofractionated radiation was feasible and well-tolerated with short-term follow-up. In the era of personalized medicine, the ability to deliver more efficient treatment could then expand a patient's ability to have concurrent or more timely personalized systemic therapy.

A prospective study presented by Kathy Han, MD, MS, and collaborators examined the impact of metformin with chemoradiation with an imaging PET/CT biomarker endpoint to predict early response in locally advanced cervical cancer treated with chemoradiation.

Tumor hypoxia is associated with poor response to RT and chemotherapy and worse treatment outcome. Metformin has been shown to enhance tumor RT response in xenograft models by inhibiting tumor cell oxygen consumption. Retrospective studies have also shown metformin use in diabetic patients to be associated with lower risk of (cervical) cancer mortality.

This trial investigated whether metformin could decrease tumor hypoxia and improve tumor response to RT in patients with stage IB-IVA cervical cancer. Patients underwent screening PET imaging with hypoxia tracer fluoroazomycin arabinoside (FAZA). Those with non-hypoxic tumor (no FAZA uptake) were excluded. Patients with FAZA uptake were randomized in a 2:1 ratio to receive either metformin in combination with standard chemoradiation therapy (chemo-RT) or standard chemo-RT alone. A second FAZA-PET/CT scan was performed after one week of metformin or no intervention in control group, just before start of chemo-RT. The hypoxic fraction (HF) was defined as the ratio of the number of hypoxic voxels to the total number of tumor voxels. Of the 20 patients who consented, six were excluded due to no FAZA uptake and one withdrew. The HF of the 10 patients in the metformin arm decreased by an average of 10.2% (44.4% to 34.2%) ± SD 16.9% after one week

Continued on the following page

of metformin, compared to an average increase of 4.7% (29.1% to 33.8%) ± 11.5% for the three patients in the control arm. The two-year disease-free survival (DFS) was 67% for the metformin arm versus 33% for control.

This hypoxia-targeted trial showed that metformin decreased cervical tumor hypoxia with a trend toward improved DFS. A larger confirmatory trial is warranted. We continue to look for biomarkers and novel therapeutics in node positive cervical cancer, which continues to represent an unmet medical need.

By Andreas Rimner, MD, and Inga Grills, MD, Chair and Vice-chair of the Lung/Thoracic Track on the Annual Meeting Scientific Committee

TOP-RATED ABSTRACTS IN THE LUNG TRACK

focused on the question of safely combining immunotherapy and thoracic radiation therapy. Salma Jabbour, MD, FASTRO, presented updated results of the KEYNOTE-799 study. This prospective phase II study explored whether pembrolizumab, an anti-PD-1 antibody, can be safely delivered in combination with concurrent chemotherapy and radiation therapy in patients with newly diagnosed unresectable, locally advanced stage III non-small cell lung cancer (NSCLC).

Two cohorts enrolled a total of 216 patients. Patients in cohort A (squamous and nonsquamous lung cancer) were treated with carboplatin/paclitaxel/pembrolizumab (200mg iv q3 weeks) and concurrent conventionally fractionated radiation therapy to a total dose of 60 Gy in 30 fractions starting with cycle 2. Patients in cohort B (only nonsquamous lung cancer) were treated with cisplatin/pemetrexed/pembrolizumab and the same radiation therapy. Primary endpoints were overall response rates (ORR) and incidence of grade 3+ pneumonitis. The overall response rate was 70.5% for cohort A and 70.6% for cohort B, consistent with promising antitumor activity of concurrent chemo/IO/RT. Grade 3+ pneumonitis occurred in 8% in cohort A and 7% in cohort B, with 4/112 patients in cohort A and 1/102 patients in cohort B experiencing fatal pneumonitis. It is important to note that the grade 3+ pneumonitis means need for continuous oxygen or hospitalization for pneumonitis, which in and of itself represents a more severe than average course of pneumonitis. In contrast, the PACIFIC trial that established the use of consolidative durvalumab after completion of concurrent chemoradiation reported a grade 3+ pneumonitis rate of 3.4%, possibly because the PACIFIC trial excluded patients that progressed early after chemo-RT or had persistent grade 2+ toxicities. Thus, the grade 2+ pneumonitis rates from both trials would be highly relevant for clinical practice and side-by-side comparison. It is noteworthy that the pneumonitis rates of the KEYNOTE-799 trial occurred in the context of fairly restrictive dosimetric parameters, such as a lung V20 of 31%. The phase II ETOP-NICOLAS study on concurrent nivolumab/chemo-RT reported a 12% grade 3+ pneumonitis rate, again suggesting a slightly higher pneumonitis rate with concurrent chemo/IO/RT.

We expect more results on the safety and efficacy of concurrent chemo/IO/RT from the PACIFIC-2 trial that compares concurrent durvalumab + chemo-RT with concurrent chemo-RT alone. A definitive comparison of concurrent chemo/IO/RT and chemo-RT followed by consolidative immunotherapy is being investigated in the ECOG-ACRIN study EA5181 that is open to accrual.

Casey Liveringhouse, MD, presented results from a prospective phase I/II study combining chemo-RT with ipilimumab (1mg/kg) followed by adjuvant nivolumab (480mg iv q4 weeks) in patients with unresectable stage III NSCLC. This study demonstrated that concurrent ipilimumab is more toxic than what is known thus far about concurrent anti-PD-1/PD-L1 therapy. Future studies on chemo-RT combined with various immunotherapy drugs with different biological mechanisms, especially when administered concurrently, need to be carefully designed and monitored to identify the right balance between improved efficacy and acceptable toxicity. See page 11 in the Clinical Trials and Innovation article for additional details on the results of this study.

Head and Neck

By Sharon A. Spencer, MD, Discussant of the Head and Neck Science Highlights session

THERE WERE SEVERAL IMPORTANT HEAD AND NECK CANCER THEMES highlighted at ASTRO 2021, including de-escalation of radiation therapy dose and volumes, dose targeting utilizing advanced imaging and the incorporation of novel compounds. Can efficacy be improved or maintained while mitigating toxicity? What gene signatures can be validated and exploited? Of course, there is still a lot to learn, but three abstracts describe what avenues can be explored and vetted in the future.

Even though the phase III results were presented in the Plenary Session, it is important to take a brief look at the long-term results of MC1273, a phase II evaluation of de-escalated adjuvant radiation therapy for HPV associate oropharyngeal squamous cell carcinoma (HPV+OPSCC), which demonstrates the value of the original concept. HPV+ infection accounts for 70% of OPSCC worldwide (Wu, 2021) representing a cancer population with a great opportunity for survival. Therefore, it is important to mitigate long-term toxicity without compromise to ultimate survival. All patients were staged according to the AJCC 7th edition, with ECOG 0-1 performance status as well as 10 pack/year or less smoking history. The backbone borrows from the Nigro regimen. The primary end point was local tumor control at two years. The secondary end points were two-year progression-free survival, overall survival and toxicity. There were two cohorts A and B that received twice daily radiotherapy and docetaxel weekly. The highest risk cohort B with extra nodal extension (ENE) received a simultaneous boost to the levels of ENE. Median follow-up of patients alive was 52 months. The local regional control for the entire group was 91.4% in five years. The local regional control for cohort A and B was 100% and 84.1%, respectively. Late grade 3 toxicity at five years was 1.2%.

Hypoxia has historically been associated with decreased tumor response and tumor control and is also known to negatively impact the immune response (Barsoum, 2014). Hypoxic modifiers have been effective to overcome resistance (Overgard, 2011; Overgaard, 1998). JM Brooks and colleagues constructed a 54-gene hypoxia immune signature using the Cancer Genome Atlas head and neck cancer dataset and two independent cohorts (Brooks, 2019). They identified three subgroups with distinct phenotypes and survival: hypoxia low/immune high, hypoxia high/immune low and a mixed phenotype with five-year overall survival rates corresponding. Nils Nicolay, MD, PhD, and colleagues have incorporated PET imaging as well and presented results at ASTRO 2021. Forty-nine patients with locally advanced HNSCC were prospectively enrolled and underwent longitudinal hypoxia PET imaging with Fluoro-18 misonidazole at weeks zero, two and five during chemoradiation therapy. The patients were stratified into four subgroups based on their tumor-infiltrating lymphocytes and by the hypoxia tissue marker carbonic anhydrase IX. The hypoxia PET-based hypoxia modifiers separated out as three distinct prognostic subgroups, favorable (TIL high/early PET response), intermediate (TIL high/no early PET response or TIL low/early PET response) and a poor (TIL-low/no early PET response). The immunohistochemistry based immune-hypoxia classifiers using carbonic anhydrase followed a similar trend. There is a potential option for patient stratification in clinical research. Hopefully others can also validate this encouraging work.

Lastly, the impact of radio resistance and prognosis in HNSCC is well known. Phillip Pifer, MD, PhD, and colleagues noted the association between focal adhesion kinase (FAK) expression and poor outcomes in (HPV-) HNSCC. In order to test the hypothesis, they examined 324 cases from the TCA and a single institution cohort of 81 patients. High levels of FAK copy number and gene expression were associated with worse DFS in TP53 mutated (HPV-) HNSCC. Defactinib, a FAK inhibitor, was used to treat TP53 mutated cell lines resulting in radiation and chemo sensitization. FAK as a potential target has far reaching implications in this patient population.

The body of work presented at ASTRO 2021 demonstrates that toxicity can be mitigated while maintaining efficacy. Gene signatures can be exploited, and new targets can be isolated for novel therapies.

See reference lists at www.astro.org/Winter22News.

DEI IN FOCUS at the 2021 Annual Meeting

BY CHRISTINA CHAPMAN, MD, MS, FUMIKO CHINO, MD, AND MALIKA SIKER, MD

THE ASTRO ANNUAL MEETING IS THE WORLD'S LARGEST GATHERING OF RADIATION ONCOLOGISTS. Practice changing research is presented during this prestigious meeting across more than 18 different scientific tracks. In line with the Society's core value on diversity and inclusion, what better stage than the Annual Meeting to debut a diversity, equity and inclusion (DEI) in health care track and make a concerted effort to highlight the excellence we have in our diverse membership who are advancing our field in clinical care, research, education and advocacy. Below we detail these efforts, highlight key DEI sessions and research from the meeting, and share more on ASTRO's DEI-related legislative priorities for the year.

New #DEIinRO track at the ASTRO Annual Meeting

While education sessions and research findings on health equity, diversity and inclusion in radiation oncology have been included during previous ASTRO Annual Meetings, historically, this essential topic had not been designated its own track with scientific discourse dispersed among the various other tracks. As a result, the impact of the discussions surrounding this topic had previously been diluted. This changed at ASTRO 2021 where "Diversity, Equity and Inclusion in Health Care" was featured in its own, new education and scientific tracks to maximize impact and interest among attendees.

The education track included four educational sessions led by a diverse group of faculty. The yearly ASTRO/NCI Diversity Symposium focused on "Physician Driven Social Change: A Historical Perspective and Opportunities for Radiation Oncologists." During this event, speakers reviewed the impact of the medical community on health inequities and ways that radiation oncologists can become agents of change through research, clinical departmental work, medical education and community engagement. Another highlight of this track was an education session on mitigating bias in recruitment, which focused on practices for attracting a diverse, dynamic workforce to sustain the future of radiation oncology. Best practices in workforce recruitment include recognizing and mitigating cognitive bias, implementing a holistic candidate review and using a structured interview. Beyond recruitment, it is imperative to cultivate a culture of belonging to support a workforce where everyone can thrive and succeed regardless of background. The education session "Creating Equitable and Inclusive Spaces for Black, Indigenous and Latinx Trainees, Residents and Faculty: Opportunities and Pathways" examined this critical topic. Strategies discussed included establishing and leveraging relationships with Historically Black Colleges and Universities (HBCUs) and Hispanic Serving Institutions (HSIs) and opportunities in research through multi-institutional partnerships and government through the perspective of medical students, residents and faculty. A final education storytelling session, "Promoting Women and Underrepresented Minorities as Essential Leaders in Research" presented a diverse group of radiation oncologists who shared their perspectives and insights.

The scientific track featured 50 abstracts and posters. The Oral Scientific Sessions included the highest scoring abstracts with topics ranging from patient care with mobile technology and clinical trials to initiatives and programs to improve diversity in the radiation oncology workforce. Christina Chapman, MD, MS, was the featured discussant of the track's Science Highlights session where top noteworthy abstracts and their impact were examined. Deliberate efforts were made to select abstracts that went beyond simply describing disparities. Descriptive data on

racial/ethnic, geographic and other types of cancer disparities have existed for decades, but there has not been enough emphasis on identifying effective solutions and optimizing their implementation. The session was therefore designed to emphasize abstracts that either demonstrated efficacy of health equity interventions or provided novel insights into potential areas for intervention.

Highlighted scientific abstracts from the Annual Meeting

One of the top-rated abstracts in the DEI track was presented by Matthew Manning, MD, FASTRO, on ACCURE (Accountability for Cancer Care through Undoing Racism and Equity), an NIH-funded, community-based participatory research intervention designed to reduce racial disparities in early-stage breast and lung cancer treatment completion. The system-based, multimodal intervention utilized an EMR-based informatics tool to flag missed treatment milestones, a nurse navigator, racial equity training and a physician champion. The racial equity training involved a two-day training that focused on a historical, cultural and structural analysis of racism as opposed to interpersonal racism and unconscious bias. The nurse navigators were trained in barriers to care relevant to racial minority groups and on eliciting patient perceptions and views about their diagnoses and related factors. The group previously reported the effect of the intervention on the receipt of curative treatment. At ASTRO 2021, they reported five-year survival outcomes by race for patients from the tumor registry during the study period and compared them to historical controls. They observed a significant decrease in the Black-white survival disparity for early stage lung cancer and elimination of the disparity for breast cancer. The study also suggested that there may be ongoing racial disparities in surgical selection for lung cancer treatment. Although high priority needs to be given to eliminating the broader structural factors that drive cancer disparities, interventions like these fill critical gaps in addressing cancer disparities in the short-term.

Multiple abstracts were presented on interventions designed to mitigate the impact of racism on the radiation oncology workforce. Idalid Franco, MD, MPH, presented on the RISE (Radiation Oncology Intensive Shadowing Experience for Medical Students Underrepresented in Medicine) program, a one-week virtual clinical rotation implemented at the Harvard Radiation Oncology Residency Program. The experience paired each medical student with mentors from a variety of categories (residents, faculty, dosimetry, physics and residency program directors) and found a high degree of satisfaction among the mentors, with additional information about the student experience forthcoming. Vonetta Williams, MD, PhD, presented an abstract on the ASTRO Aspiring Scientists and Physicians Program, an initiative of the Committee on Health Equity, Diversity and Inclusion. The program reached undergraduate and medical students and was found to positively influence their perceptions of and interest in radiation oncology. It is particularly notable that Drs. Franco and Williams were both resident physicians at the time of submission of their abstracts, highlighting the importance of trainees as a source of innovation in health equity research and activism.

ASTRO #DEIinRO efforts on a national stage

Beyond highlighting #DEIinRO issues at the Annual Meeting, ASTRO has led ongoing national advocacy efforts to promote the field of radiation oncology, improve the quality of radiation delivery and protect access for patients. The advocacy focus this year included renewed efforts to improve Medicare payments, the RO-APM model, increased investments in radiation oncology research and prevent insurance coverage disruptions for patients with cancer. A new advocacy item, "Advancing health equity measures to reduce cancer disparities in patient care," was added this year to highlight how access to high quality radiation oncology treatments is an essential health equity concern.

Continued on the following page

The COVID-19 pandemic focused national attention on health care disparities in the United States, as countless Americans fell through the known gaps of care. Research has shown that people of color and other marginalized groups were disproportionately impacted by both COVID-19 and economic hardship in addition to decreased access to cancer diagnosis, treatment and survivorship care. ASTRO continues to support legislation to expand access to high quality health care to underserved populations and highlight how proposed payment models like the RO-APM may actually penalize providers who treat vulnerable populations with higher risk patients who require extensive support services. An unintentional downstream effect of this financial penalty could lead to decreased availability of radiation care in rural areas or in areas with high numbers of patients with complex care needs, in effect exacerbating existing disparities.

As part of the ongoing role of ASTRO's new Council of Health Equity, Diversity and Inclusion (HEDI) with the late 2021 bylaws vote, we will continue to work toward our mission of improving health care access in underserved populations and partner with other organizations in the efforts to bridge the gap for marginalized groups.

Christina Chapman, MD, MS, is vice-chair of the HEDI Track on the Annual Meeting Scientific Committee.

Fumiko Chino, MD, is the vice-chair of the Congressional Relations Subcommittee.

Malika Siker, MD, is chair of the HEDI Track on the Annual Meeting Scientific Committee and chair of the Congressional Relations Subcommittee.

Solstice™
SRS Immobilization System

MR Version Now Available!

Improve Patient Setup During Hypofractionation and SRS Treatment

Solstice™ variable pitch capability provides increased setup options in CT simulation, MR imaging and corrective positioning flexibility during treatment setup.

Pitch at 0 (chin down)

Pitch at 5 (neutral)

Pitch at 10 (chin up)

"We are very satisfied with the Solstice product. The match data of CBCT's made prior and after the treatment indicates high accuracy and stability. The pitch correction functionality gives us extra reassurance in positioning accuracy of the patient especially in treatment of multiple metastases using single isocenter."

Dr. Chin Loon Ong, Medical Physicist,
Department of Radiotherapy Haga Hospital, Den Haag, Zuid Holland

Find the Solstice Instructional Video on YouTube or contact us for a demo!

info@CivcoRT.com | www.CivcoRT.com

CIVCO Radiotherapy™

CANCER BREAKTHROUGHS: TOP RESEARCH FROM ASCO, AAPM & AACR

BY STEPHEN ABEL, DO, MHSA, AND SUSHIL BERIWAL, MD, MBA, FASTRO

THE THIRD ANNUAL CANCER BREAKTHROUGHS SESSION was co-moderated by ASTRO Chair Laura Dawson, MD, FASTRO, and Felix Feng, MD, co-chair of the Annual Meeting Scientific Committee, and highlighted several groundbreaking trials presented at the annual conferences of the American Society of Clinical Oncology (ASCO), American Association of Physicists in Medicine (AAPM) and American Association for Cancer Research (AACR). The overarching purpose of the Cancer Breakthroughs session is to provide a collaborative forum for physicians, scientists and researchers to present and synthesize practice-changing information in a far-reaching manner.

Representing ASCO, in addition to receiving the distinguished ASTRO 2021 Gold Medal, Lori Pierce, MD, FASTRO, presented three abstracts from the 2021 ASCO annual meeting plenary session.

The first abstract was the randomized, phase III OlympiA trial evaluating the effect of adjuvant olaparib following neoadjuvant chemotherapy and local therapy in patients with germline BRCA1/2 mutations and high-risk HER2-negative early breast cancer.

Invasive disease-free survival (86% vs. 77%) and distant disease-free survival (87% vs. 80%) were improved with the addition of adjuvant olaparib ($p<0.001$ for both) with a trend toward improvement in overall survival (92% vs. 88%; $p=0.02$).

Dr. Pierce highlighted several important clinical implications of the interim results, including under-utilization (<50% of qualifying patients per NCCN) of genetic testing in high-risk populations, identification of the first adjuvant targeted treatment for BRCA 1/2 associated TNBC and sequencing of local therapies with PARP inhibitors (XRT completion prior to starting PARPi).

The second abstract presented was the phase III VISION trial evaluating the role of ^{177}Lu-PSMA-617 in patients with mCRPC. Patients who received prior ADT and taxane-based chemotherapy were randomized to receipt of therapeutic ^{177}Lu-PSMA-617 and standard of care versus standard of care only (cytotoxic chemotherapy, radium-223 and/or immunotherapy were not permitted). Improvements in imaging-based PFS (nine months vs. three months), overall survival (15 months vs. 11 months) and time to first symptomatic skeletal event (11 months vs. six months) were noted ($p<0.001$ for all) in patients receiving ^{177}Lu-PSMA-617. Dr. Pierce stated that, while these results are encouraging, it remains unclear if the results would have varied if ^{177}Lu-PSMA-617 had been compared to active treatment.

The third abstract presented was the phase III OUTBACK trial comparing adjuvant chemotherapy following chemoradiation therapy versus chemoradiation therapy alone in patients with locally advanced cervical cancer. No difference in PFS or OS was noted between the two arms, albeit greater toxicity in patients receiving adjuvant chemotherapy. Dr. Pierce

underscored the importance of conducting randomized trials and provided the following summary: "Looking at the range of outcomes in these three randomized trials shows the practice-changing impact of both positive and negative results on the care of patients with cancer."

Representing AAPM, Magdalena Bazalova-Carter, PhD, presented two abstracts from the AAPM annual meeting. The first abstract (Mickevicius et al.) examined the feasibility, utility and potential future role(s) of MR fingerprinting (MRF) in MR-guided radiotherapy. In this study, a newly developed MRF technique, taking advantage of machine learning, was validated using lower magnetic field strengths (0.35T). In conclusion, the novel MRF technique may have future clinical applications in prostate cancer management including MR-based adaptive treatment, glandular sub-volume targeting and treatment outcome prediction.

The second abstract (Montay-Gruel et al.) focused on the neurocognitive sparing effects of FLASH-RT. Compared to conventional irradiation, ultra-high dose-rate FLASH-RT demonstrated greater long-term neurocognitive sparing in juvenile mice. Additionally, FLASH-RT delivered using hypofractionated courses did not yield greater toxicity or compromise tumor control in adult mice. Taken together, these studies may serve as a framework for evaluation of FLASH-RT in a clinical trial setting, which will represent a critical step toward the clinical implementation of FLASH-RT.

Representing AACR, Antoni Ribas, MD, PhD, presented the results of several practice-changing abstracts from the AACR annual meeting, including the results of three phase III trials. The first trial (CHRONOS-3) compared the addition of copanlisib (PI3K inhibitor) to standard rituximab monotherapy in relapsed indolent NHL. At a median follow-up of 19 months, the primary endpoint of PFS was improved (21 months vs. 14 months, P<0.0001) in patients receiving copanlisib and rituximab.

The second trial compared the novel soluble T-cell receptor (TCR) therapeutic tebentafusp versus investigators choice (pembrolizumab, ipilimumab or dacarbazine) in patients with metastatic uveal melanoma. At a median follow-up of 14 months, the primary endpoint of OS was improved (22 months vs. 16 months, p<0.0001) in patients receiving tebentafusp. Dr. Ribas emphasized the significance of the trial result, as this was the first therapeutic to ever demonstrate a survival advantage in patients with metastatic uveal melanoma. The third trial (CheckMate 816) compared neoadjuvant nivolumab + platinum-doublet chemotherapy versus neoadjuvant chemotherapy alone in resectable (IB-IIIA) NSCLC. The primary endpoint of pCR was improved in patients receiving nivolumab + chemotherapy compared to chemotherapy alone (24% vs. 2.2%, p<0.0001). The results of CheckMate 816 represent the first phase III study to show benefit of neoadjuvant immunotherapy with chemotherapy for resectable NSCLC.

Lastly, Dr. Ribas presented two abstracts relating to cancer predisposition. The first (Blauel-Bocko et al.) described the identification of inherited pathogenic germline mutations (16% of cohort) in a neuroblastoma cohort. Inherited germline mutations were associated with comparatively worse survival outcomes. The second abstract (Plym et al.) described the use of a validated polygenic risk score (PRS) in stratification of men with prostate cancer. The PRS predicted for both development of prostate cancer as well as development of lethal prostate cancer. Interestingly, adherence to a healthy lifestyle was not associated with a reduced risk of developing prostate cancer overall. However, healthy lifestyle adherence was associated with a reduced risk of developing lethal prostate cancer suggesting an attenuation of genetic cancer susceptibility through modifiable environmental factors.

Stephen Abel, DO, MHSA, is a radiation oncology resident at Allegheny Health Network Cancer Institute in Pittsburgh.

Sushil Beriwal, MD, MBA, FASTRO, is the Academic Chief of Radiation Oncology at Allegheny Health Network Cancer Institute, Pittsburgh.

EDUCATIONAL SESSIONS HIGHLIGHTS

Educational sessions help attendees improve their professional practice. Here we summarize a few key sessions from the educational track from ASTRO 2021.

Edu 18: Priming the Immune System Prior to CAR T Cell Therapy: An Emerging Role of Radiation

BY BOUTHAINA DABAJA, MD, FASTRO

THE EDU 18 SESSION HIGHLIGHTED AN EMERGING ROLE of radiation in promoting an effective immune priming in patients with relapsed refractory lymphoma, especially when treated with immunotherapy and or cellular therapy. Radiation primes anti-tumor immune response by enhancing the cross-liberating tumor antigens from dying cells, which are then taken up, processed and presented by the dendritic cells. This is what we refer to as "immunogenic cell death."[1] Immunogenic cell death increases an inflammatory microenvironment via danger associated molecular patterns (DAMP) and proinflammatory cytokines facilitating dendritic cell maturation to effectively prime effector T cells.[2]

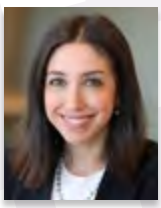
Recent clinical studies have shown that Chimeric Antigen Receptor T cell (CAR T) therapy directed, for instance, against Cluster of Differentiation 19 (CD19) has emerged as a promising novel treatment for relapsed refractory B cell lymphoma, culminating in FDA approval of multiple CAR T therapies. Subsequently, a durable response was observed in the ZUMA 1 trial (complete response of 54% and overall response of 82%),[3] and JULIET trial (complete remission of 40% and overall response of 54%),[4] thus establishing cellular therapy in clinical practice. Radiation emerged as an essential part of the current approach as a "bridging option" to buy time between leukapheresis and CAR T cell infusion.

A typical case presentation would be a patient relapsed refractory diffuse large B cell lymphoma, and while being prepared to undergo CAR T cell therapy, radiation therapy is administered to address a bulky symptomatic site, radiation resulted in complete remission in the radiated site and an immunological response outside the radiation field, and finally a complete remission was documented after cellular therapy suggesting that radiation has resulted in an improved outcome and fitness of the infused cells.

Multiple studies have been published demonstrating the benefit of radiation given before and some cases after cellular therapy. These studies proved the feasibility, applicability and an improvement in progression-free survival for those who received radiation bridging over those who did not. The studies are suggesting a potential benefit for a dose as low as 20 Gy along with a limited field that, in the interest of avoiding toxicity, could address part of the disease rather than chasing every visible site.[5,6]

In summary, radiation therapy is expected to play a major role in improving the outcome of patients with relapsed refractory patients with hematological malignancies through an immunological priming process.

View the reference list for Edu 18 at www.astro.org/Winter22News.



Edu 09: The New Virtual Reality – Improving Care Through Telemedicine and Understanding Its Impact on Patients, Policy and Payment

BY DANIELLE RODIN, MD

THE COVID-19 PANDEMIC PROPELLED TELEMEDICINE from a practice used by a handful of providers into the mainstream. Alejandro Berlin, MD, MS, opened this session by describing how telemedicine can be both a tool for radiation oncologists as well as a lever for implementing innovative virtual solutions across the continuum of care delivery. These include new communication tools, the collection of patient-reported outcomes and asynchronous care delivery for complex patients.

Erin Gillespie, MD, followed with a presentation on the results of a patient experience survey of telemedicine during the COVID-19 pandemic, which found high rates of satisfaction with minimal impact on the patient-provider relationship or confidence in the care team. Not surprisingly, however, patients wanted to be asked about their perspective and that it was

important to maintain telemedicine as an option.

These sentiments were echoed by Allison Rosen, MS, a colorectal cancer survivor, who described how there is no "one size fits all" approach and that telehealth should be offered and covered based on patient preference for certain types of cancer visits. This was well illustrated by the comments she shared from two different patients on receiving bad news over telehealth, in which one patient commented, "I'd rather have that discussion face-to-face, if at all possible," with another saying, "I think that being in the comfort of your own home can sometimes be helpful, especially when you get bad news or something and then walk out of the office crying or being upset."

Daniel Petereit, MD, FASTRO, went on to describe the disparities in telemedicine use for patients in rural or remote areas. As a provider to the Northern Plains American Indians in South Dakota, the lack of widespread, high-speed internet, and the cost and expense of travel to centers with video, necessitated the use of phone for most telemedicine encounters. He also commented that, for many isolated patients, a clinic visit is often their only human interaction and innovative solutions are needed to overcome the infrastructure challenges.

Trevor Royce, MD, MS, MPH, ended the session with a discussion of the policy and regulatory changes environment and described the many open questions that remain, including those on reimbursement, licensing, security, infrastructure, quality, fraud and equity. However, in the words of ASTRO's Immediate Past Chair, Thomas Eichler, MD, FASTRO, "telemedicine, in some form, is here to stay."

Edu 04: Radiation Oncologists' Role in Promoting Person-Centered Care in the Curative and Palliative Settings

BY MALCOLM MATTES, MD

DO YOU PRACTICE PATIENT-CENTERED CARE?

Most physicians, and the health care systems in which they work, would likely say that they do. However, many factors contribute to providing a truly patient-centered experience, and for most of us there remains significant room for growth.

The Institute of Medicine defines patient-centered care as being respectful of, and responsive to, individual patient preferences, needs and values, and ensuring that patient values guide all clinical decisions. By this approach, patients are treated with dignity, compassion and respect through care that is personalized, coordinated and enabling.

In the curative setting, radiation oncologists can promote more personalized care by offering shorter duration radiation treatment courses where appropriate to help meet the needs of patients and their family/caregivers. We can more effectively coordinate care through the use of dedicated patient navigators and participate in multidisciplinary clinics and tumor boards. We can provide care that is enabling by offering decision aids and other educational materials, encouraging patients to ask questions, granting open access to medical records and utilizing patient-reported outcomes. In the palliative setting, radiation oncologists can tailor treatment plans to help meet patients' specific physical and environmental needs and evaluate the risks and benefits of radiation in the context of patients' overall goals of care. We can also help promote understanding of prognosis, advance care planning and the widely recommended and evidence-based consultation with palliative/supportive care services alongside standard oncologic care, all of which can help to address patients' other physical, psychosocial and spiritual needs.

Finally, we must be cognizant of the fact that delivering patient-centered care in oncology can be challenging due to the need for equipoise among multidisciplinary providers in preference-sensitive decisions. As such, if radiation oncologists desire to fully contribute toward a patient-centered experience, steps must be taken not only to improve the care we directly provide to the patients we see, but also to enhance multidisciplinary care at the level of the cancer center and health care system so that all patients get the treatment options they deserve. We must promote our important role in an effective multidisciplinary environment, hold ourselves accountable to practice evidence-based medicine and offer recommendations that put the patient before treatment modality, communicate with our colleagues in a timely fashion, engage in diagnosis as well as treatment, and be proactive about interdisciplinary education so that our colleagues in other specialties better understand the value of radiation therapy.

Overall, striving to be better and fully engaged citizens of an oncology community can lead to a variety of positive outcomes, and a more just culture, for our patients and ourselves.

BEYOND THE CLINIC

Sewit Teckie, MD

Gaorav Gupta, MD, PhD

Beyond the Clinic focuses on the newsmakers, entrepreneurs, inventors, government leaders and beyond — radiation oncologists that have melded their expertise in clinical practice with interests outside traditional work in medicine. Have a person you'd like to feature? Email suggestions to ASTROnews@astro.org.

Inventor's Corner

TRANSITIONS CAN LEAD TO OPPORTUNITIES FOR SERENDIPITY because of the newness of it all. How does one set out to create something new? *ASTROnews* Editorial Board member Sewit Teckie, MD, system chief of radiation oncology at NYC Health and Hospitals and associate professor at SUNY Downstate in New York, recently spoke with Gaorav Gupta, MD, PhD, a radiation oncologist and assistant professor at the University of North Carolina, and inventor and co-chair, Scientific Board of Advisors at Naveris. Dr. Teckie and Dr. Gupta first met as co-chief residents at Memorial Sloan Kettering Cancer Center and recently connected to discuss Dr. Gupta's path to go beyond the clinic to become an inventor and entrepreneur.

Sewit Teckie, MD: Gaorav, it is great to speak with you! Thanks for being here today. Maybe we could start with you telling us about what you do now at UNC?

Gaorav Gupta, MD, PhD: Well, I'll start out by saying that I have a dream job — my dream job. And my dream job was always to practice medicine and to study ways in which medicine can be better. As a radiation oncologist, clinically, I focus on breast cancer and the care of breast cancer patients at the University of North Carolina. And in the laboratory, I study predominantly drivers of breast cancer and novel strategies for therapy. We also are very interested in predictive biomarkers to help personalize cancer therapy, including radiation but also other forms of targeted therapy and immunotherapy.

ST: What is one main project you're working on now?

GG: One area that I'm very excited about is our investigation into how cancer cells repair DNA damage differently than in normal cells. Those studies have led us to an enzyme called DNA polymerase theta that we've shown to become hyper-activated in certain types of cancer and remarkably it's actually non-essential, or dispensable, in normal cells. It became clear pretty early on that targeting polymerase theta may be beneficial in the context of cancer treatments, including radiation therapy. Several companies are developing DNA pol-theta inhibitors, and one is just about to enter first-in-human clinical trials. We are fortunate to be able to collaborate with some of these companies to help discover how we can best use them to better treat cancer. It's an exciting time to be working in this area and probably similar to when PARP inhibitors were first being developed as new cancer therapies about 15 years ago.

ST: Thanks for teaching us about DNA polymerase inhibitors as a potential cancer therapy. Now, I wanted to switch gears and talk about one of your other hats: Inventor. Please take us back to the early days of your HPV DNA PCR assay and how that got started.

GG: The HPV blood tests story is one I love to tell because it's a story of serendipity and discovery. I came to UNC to study breast cancer. I didn't come to study head and neck cancer.

As a physician-scientist in my department, I had a colleague who was intensely focused on HPV-related head and neck cancer, Bhisham Chera. He was conducting really forward-looking clinical trials for de-intensification of chemoradiation for HPV-related cancers. It was interesting to hear some of the conversations behind the scenes at the time because there was a lot of concern about whether we should be

de-intensifying treatment for patients who are highly curable. By the time I arrived at UNC, there was already some initial evidence that for low-risk HPV-related cancers de-intensified therapy seemed to be working quite well. But as they started broadening the eligibility, we encountered more uncertain areas, for example, patients with larger primary tumors or more lymph node positivity, or patients who had smoked 15 pack-years of tobacco 20 years ago. So it was a question of where do we draw the line in terms of who we consider to be safe for de-intensification therapy on a clinical trial versus standard therapy. It seemed like every provider, and also different patients, have different risk tolerances, and it became very gray, very fast.

As I was hearing some of these discussions, it occurred to me that if we had a way of monitoring response to treatment in real time it may provide incredible value for determining if a particular patient is responding well to chemoradiation and an opportunity to tailor how much therapy each individual patient needs. That's really where the idea came from. My awareness and interest in circulating tumor DNA led me to believe that if it was of clinical value, we might be able to develop a blood-based circulating DNA test for HPV that might give us a non-invasive way of quantitatively monitoring treatment response during the course of chemoradiation therapy.

So, that's how it began. I essentially had a water cooler conversation with Bhisham Chera [MD] in our department, and he loved the idea. But of course, going from idea to execution can be a long and complex process. My lab had been working on some ultra-sensitive methods for measuring cell-free DNA, predominantly in breast cancer. The nice thing about HPV is that it's a foreign target; it's a genomic target that's not typically in our normal cells. It is easy to discriminate from your own DNA. That is in contrast to a KRAS mutated cancer where the only thing that's different in cancer is a single nucleotide where the mutation occurred.

I was confident that we could develop methods to detect HPV in the blood. It occurred to me that the best assay should have very little noise, should have extreme sensitivity and ideally should detect HPV that had been inside of a tumor cell. That last criteria had additional advantages because as a cancer screening tool, if you had a biomarker that was really selective for HPV that was processed during a tumorigenic process, then maybe in the future it may have some roles in improving our ability to detect cancer earlier in more of a screening population.

We tried a few different methods and ultimately found a strategy that seemed to be working really well. This is where the collaboration with Bisham was really amazing because he had spent several years building up a clinic trial infrastructure in our department to enroll the majority of our HPV-related cancer patients onto prospective clinical trials. Remarkably, over two years we were able to collect 1,000 blood samples on nearly 200 Patients. This is where the synergy occurred. I had a lab that could develop the test, but it is not really valuable unless it's linked to a process by which we can evaluate how well it performs in patient samples, which is what Bhisham brought to the project.

That's really how this project came to be — the synergies between my scientific background and Bisham's experience in clinical trials. It allowed us to quickly recognize that the test we had developed was actually really reliable, reproducible, specific and sensitive at detecting tumor-derived HPV in the plasma of patients with HPV-related cancer.

ST: I love that story because it really shows the value and beauty of collaboration. Once you had developed the assay and tested it, when did you have the feeling that this could be something bigger? That it might be a company?

GG: I will say I'm not a natural entrepreneur. The motivation of my research was not to start a company. I was also very wary of diagnostic start-ups because I was aware that commercializing a test is complex and there are many potential pitfalls. Part of me was wondering couldn't someone else just do the same thing or something similar?

But as I thought about it more, I realized two things. First, there was no company doing something similar, and second, there were some lessons learned from a similar effort in EBV related nasopharyngeal cancer where there was a prior demonstration that you can detect fragments of EBV in the blood in patients with EBV-related nasopharyngeal cancer. However, the scaling of those tests to integrate them into clinical trials turned out to be much more challenging than they had initially realized because they had decentralized RT PCR assays at each institution. The concordance was very poor, and in order for it to be useful for treatment decisions as assay has to be highly reproducible.

So those two things put together made me more enthusiastic about commercialization of the assay we had developed. But anytime you think about

Continued on the following page

commercialization you open up a huge can of worms. All the people who will tell you, "no, that's not going to work" or "here are all the reasons why this will work," I encountered all of that.

Ideally, you need a partner who can see a path forward, knows how to raise money, knows how to make this a business product and show its business value in addition to clinical value. These are things, as an academic, you're not taught to think [about]. I was completely lost. Another moment of serendipity is that I happen to have a close acquaintance with a biotech background who heard the story of our discovery and believed in it. That person was my own biological brother. So that's really how we jumped from the idea of commercialization to actually forming a company.

I will say that our path was not the only path; many universities will have resources to help you start a company based on discoveries made at the institution. There are also NIH-based funding mechanisms like SBIR/STTR, which can help fund academic-to-industry transitions.

ST: I think we can all relate to your feeling of being unprepared to make the leap from academic to commercial product. Can you remind us all your current role in the company?

GG: I am a Scientific Advisor to the company. Our input was critical as we formulated the vision. Having scientists and clinicians guide the company in those early stages was really important, and I really enjoyed being a part of these conversations. When you think about the path to having a product, the path is very different in a commercial lab than in an academic lab. In a commercial lab, you have to think about the process, quality checks, delivery times, vendors, all these other steps that as an academic you're not used to thinking about. The company quickly recruited business experts in diagnostics who had experience in these processes. It was really a learning experience for me to interface with these individuals.

ST: What has the timeline of this process been for you?

GG: The first HPV test we ran in our lab was in late 2015. By 2017, we knew we had something exciting in our hands. Around that time, we decided to file for intellectual property for the assay through UNC. In 2018, the idea of a company started and in 2019, it started to come together.

With startups, people get excited by the idea and initially they were working for free. It's really incredible! Throughout 2019, we started to talk to potential seed investors, and we started getting funds in the fall of 2019, which is the first time anyone got paid at the company. In March 2020, our series A financing closed, which was exactly at the start of the COVID-19 pandemic [in the U.S.]. There were a lot of challenges that came with COVID but there were also opportunities. We started hiring some salespeople and we had a CLIA-grade test that could be used in patients. We were worried that we would have to put a pause on the clinical grade assay. But then it occurred to us that head and neck cancer patients, particularly those in post-treatment surveillance, were heavily affected by the pandemic; they were being followed by telehealth visits and foregoing laryngoscopy exams. We thought this could be an opportunity to consider the potential value of the test as a cancer surveillance tool. The company partnered up with mobile phlebotomy service providers to draw blood samples at a patient's house and test that blood sample for tumor-derived HPV. This technology filled a gap in clinical care.

Gaorav Gupta, MD, PhD, radiation oncologist and inventor in his lab at UNC with a postdoctural trainee, Wanjuan Feng, PhD.

Now as we fast forward a year later, slowly but surely, there's been increasing use of the test by more providers. And what's been really gratifying is the company has now been able to assess how well this real-world application of the tests in a clinical grade environment has been performing. They've actually just submitted an abstract to a scientific meeting where they're going to report the real-world evidence validation of this test as a cancer surveillance tool.

What was really gratifying to me and Bisham is that the accuracy of this test at the company was even greater than the accuracy we published in our Journal of Clinical Oncology paper in 2020. It was really gratifying to see the transition of our academic

lab-developed test into a commercial test, accessible throughout the country, and that it performs even better in their hands. The other thing that excites me is that the test is increasingly being incorporated into therapeutic clinical trials. There are over 80 clinical trials in various stages of development. That is something that would not have happened if we had kept the technology at UNC. There are over 200 physician providers who have used the test, over 4,000 blood tests have been performed.

ST: Great to hear that clinical trials are being done with the test. Gaorav, the assay we are referring to here is the NavDx Assay. Can you tell us in your own words what the assay does?

GG: NavDx is an assay that provides ultra-sensitive detection of tumor-derived HPV in the blood of patients with HPV-related cancers. It's utility for guiding clinical management is still under investigation. As a biomarker of cancer, it may have value in surveillance of patients who have undergone therapy. And as an integral biomarker in clinical trials, it provides new opportunities for personalization of cancer therapy. But that is something that really needs further scientific investigation and evidence to support.

The other part that I want to highlight is that throughout this process it's really important to be very open and communicative with your institution's Conflict of Interest committee, because these situations can become very complex. Additionally, the UNC Office of Technology Development was instrumental in patent filing and negotiating the licensing of the intellectual property to Naveris.

> "I think anytime you make a transition, there is an opportunity for serendipity."
>
> Gaorav Gupta, MD, PhD

ST: That is a really great point. I wanted to ask you now to reflect on your clinical role. How do you feel that being in the clinic complements your work with Naveris and your research work in general?

GG: Being a clinician gives you a perspective on the unmet needs of cancer patients. And that doesn't just come from medical knowledge, it comes from interacting and engaging with patients. Seeing the struggles that our patients have to live through even after they have been cured of cancer from the treatments we give them, really highlights the need to not just focus on cure but to also focus on reducing toxicity. I think that was really the driving motivating factor for our work on HPV-related head and neck cancer.

It's also really relevant to my work in breast cancer where in some cases we get improved outcomes by adding more toxic therapies. You might be helping a few, but you're harming many others who perhaps were already being cured with the original treatments they were getting. This experience with the HPV biomarker really motivated my interests in further developing predictive biomarkers that will help patients with breast cancer get the right type therapy: Not too little, but also not too much. Radiation actually has a really important role to play in that, and it's something we're exploring in triple negative breast cancer by looking at the combination of radiation and immunotherapy as a possible way of reducing the need for chemotherapy that has higher levels of long-term side effects.

ST: Thanks Gaorav. These are great insights. I really like how organic your story is.

GG: And none of it would have happened if I didn't take a job at UNC.

ST: It is amazing how opportunity works like that.

GG: One thing that I think is true is that when you actually take the jump to a new environment, you'll find things you never knew existed. I think anytime you make a transition, there is an opportunity for serendipity.

ST: Last question (for real this time): Where do you see yourself in five or 10 years?

GG: I strongly believe in the cross-talk between laboratory-based discovery and clinical medicine. In radiation oncology, this interface is still very young and there is immense potential to transform how we use radiation to treat cancer patients. How do we make it more patient-centered, personalized and effective with higher cure rates and less toxicity? So, where I see myself in five or 10 years is finding new opportunities to translate scientific discoveries into innovative ways of personalizing radiation therapy for our cancer patients. Like I said at the start — this is my dream job!

PAUL E. WALLNER, DO, FASTRO, AND DAVID LASZAKOVITS, MBA

"BEST OF" QUESTIONS FROM THE ASTRO ANNUAL MEETING

THE AMERICAN BOARD OF RADIOLOGY (ABR) has staffed a booth at the Annual Meeting for many years to answer questions, assist with resident, candidate or diplomate needs, and provide literature on ABR programs. As the focus of this issue of *ASTROnews* is the "Best of ASTRO," providing responses to several frequently posed questions seems appropriate.

The most frequently posed queries related to diplomates' participation in the ABR Continuing Certification (CC) program (previously called Maintenance of Certification, or MOC). Several diplomates asked how they could verify their current CC status. Every ABR candidate and diplomate can go to the ABR website at www.theabr.org. In the upper right corner of the screen, there is a login tab to myABR. This access requires an email address or ABR ID number and password. Once the site is reached, the left-hand menu has a MOC/Attestation tab. Clicking on that tab will bring up the status of the four CC parts: parts 1, 2 and 4 currently require only annual attestation of completion, but personal records should be kept in the event the diplomate is subjected to a random audit. Part 3, Online Longitudinal Assessment (OLA), is completed by regular participation. Clicking on any of these tabs will provide the current status of each part as well as other CC program information.

Diplomates also frequently asked for details regarding participation in OLA. Each ABR diplomate participating in CC receives a weekly email notification that two OLA question opportunities are available. Questions are selected randomly from the eight radiation oncology (RO) clinical categories. A separate category of non-clinical skills (NCS) consists of biostatistics, bioethics, patient safety, quality assurance and clinical informatics. All NCS questions are taken directly from the ABR web-based syllabus. Diplomates may elect to answer one or both questions each week. Once issued, questions are available for four weeks, allowing a diplomate to "bank" up to eight questions. Completion of a minimum of 52 questions each year is required to avoid a penalty. The OLA program is designed to "score" diplomates based on their own performance. Participants receive an initial annual performance evaluation on January 1, subsequent to answering 200 scorable questions. The timing of that evaluation is dependent on the number of questions answered each year. All active participants have the opportunity to serve as a "question rater" for the questions they receive. After volunteering to serve as a question rater, the participant will be provided access to a brief instructional video, following which they are asked to provide a rating for each question they answered as to whether the average radiation oncologist would answer the question correctly. Because questions are distributed randomly, no individual question is "scored" until it has been answered by 50 diplomates and rated by at least ten, with psychometric validity. At this time, approximately 38% of RO CC participants serve as question raters.

Several diplomates indicated an interest in serving as ABR volunteers. Interested individuals may complete volunteer applications at any time at the ABR website, but committee appointments are made by the RO trustees once each year, typically in February or March. Appointments to one of the eight clinical category committees, the radiation and cancer biology committee, or one of the two advisory committees (initial certification and CC) are based on committee needs. The ABR especially seeks and values diversity of gender, ethnicity, practice model, geographic location and clinical interest. Volunteers may also serve as reviewers of continuing medical education self-assessment modules submitted by specialty organizations. All ABR volunteers, including those holding non-time-limited certificates, must be active in CC.

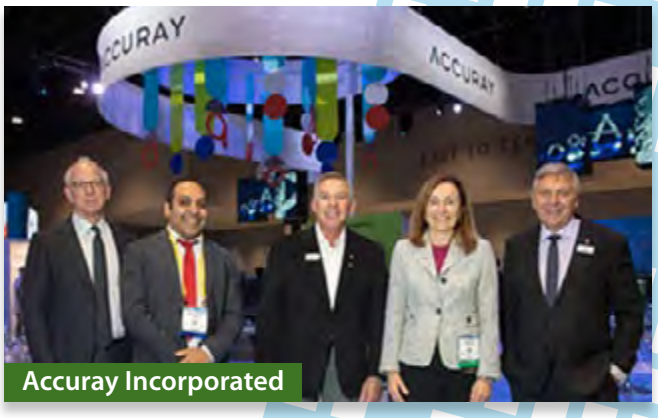
One query posed by several residents related to the number of initial certification exams the ABR plans to administer in 2022 and beyond. The ABR has announced specific 2022 dates for single administration of the three computer-based Qualifying Exam (QE) parts and two administrations of the oral Certifying Exam (CE). It is likely that a similar schedule will be announced for subsequent years. Development of computer-based exam parts consumes almost a full year and, with a finite amount of available content material, more than a single annual administration of the QE parts is not anticipated.

The ABR is happy to respond to any additional questions and can be contacted at information@theabr.org or 520-790-2900.

In *Appreciation* of ASTRO's 2021 **Corporate Ambassadors** and **Annual Meeting Sponsors**

ASTRO's Exhibit Hall provides members the chance to discover the latest and greatest technology, products and services in the radiation oncology field. As a thank you, Ambassadors and Annual Meeting Sponsors enjoy a special opportunity to meet with ASTRO leadership in an Annual Meeting tradition. Thank you, ASTRO Ambassadors and Annual Meeting Sponsors, for your generous sponsorship of the meeting. If you'd like to learn more about the benefit of Annual Meeting sponsorship, visit **www.astro.org/AMpromoOpps** or email **corporaterelations@astro.org**.

Blue Earth Diagnostics, Inc.



Accuray Incorporated


Boston Scientific


AstraZeneca


Bristol Myers Squibb

GT Medical Technologies, Inc.

CIVCO Radiotherapy

Mevion Medical Systems

Elekta

Myriad Genetics

Galera Therapeutics, Inc.

Naveris, Inc.

Thank you

Novocure

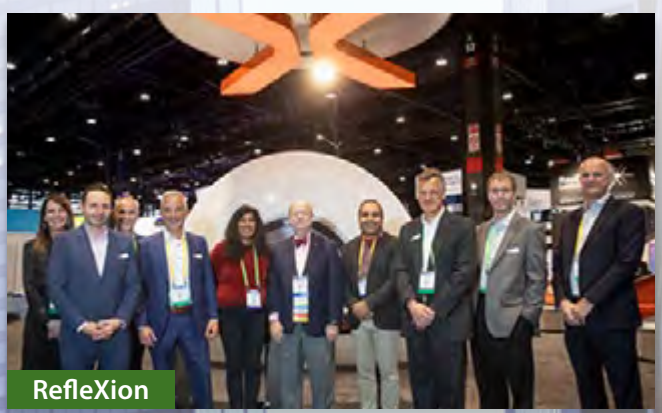
Sun Nuclear Corporation

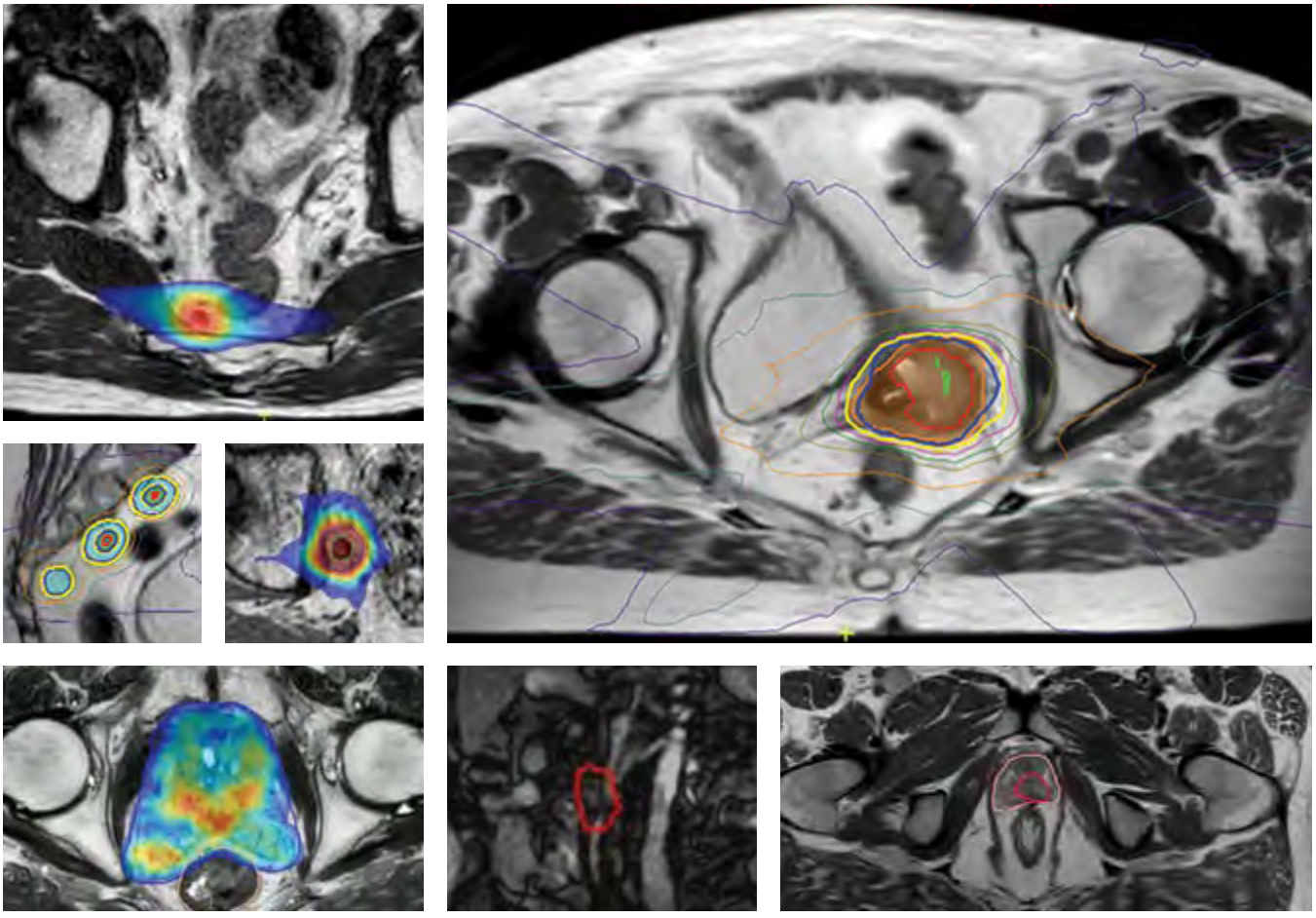
Palette Life Sciences

Varian, A Siemens Healthineers Company

RaySearch Laboratories AB

ViewRay, Inc.


RefleXion



See clearly every time you treat.

Elekta Unity changes how you deliver radiation therapy.

For the first time, using MRI-guided radiotherapy, you can see the tumor's movements and its exact position while you're treating it. This is the precision you need to deliver a truly personalized treatment. Explore what precision radiation medicine with Elekta Unity can mean for your patients and your practice.

Focus where it matters.
elekta.com/seeUnity

Elekta

JOURNALS HIGHLIGHTS

HIGHLIGHTS FROM *INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY • BIOLOGY • PHYSICS*

October 1, 2021

Proton Therapy for Breast Cancer: A Consensus Statement from the Particle Therapy Cooperative Group Breast Cancer Subcommittee

Mutter et al.

In this consensus statement and literature review, a PTCOG panel of breast cancer experts assess the data available on the use of proton therapy for breast cancer. The panel addresses cost-effectiveness analyses; provides expert consensus recommendations on indications and technique; and highlights ongoing trials' cost-effectiveness analyses and key areas for future research.

November 15, 2021

Involved-field Radiation Therapy Prevents Recurrences in the Early Stages of Hodgkin Lymphoma in PET-negative Patients After ABVD Chemotherapy: Relapse Analysis of GHSG Phase 3 HD16 Trial

Baues et al.

The HD16 trial of the German Hodgkin Lymphoma Study Group (GHSG) demonstrated that radiotherapy in early-stage Hodgkin's lymphoma without risk factors (ESHL) cannot be safely omitted and thus combined modality therapy (CMT) remains the standard treatment. In this secondary analysis the authors looked at the local effect of consolidating involved-field radiation therapy (IFRT). PET-negative patients on the HD16 study showed no significant toxicity after 20Gy IFRT and the omission of IFRT resulted in more local recurrence. They conclude that consolidation IFRT should still be considered as standard therapy in this subgroup.

December 1, 2021

Prospective Clinical Investigation of the Efficacy of Combination Radiation Therapy with Immune Checkpoint Inhibition

Akama-Garren et al.

Preclinical evidence supports the potential for therapeutic synergy between immunotherapy and radiotherapy through modulation of the tumor microenvironment and anti-tumor immune responses. Local therapy also has the potential to overcome localized sites of relative immune suppression and resistance. This review discusses the emerging results from prospective clinical trials of combination immunotherapy and radiotherapy, the safety and efficacy of their combination, concordance with preclinical and retrospective data and some of the remaining open questions to be addressed by future clinical trials.

These articles represent a sampling of content from Dr. Zietman's Issue Highlights, printed at the beginning of each Red Journal. For additional highlights, please visit www.redjournal.org/issues.

HIGHLIGHTS FROM *PRACTICAL RADIATION ONCOLOGY*

November/December 2021

Characterization of Underrepresented Populations in Modern Era Clinical Trials Involving Radiation Therapy

Bero et al.

Investigators from the Medical College of Wisconsin reviewed 122 trials from ClinicalTrials.gov for patient characteristics and demographic composition. The racial composition of the study population was compared with the 2018 U.S. Census. Every clinical trial group analyzed in the study had a significantly different race population compared to the U.S. Census, and in every subgroup, Black patient participation was less than expected. When looking at all trials, Asian and other excluded populations had the largest difference between trial enrollment and the U.S. Census. The authors also found the subgroup with the largest difference in enrollment for patients who identified as Black, Asian or other was for trials evaluating proton therapy. Bero et al. conclude that efforts to overcome composition disparities are important to accurately represent the population. Also available in this issue is an editorial on this topic by Kesarwala, Godette and Bradley: A Call to Action: Radiation Oncology Trials and Minority Enrollment.

Higher Dose to Organs at Risk: The Unintended Consequences of Intravenous Contrast Use in Computed Tomography Simulation for Cervical Cancer

Wang et al.

Wang and colleagues examined whether the use of intravenous contrast for computed tomography

Continued on the following page

scans could cause an expansion of the inferior vena cava, leading to excessive contouring and unexpected toxicities. The study compared scans with and without contrast for twenty patients with cervical cancer who underwent prophylactic extended-field radiation therapy. The investigators found that scans using contrast were more likely to lead to higher doses to the duodenum and right kidney than scans without contrast. The authors suggest that further investigation of the relationship between dosimetric data and these toxicities would be warranted.

A Prospective Randomized Controlled Trial to Compare the Use of Conventional Dark Ink Tattoo and Ultraviolet Ink Tattoo for Patients Undergoing Breast Radiation Therapy

Lim et al.

The authors of this report examined the ease of use, accuracy and patient experience when using an ultraviolet (UV) ink tattoo for radiation therapy alignment as compared to a conventional tattoo. This was a two-part study, beginning with a feasibility pilot where patients with breast cancer received both conventional and UV tattoos. After the pilot, 34 patients were randomized into two groups, receiving either all conventional or all UV tattoos. The investigators then surveyed the staff and patients to assess satisfaction. Use of UV tattoos did not significantly affect setup error, and most staff reported that UV tattoos did not significantly affect setup time and that they were not difficult to localize. Patients with UV tattoos reported high satisfaction and self-confidence; however, there was no statistical difference between the UV and conventional ink groups.

HIGHLIGHTS FROM *ADVANCES IN RADIATION ONCOLOGY*

Mitigating Implicit Bias in Radiation Oncology

Diaz et al.

Implicit bias is one of the most insidious and least recognizable mechanisms leading inequity and disparities. Evidence shows that explicit and implicit biases have a negative impact on doctor-patient communication and patient outcomes; however, most physicians deny or are unaware of their bias.

The goal of this manuscript is to increase awareness of the multiple settings in which implicit bias can occur and discuss resources to address it using real life and synthesized hypothetical scenario discussions. For example, in Case 1, a patient requests that his care team includes only white doctors and nurses after receiving an initial exam from a Chinese resident. The article suggests that the physician complies with the Accreditation Council for Graduate Medical Education's nondiscrimination policy. Some additional strategies that the attending physician could implement are to make the invisible "visible," disarm the microaggression and educate the perpetrator.

Emerging Cybersecurity Threats in Radiation Oncology

Joyce et al.

Modern imaging is highly dependent on information technology and data storage, which has made it vulnerable to cyberattacks. Cyberattacks have increased in the past decade, impacting radiation oncology practices and leading to the interruption of radiation therapy for thousands of patients with some catastrophic results. According to a 2014 study, 94% of health care organizations have experienced a cyberattack. Some of the top cybersecurity risks in 2021 include ransomware attacks, third-party supplier's security, phishing and software vulnerabilities and misconfigurations. As the threats continue to evolve, it has made it difficult for health care organizations to combat the issue and has required a cultural shift around cybersecurity. The authors recommend these key strategies: adopting cloud-first and zero-trust security strategies and assuming a breach mentality.

Development of a Financial Toxicity Screening Tool for Radiation Oncology: A Secondary Analysis of a Pilot Prospective Patient-reported Outcomes Study

Prasad et al.

Financial toxicity is prevalent among oncology patients. Identifying patients at risk of financial toxicity is essential for optimal patient outcomes. Studies show that 75% of cancer patients struggle to make co-payments and about 20% cut back on medication to defray the cost. While a validated measure of financial toxicity tool exists for general oncology patients, there is no standardized tool for radiation oncology. The aim of the study was to develop a rapid, no-cost and reliable financial-toxicity screening tool for clinical radiation oncology patients. Prior to treatment, 157 patients completed a 25-item modified comprehensive survey for financial toxicity that included subjective and objective patient reported measures. The results showed that 22% of patients were experiencing financial toxicity. The resulting tool is sensitive (89%), specific (70%) and able to detect early onset of patient reported financial toxicity.

Submit your abstract for ASTRO 2022!

ASTRO 64TH ANNUAL MEETING

Meeting Dates: October 23-26, 2022 | **Exhibit Dates:** October 23-25, 2022

Henry B. González Convention Center

San Antonio, Texas

View the guidelines and access the submission site:

astro.org/AMabstracts

Submission Deadline:

Tuesday, March 1, 2022 • 11:59 p.m. Pacific time

RayStation

ENHANCED EFFICIENCY AND OPTIMAL PLANNING FOR EVERY PATIENT

For every person diagnosed with cancer, efficacy of care is tantamount to outcome. Machine learning* brings innovation and transformation to the planning, delivery, and management of cancer treatment, allowing every individual to obtain optimized treatment planning tailored to their unique needs.

Redefining what's possible in cancer care. For us – It's Personal.

*Subject to regulatory clearance in some markets.

ADVANCING CANCER TREATMENT

RaySearch Laboratories
