AMERICAN ASSOCIATION of PHYSICISTS IN MEDICINE

Improving Health Through Medical Physics

AAPM Newsletter — Volume 43 No. 3 — May|June 2018

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MAY | JUNE 2018

AAPM NEWSLETTER

IMPROVING HEALTH THROUGH MEDICAL PHYSICS

Spring Clinical Meeting 2018: YIS and Best PosterCompetition Winners

WHAT HAPPENED IN VEGAS TRANSLATES INTO NEW CLINICAL SKILLS AT HOME

Brian Leong, YIS 3rd Place | Ilma Xhaferllari, YIS 1st Place | Akila Kumarasiri, Best Poster | Irwin Tendler, YIS 2nd Place

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- Annual Meeting Subcommittee Report
- CRCPD Report
- US Science Fest
- Imaging Practice Accreditation Subcommittee Report
- WGIMRT Report

and more...

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Medical Physics Leadership Academy

Robin Miller, Chair TG297

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Left to Right: Justin Parscale, Robin Miller, Claire Almanza, Arnold Pompos, Brent Parker; Photo Credit: Timothy Blackburn, PhD, UTSW

Project Management

If you had a medical physicist wish list for a cancer center what would it include? The University of Texas Southwestern Medical Center (UTSWMC) asked themselves that very question spending over a year formulating a solution prior to engaging an architect. The premise was to create a new type of

environment for both patients and staff; rethinking every aspect of the building, patient experience and work flow.

The session speakers included Justin Parscale, AIA, from Perkins + Will, Claire Mendenhall-Almanza, Director of Marketing UTSWCM and Arnold Pompos, PhD, Interim Director of Clinical Physics UTSWMC. They discussed the overall multiyear process culminating in the opening of a new $66 million radiation oncology center in early April 2017.

The project core included flexible vault design independent of vendor, with a smaller vault footprint including two doors: one entrance for the patient and a second "back door" with access to a technology corridor where all equipment (patient immobilization, physics tools) is stored. Office and staff lounge areas were optimized to encourage collaboration and staff interaction. The speakers shared insights into the lessons learned from the start of the process to where they are now—already thinking ahead to the next phase.

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REPORT FROM THE JOINT COMMISSION

Matt Wait, MS | Los Angeles, CA

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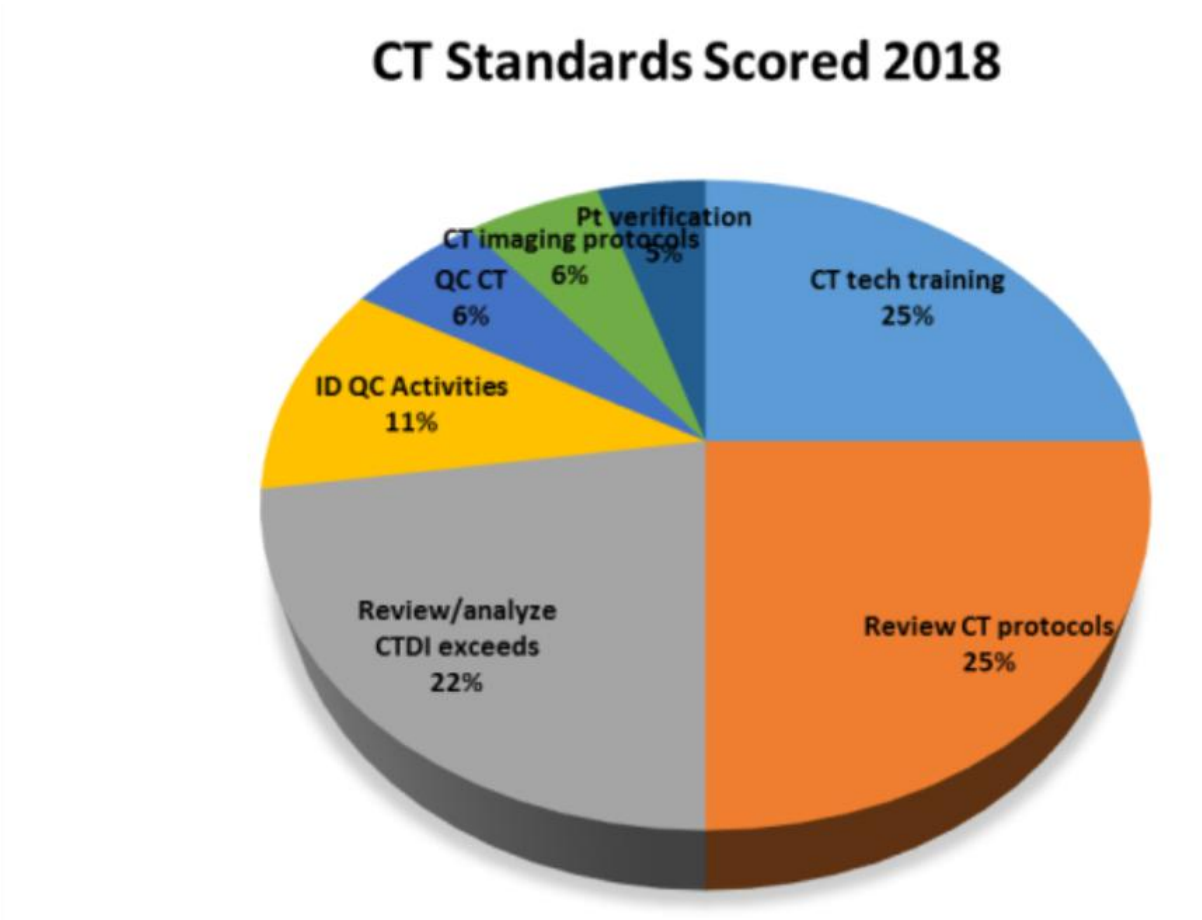
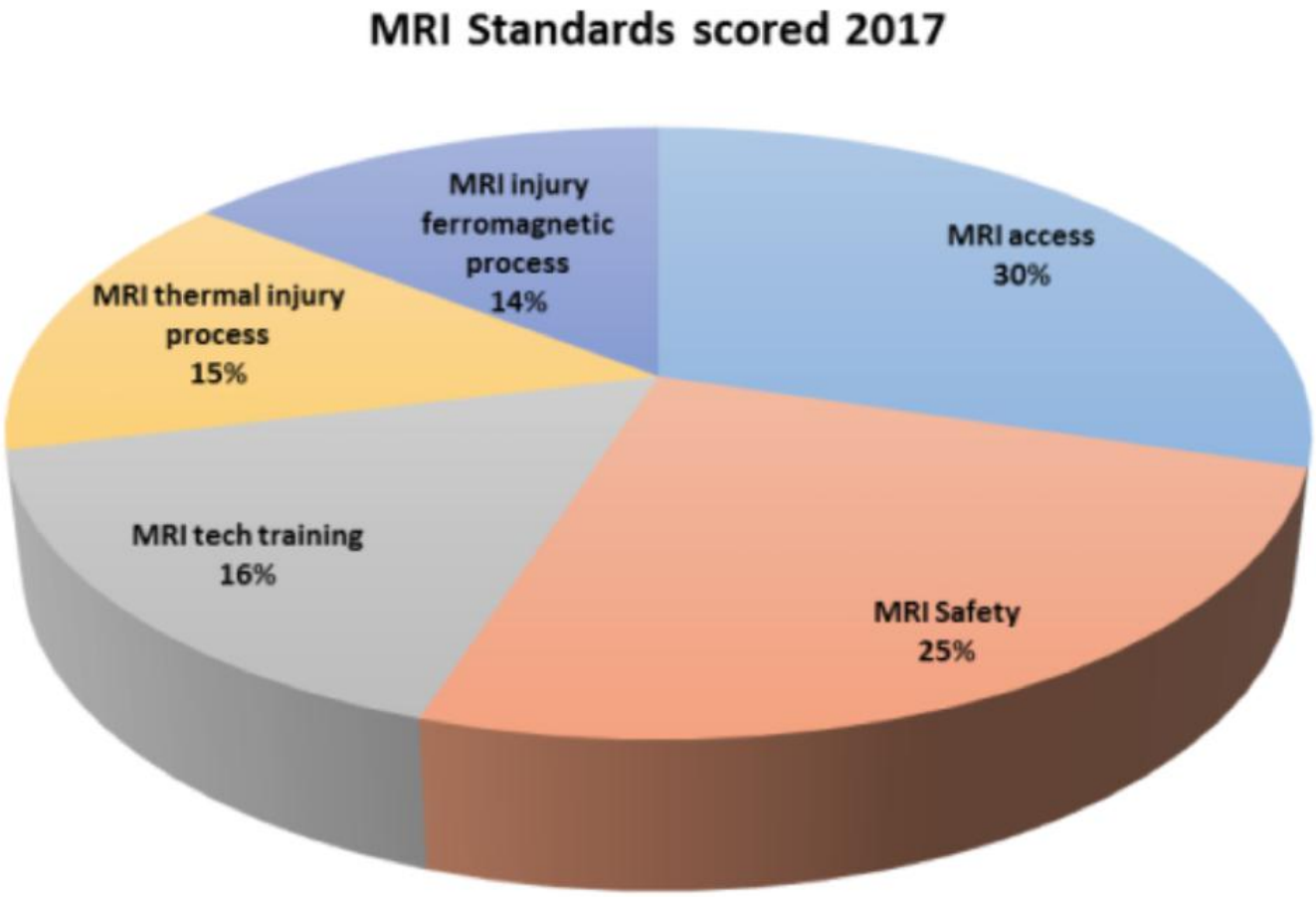
At the 2018 AAPM Spring Clinical Meeting in Las Vegas, **Dr. Andrea Browne** of The Joint Commission (TJC) presented on proposed updates to TJC's Elements of Performance relevant to diagnostic imaging.

Dr. Browne began with a review of all the Environment of Care standards that apply to diagnostic imaging, including several that have recently been moved or re-categorized. She also touched on sections in Human Resources, Leadership, Medication Management, Medical Staff, Provision of Care, and Performance Improvement and reviewed the new requirement as of January 1, 2018 that facilities keep a "library" of service and maintenance manuals for all their medical equipment. Dr. Browne took time to show the top citations for ambulatory care centers (IC.02.02.01, "The organization reduces the risk of infections associated with medical equipment, devices, and supplies," 60%) and hospitals (L5.02.01.35, "The hospital provides and maintains systems for extinguishing fires, 86%). Of MRI and CT standards scored in 2017, the top citation was for MRI Safety (25%) and for CT Protocol Review (25%), respectively. Dr. Browne also shared some typical surveyor observations, such as employees not wearing dosimeter badges and no process for reviewing thermal injuries.

In the final part of Dr. Browne's presentation, which drew the most attention from the audience, she discussed proposed changes to the standards relating to fluoroscopy. The proposed changes, which are available here, relate to all fluoroscopic procedures performed at accredited hospitals, critical access hospitals, ambulatory care, and office-based medical facilities. TJC would require specific tests performed annually on fluoroscopic equipment, such as "high-contrast resolution," "low-contrast resolution," "exposure rate for typical exams" (to a phantom, Dr. Browne clarified), and "automatic dose rate and automatic exposure control function performance." TJC would also add fluoroscopy procedures to its requirement for maintaining and reviewing protocols, which previously only applied to computed tomography. Also like CT, fluoroscopy procedures that exceed specified dose threshold set by the facility would require investigation (the current language says "ranges" but Dr. Browne informed the audience that it would be updated to a threshold). Under the proposed revisions, the "radiation safety officer"

(RSO) would be defined to "mak[e] certain that radiologic services are provided in accordance with law, regulation, and organizational policy." Dr. Browne admitted that RSO was the best name they could think of for the role, acknowledging that the position was already well defined.





The revisions also tighten credentialing and education requirements for individuals operating fluoroscopic equipment, who Dr. Browne defined as whoever sets up and activates the machine. According to Dr. Browne, the proposed changes were motivated by the concern of TJC members that many technologists and physicians who employ and operate fluoroscopic equipment don't have a complete understanding of the equipment capabilities and dose reduction methods. She noted that the Joint Commission goes through an extensive literature review as well as technical advisory and standards review panels when implementing or changing standards.

After the presentation, several physicists present had the opportunity to ask Dr. Browne specific questions about the proposed changes to the standards. Many physicists spoke up about the annual testing requirement, which allows health physicists as well as medical physicists to perform the required tests. One physicist noted that the potential for damaging radiation effects were highest in fluoroscopic systems among all diagnostic modalities and expressed concern that health physicists may not have the required training to test this equipment effectively. Dr. Browne responded that TJC has received considerable input from the Health Physics community to consider the competency of health physicists in regards to supporting patient safety through the use of fluoroscopic equipment. Several physicists also were concerned that the language for fluoroscopic testing didn't allow for assistance, as for computed tomography, magnetic resonance, and nuclear medicine. Dr. Browne assured the attendees that the language would be updated to match the other modalities. Other physicists expressed concern

that it was impossible to police physicians on the use of radiation during fluoroscopic procedures and that the modality of fluoroscopy didn't lend itself to the use of CT-like "protocols." Dr. Browne noted that "protocol" is probably a poor choice of words for the requirement. Another physicist concern brought up during the meeting was the expanded role of the RSO. Dr. Browne responded that she believed that someone needed to fill this proposed role in healthcare facilities. She noted that TJC has already received a lot of feedback from the medical physics community on the proposed requirements and that changes were certain to be made. Comments on the new requirements were being accepted until April 20, 2018. The Joint Commission will then review the input and revise the standards, and may re-issue for comment before they are finalized July 1, 2018, and take effect in January, 2019.

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2018 SPRING CLINICAL MEETING

James Glitz, MS | Jonesboro, AR

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A First Timer's Review of the 2018 Spring Clinical Meeting

This was my first professional conference and I found it decidedly valuable, especially for younger members of the field such as myself that are in need of as much information and education as we can get.

For me, the most valuable talks were those regarding imaging for stereotactic treatments on linear accelerators, and the various errors/uncertainties that are associated with different modalities and reconstructions.

This is particularly valuable information as many community clinics are beginning to implement stereotactic treatments across the country without access to a full physics team, and I've witnessed uncertainty about what should be employed to treat the patients most effectively.

It was also apparent that there is a lot of research regarding automation in treatment planning, with most of the results presented looking promising. As the speakers stated, full implementation is still fairly far off, but it shows a clear future paradigm shift in radiation therapy.

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2018 SPRING CLINICAL MEETING

SCMSC Membership

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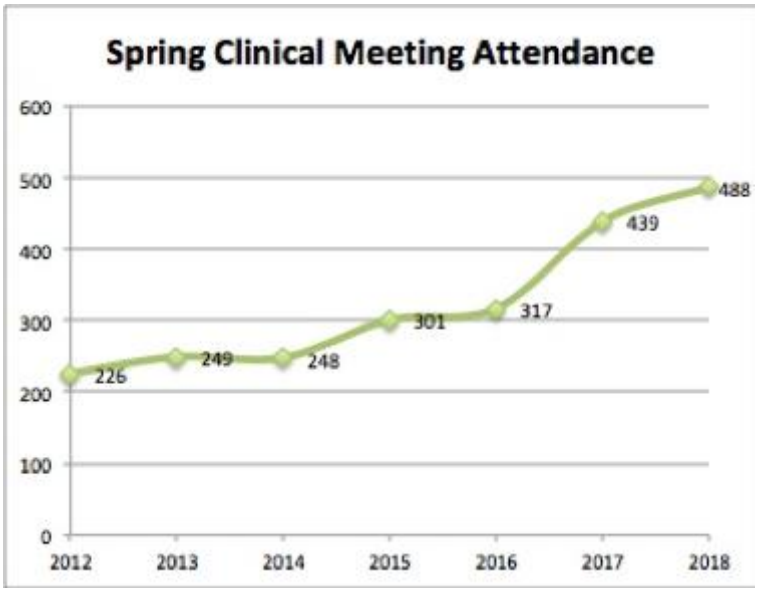
By The Numbers

The American College of Medical Physics (ACMP) was established in 1982 with the help of the AAPM. In 2011, the Society was transitioned into the AAPM. In the transition, the ACMP Annual Meeting became the AAPM Spring Clinical Meeting (SCM). The first SCM was held in 2012, in Dallas, Texas. Several key characteristics of the ACMP Annual Meeting have been preserved in the SCM such as:

- A focus on clinical and professional issues
- Providing the required annual amount of CEUs on specific topics such as mammography and stereotactic breast biopsy
- Including several self-assessment module (SAM) sessions
- Scheduling over the weekend and the first two days of the week to minimize time away from the clinic
- Including nice lunches with adequate time to catch up with colleagues and technical exhibitors

Over the past seven years, the meeting has grown with more than double the attendance in 2018 compared to 2012.



Other meeting details:

- 51 posters were submitted
- 38 technical exhibitors
- 3 sponsorships
- 6 vendor education sessions
- 34 SAM
    - 8 diagnostic
    - 2 joint diagnostic-therapy
    - 5 mammography
    - 8 professional SAM
    - 11 therapy SAM
- 12 young investigator presentations

Next year, the Spring Clinical Meeting will be held in Kissimmee, FL. The Gaylord Palms is an ideal meeting location with premiere meeting space and resort amenities, all while being a short distance from Disney World. Please mark your calendars for March 30, 2019. Next year's meeting promises to be the best yet.

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CHAIR OF THE BOARD'S REPORT

Melissa Martin, MS | Signal Hill, CA

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It is a privilege to serve as your Chair of the Board of Directors this year. Following the Spring Clinical Meeting in Las Vegas, the Board of Directors (BOD) had a two day session on Strategic Planning for the Organization. Using data from the last Members' Survey, we have identified 10 areas that need to be further developed. Further development of the intent and strategy for implementing each of these areas will direct the Finance Committee and overall budget process for the next year and into the future. In the following table are the eight identified strategic objectives at the highest level that were approved on April 11 during this first annual Strategic Planning Meeting of the Board. For each of these areas, there are multiple sub-objectives and proposed metrics to be developed further.

Innovation

Strategic Goal #1: Drive scientific and clinical innovation in medical physics to improve human health

Membership

Strategic Goal #2: Enhance the value of AAPM membership experience and service

Leadership

Strategic Goal #3: Promote leadership role of the organization and its members

Education

Strategic Goal #4: Cultivate excellence in medical physics education

Organizational Management

Strategic Goal #5: Practice stewardship in continuous assessment of programs and services

Communication

Strategic Goal #6: Improve communication internally and externally

Patient Care

Strategic Goal #7: Ensure High Quality Patient Care

Diversity and Inclusion

Strategic Goal #8: Promote diversity, inclusion and equity in healthcare

Some of our members have been involved in this development process for three years now so there is a solid foundation to work from and further refine our direction for the future. If you have input that you would like the Board to consider, please contact your Chapter Representative or myself directly.

There are other areas of activity in which we are very involved at this time. We met with the Executive Committee of the Canadian Organization of Medical Physics at the Spring Clinical Meeting and continued our coordination of activities of the two organizations that are mutually beneficial to us all. We also met with our newly organized Corporate Advisory Board at the SPC, to develop our relationships with our vendors in a way that will offer new opportunities to both our physics and Corporate Members. We encourage our physics members that are employed in industry to get more involved in AAPM committee work. This is one of our Strategic Goals that we are working to develop and strengthen.

There are two Medical Physics Practice Guidelines being submitted for review by the Board of Directors that will have significant impact to the practice of medical physics in the future: MPPG # 7: "Supervision of Medical Physicist Assistants" and MPPG # 10: "Scope of Practice for Medical Physics". Both of these MPPGs have been in the process of development for over two years with much input.

President Bruce Thomadsen has formed an Ad Hoc Committee to work with members of the Health Physics Society to explore how the two organizations can work together to cover the requirements in training and education relative to the radiation safety needs for the future as well as integrate the activities and training of HPS members into the medical community.

We are encouraged about the development of funding for four new residencies in Imaging Medical Physics—two will be funded by AAPM and two will be funded by the RSNA. Encouragement from the graduate programs to interest graduate students in imaging is appreciated. As can be seen from the current job openings on our website, the demand for Imaging Medical Physicists is growing. This demand will only increase as The Joint Commission continues to require additional training and equipment evaluations by Qualified Medical Physicists.

As you can see, your Executive Committee and the organization is alive and well and very active. We appreciate all of our members and encourage you to contact us at any time.

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EXECUTIVE DIRECTOR'S REPORT

Angela R. Keyser | Alexandria, VA

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ELECTION PROCESS ONLINE ONLY!

Elections for the 2018 Officers, Board Members-at-Large and Nominating Committee Members will open on June 20 and will run through July 11. Again this year, AAPM will use the Bulletin Board System (BBS) during the election process to allow members to discuss issues of concern with the candidates and the election in general. The election process will be online only so be alert for e-mail announcements.

NEW AAPM PUBLICATION

A new AAPM Report is available online:
Report of AAPM Task Group 162: Software for Planar Image Quality Metrology

EDUCATION AND RESEARCH FUND UPDATE

Are you a "Platinum, Gold, Silver, or Copper" level contributor to the AAPM Education and Research Fund? This information is displayed on the AAPM website to assist you in keeping track of how much you have put into the fund. If you are logged in, you will see a message along the right-hand side of the page that shows your cumulative contributions with an indication of the additional donations required to elevate your contribution to the next "level."

There will once again be an Education and Research Fund Donors' Lounge at the Annual Meeting. Individuals who have made a cumulative lifetime donation of $100 or more will have access to the Lounge. Comfortable seating, beverages, and electronic charging stations will be available.

Consider donating to the Education and Research Fund today.

2018 FUNDING OPPORTUNITIES

Research Seed Funding Grant (Application Deadline: May 22, 2018)

Three $25,000 grants will be awarded to provide funds to develop exciting investigator-initiated concepts, which will hopefully lead to successful longer-term project funding from the NIH or equivalent funding sources.

Funding for grant recipients will begin on July 1 of the award year. Research results will be submitted for presentation at future AAPM meetings.

Applicants must be a member of AAPM at time of application (any membership category).
View additional information and access the online application »

AAPM Best Award (Application deadline: May 22, 2018)

Best Medical will provide five fellowships in the amount of $1,000 each, to be used for travel, food and lodging expenses to attend the 2018 AAPM 60th Annual Meeting & Exhibition. AAPM will provide complimentary Annual Meeting registration for each recipient, including social function tickets.
View additional information and access the online application »

AAPM Imaging Physics Residency Grant (Application deadline: June 8, 2018)

On November 29, 2017, the AAPM Board of Directors approved $140,000 in funding for two new imaging physics residency positions, in diagnostic, diagnostic with a nuclear medicine option, or nuclear medicine. With this funding, the selected institution(s) will receive $35,000 per year for two years as matching support for one resident.

The purpose of the AAPM funding is to provide 50% support of a resident's salary for two imaging physics residents. The awardee institution(s) will provide the other 50% support. After the period of the award is over, the intent is that the awardee institution(s) will continue to fully support this new imaging physics residency position. Demonstration of this intent should be included in the application materials. CAMPEP accreditation is expected within the first year of the funding period, if a program is not currently accredited.

All imaging physics residency programs are eligible to apply. Programs that have not received prior AAPM Imaging Physics Residency Grant Funding are particularly encouraged to apply. New programs will receive priority consideration.
View additional information and access the online application »

YOUR ONLINE MEMBER PROFILE

This is a reminder to review your AAPM Membership Profile information and make any changes necessary. Please, upload your picture if you have not already done so.

Remember to review the "Conflict of Interest" area of the Member Profile to self-report conflicts per the AAPM Conflict of Interest Policy.

AAPM recognizes that not everyone is interested in every topic that we communicate to our membership, so we are now organizing our e-mail communications into "campaigns" that are typically time and event based. The first time you receive an e-mail about a particular event, you may opt out of receiving future e-mails on this topic at the bottom where it says, "*To inhibit future messages of this kind, click here.*" For example, if you know you aren't able to go to the 2018 Annual Meeting and don't want communications about the meeting, you may opt-out from any e-mail in the campaign, or from the e-preferences screen in your member profile.

UPDATE ON AAPM'S NEW BUSINESS SOFTWARE

At the March 2017 meeting, the AAPM Board of Directors approved the purchase of a new Association Management System (AMS) with integrated Financial Management System (FMS), the main business software for the organization. The recommendation came from TG 285 - Task Group on AAPM Association Management System chaired by AAPM Treasurer **Mahadevappa Mahesh**. AAPM's current system, IMPAK/APAK, has been in place since 1996. The decision was prompted in part by the sale of the software company to another vendor that was not offering a package that met AAPM's requirements.

The new systems are Microsoft Dynamics 360 GP (formerly Great Plains) as our FMS, and Abila Netforum Enterprise as our AMS. The FMS system went live in mid-February. The AMS contracts were signed early in the year, and implementation has begun with a "Go Live" scheduled for the second week of May. This is a huge investment and undertaking, but I'm very pleased and proud of how the AAPM HQ team has managed this process. The next few months will be very busy, especially for the Information Services and Finance teams as we strive to build out functionality in the new system that meets or exceeds the tools provided by the old system.

AAPM'S HQ TEAM . . . AT YOUR SERVICE!

Who does what on the AAPM HQ Team? See a list with contact information and brief descriptions of responsibilities online. An Organization Chart is also provided.

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TREASURER'S REPORT

Mahadevappa Mahesh, PhD | Baltimore, MD

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Last year in my May-June report, I discussed AAPM's decision to purchase a new Association Management System (AMS) and Financial Management System (FMS) system. Since then, a lot has happened, and I will provide an update in this report. As per the plan, the FMS is now fully implemented and is currently being used by the AAPM Financial staff and the AMS system is going through the final training process. To date this project has gone smoothly starting with the decision to move forward with a plan for purchasing the new systems, Board approval to purchase the new systems and now onto implementation. High cooperation and enthusiasm from AAPM staff has made this project possible and on time and I am hoping that the new systems will make the organization's work more efficient.

Recently, I attended the American Institute of Physics (AIP) Assembly of Society Officers meeting at the American Center for Physics, College Park, MD and wanted to share some of the topics that were discussed related to the current state of science policies. Three panels convened to offer an analysis and planned strategies for advancing member organizations' science advocacy: ***The New Reality of Science Policy; Communicating Science to Gain Public Trust; and Positioning Your Society for the Age of Open Science.***

THE NEW REALITY OF SCIENCE POLICY

Michael Henry, Director of *FYI Science Policy News*, offered an optimistic analysis of the current political climate for science. He posited an unexpected renaissance for the physical sciences, comparing the Trump administration's proposed science budget against appropriations, with evidence showing bipartisan support for science funding. **David Goldston**, Director of the Washington office of MIT, further supported the view that science funding has been relatively stable over the long term.

Kathleen Kingscott, Vice President Strategic Partnerships at IBM Research, set out a process for organizations to develop advocacy priorities and strategies, and **Eleanor Dahoney**, Vice President Policy and Advocacy at Research!America, coached attendees who lobby to know their legislator's priorities and draw on values and emotions.

COMMUNICATING SCIENCE TO GAIN PUBLIC TRUST

The second group of panelists discussed the importance of communication in gaining the public's trust. **Laura Helmuth**, Health Science & Environment Editor for *The Washington Post*, talked about how the media report on science. She noted the dynamic nature of this pocket of journalism, which is increasingly dominated by journalists with significant science education and training. This is a welcome change for organizations like us to have journalists with a science background who can provide a balanced discussion on complex scientific issues such as radiation risks and benefits to the general public. **Jevin West**, Assistant Professor at the University of Washington, discussed his work combatting misinformation in science. He looked at the viable business model for spreading misinformation, and expressed the need to teach students and others how to look at science publications critically.

Nathan Sanders, co-founder of ComSciCon, and founder of the publication widely popular among science students, *Astrobites*; advocated for attendees to empower the next generation of science communicators by engaging graduate students as liaisons to the public.

POSITIONING YOUR SOCIETY FOR THE AGE OF OPEN SCIENCE

Brian Nosek, co-founder of the Center for Open Science (COS), led the final panel by talking about improving transparency in scholarly communication, and his work at COS advocating for open science. Nosek seeks to improve reproducibility by shifting incentives that impact research, and transitioning business models that dominate scholarly communication. Nosek notes that changing journal publication, a critical part of the income stream to professional societies, is a starting point that can move the scientific enterprise toward openness. He believes that societies can accommodate the move to openness by adopting other income-producing activities, such as providing peer review at registration and through research. In addition, Nosek suggests preregistration as a way of increasing transparency and reproducibility of published research. He explains that the preregistration process requires authors to specify up-front what they intend to do and how they intend to analyze their results, allowing shortcomings to be resolved early in the process.

Roque Calvo, Executive Director for the ElectroChemical Society (ECS), upended his organization's business plan, based on traditional income sources as an independent, nonprofit publisher, to advance an open science paradigm, changing ECS's publishing standard to be supported by growing a $20 million endowment. Calvo spoke about his organization's Free the Science initiative, that will make ECS research freely available to all readers, while remaining free for authors to publish. The initiative currently gives ECS authors the choice to publish their work as open access. Calvo explained ECS's change in paradigm has increased readership and engagement in their journal publication process. He says ECS plans to open access to the entire ECS Digital Library by 2024.

Overall, I found this year's AIP Assembly of Society Officers very interesting with valuable discussions on the science advocacy environment and guidance in navigating policy challenges.

I would like to thank **Richard Martin**, AAPM's Government Relations Program Manager, for his subject matter contribution to this report. Please feel free to reach out to me at mmahesh@jhmi.edu, @mmahesh1, or call me at 410-955-5115, if you have any questions concerning this report.

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REPORT FROM THE WORK GROUP ON IMRT (WGIMRT)

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Collaboration with Virginia Commonwealth University Medical Physics Graduate Program (**Samantha Conrad, Benjamin Lewis, Mark Ostyn, Siqiu Wang, Mattlew Riblett, Rebecca Mahon, and Patrick Brunick**), Henry Ford Cancer Institute Residency Program (**Akila Kumarasiri, Ilma Xhaferllari, Jennifer Dolan, Qixue Wu and Anthony Doemer**), and William Beaumont – Dearborn (**Cory Knill**)

1. Sparing all salivary glands with IMRT for head and neck cancer: Longitudinal study of patient-reported xerostomia and head-and-neck quality of life

Hawkins et al. investigated how sparing all salivary glands affects the patient-reported outcome measurements (PROMs) of xerostomia. Xerostomia (dry mouth) is common in patients with head and neck cancer; 252 patients requiring treatment to the bilateral neck (with all-gland-sparing IMRT) answered approx. 600 questionnaires about their experience with xerostomia and their head and neck quality of life over a 60 month period. Utilizing both univariate analysis and multivariate analysis, results showed that reducing the dose to bilateral parotid gland (bPG), contralateral submandibular gland (cSMG), and oral cavity (OC) doses maximizes quality of life. Radiother Oncol. January 2018 Volume 126, Issue 1, Pages 68-74

2. Local recurrences after curative IMRT for HNSCC: Effect of different GTV to high-dose CTV margins

Zukauskaite et al. compared positions of local recurrences (LR) and failure rates of head and neck squamous cell carcinomas (HNSCC) in patients treated using IMRT with different GTV-CTV1 margins from three different clinics. 1576 patients treated with IMRT were followed-up with; after 41 months 272 patients had LR. The CT locations of the recurrences were compared to IMRT plans and the different GTV-CTV1 margins. The 95% prescription dose was evaluated as well. 51% of the LRs were located within the GTV, 83% received the prescribed dose regardless of the margins, and the local recurrence rate was not influenced by the differences in the margins; no correlations or statistical significances between the IMRT margins and LR locations were found. Radiother Oncol. January 2018 Volume 126, Issue 1, Pages 48-55

3. HyperArc VMAT planning for single and multiple brain metastases stereotactic radiosurgery: a new treatment planning approach

Ohira et al. investigated a new treatment planning approach available in the newly developed prototype treatment planning system from Varian. A retrospective study of 23 patients with 1–4 brain metastases who were treated with SRS was used to compare dosimetric parameters between retrospectively generated plans using the conventional VMAT (C-VMAT), or HyperArc VMAT (HA-VMAT). They reported that HA-VMAT provided higher homogeneity index, conformity index, and lower gradient index. Moderate-to-low dose volumes (4–16Gy) were significantly reduced but resulted in more complex MLC patterns and higher MU in HA-VMAT than C-VMAT. They demonstrated that the HA-VMAT planning method is superior in these dosimetric parameters to C-VMAT planning for patients with 1–4 brain metastases. Radiation Oncology. 2018 January; 13(13).

4. Evaluation of the tumor movement and the reproducibility of two different immobilization setups for image-guided stereotactic body radiotherapy of liver tumors

Dreher et al. evaluated the tumor movement and setup accuracy of patients using two types of immobilization setups during liver SBRT. 54 liver tumor patients were included in this study, 40 patients immobilized using a vacuum couch with low pressure foil, and 14 patients with abdominal compression. Immobilization efficacy was evaluated using the ratio of GTV to ITV, tumor movement in 4D CT scans, and movement in daily online adjustments after CBCT scans. The ratio of GTV to ITV was smaller for the low pressure foil system, indicating this method allows for more relative movement of the GTV in the ITV. The online adjustments and tumor movement in 4D CT scans were smaller using abdominal compression. The authors conclude that abdominal compression leads to a greater reduction in tumor motion than the low pressure foil, leading to higher accuracy during patient positioning. Radiation Oncology. 2018 January; 13(15).

5. Does intensity modulation increase target dose calculation errors of conventional algorithms for lung SBRT?

Zheng et al. investigated whether additional uncertainty was present in treatment planning lung SBRT IMRT cases with commonly used treatment planning algorithms compared to conformal techniques. Between two study groups, 20 cases were examined using type-A algorithms (pencil beam and ray tracing), and 20 were examined using type-B algorithms (collapsed cone, and analytical anisotropic). They found that for both types of algorithms, the difference between IMRT and conformal treatment was not statistically significant. The authors speculate that this is because the smallest fields (and most uncertain) are present at the center of the target (where the dose calculations algorithms are most certain). JACMP 2018 http://onlinelibrary.wiley.com/doi/10.1002/acm2.12266/full

6. Deep-inspiration breath-hold intensity modulated radiation therapy to the mediastinum for lymphoma patients: setup uncertainties and margins

Aristophanous et al. investigated the setup uncertainties and margins in IMRT for mediastinal lymphoma patients using DIBH. The residual errors were retrospectively measured, according to autoregistration, for the total PTV and 6 anatomic subregions in 3 directions. Large differences were found among various subregions and directions, most noticeably in the lower heart, neck, and axilla regions and in the superoinferior direction. In addition, 3 IGRT daily setup strategies were also examined: no IGRT, CBCT,

and CT on rails (CTOR). Despite the measurable improvement in margin reduction from using IGRT, there was no clear conclusion whether CTOR offers an advantage over CBCT. Int J Radiat Oncol Biol Phys. 2018 Jan 1;100(1):254-62

7. Intensity modulated radiation therapy and second cancer risk in adults (Commentary)
Filippi et al. commented on the second cancer (SC) risk of IMRT in comparison with that of 3D-CRT. Citing recent radiobiological modeling studies, preclinical data, and preliminary clinical data, the authors suggest that there is at least an equivalence in SC induction risk between 3D-CRT and IMRT, with possible reduced risks of certain solid tumors for IMRT. The article also addresses the need for more clinical data in order to gain further insights. Int J Radiat Oncol Biol Phys. 2018 Jan 1;100(1):17-20

8. Technical Note: The impact of deformable image registration methods on dose warping
Qin et al. presented findings regarding the differences between organ doses warped by a purely image-based (IM-DIR) deformable image registration method and a novel biomechanical model-based (BM-DIR) deformable image registration method when applied for dose accumulation purposes. A retrospective study of 10 randomly selected patients, consisting of 5 Head and Neck (3x VMAT, 2x nine-field IMRT) and 5 Prostate cases (5x seven- or nine-field IMRT), compared the results of these two methods when used to register a CT taken after three weeks of treatment to the pre-treatment planning CT and subsequently warp the computed treatment doses from one image to the other. The researchers reported the dosimetric discrepancies between the two methods for soft-tissue organs (i.e. parotid, bladder and rectum) noting that greater discrepancies between the results of the conventional IM-DIR and BM-DIR approaches manifested in cases of large tumor volume shrinkage (e.g. the parotids). It was demonstrated that the BM-DIR method could produce a more realistic DVF around organs which experience large volume variation leading the researchers to suggest that radiotherapeutic applications which incorporate high dose gradients (e.g. IMRT and VMAT) to these sites could stand to benefit from its application. Medical Physics. January 2018 DOI: 10.1002/mp.12741.

9. Multi-GPU configuration of 4D intensity modulated radiation therapy inverse planning using global optimization
Hagan et al. designed a multi-GPU based particle swarm optimization algorithm for optimizing 4D-IMRT treatment plans using a vendor (Varian) specific GPU workstation and the Eclipse treatment planning system. The authors developed methods of applying deformable image registration on 10 phases with variable number of particles using sparse matrices to keep data within memory limitations of the system (CPU 256GB RAM and each GPU 12 GB RAM). They determined the maximum time benefit resulted from using 5 of the 8 available GPUs with increased down sampling and less particles in the swarm also reducing time. Time speed up beyond 5 GPUs was hampered by data transfer speeds and GPU clock rates. The 4D IMRT lung cancer plan using the authors approach (200 particles and 25 iterations) reduced dose to the organs at risk by as much as 26% of the max dose compared to the conventional IMRT plan. A plan with 5 GPUs and 50 particles took 35 minutes to plan. Phys in Med and Bio. 2018 Jan; 63(2)

10. The robustness of dual isocenter VMAT radiation therapy for bilateral lymph node positive breast cancer
Boman et al. compared VMAT treatment planning using dual isocenters vs. a single isocenter for

treatment of lymph node positive bilateral breast cancer (BBC). The authors had previously noted that a split-arc VMAT technique reduced dose to the ipsilateral lung and heart at the expense of a higher dose to the contralateral breast when compared to conventional VMAT arcs or static fields for left or right sided treatments. The authors were interested in comparing the dosimetric differences between single and dual isocenter plans using this split-arc VMAT technique and investigating the robustness of the dual isocenter approach. The results showed a small dosimetric advantage when using the dual isocenter approach. Conformity index, D98PTV, V20LUNGS, V5LUNGS, DmeanLUNGS, and DmeanHEART all showed statistically significant differences in favor of dual isocenters. Dual isocenters did increase the number of MU's delivered by 16.6%. The robustness of dual isocenters was tested by applying 2 and 5 mm couch shift errors in the lateral, longitudinal, and vertical directions and looking at the CTV & PTV dose. This is to simulate potential errors when moving the couch from one isocenter to the other. The maximum decrease was 5% (2.5 Gy) for D98PTV and 1% (0.5 Gy) for D98CTV when 5 mm shift was applied. Physica Medica, December 2017, Volume 44, Pages 11-17

11. Auditing local methods for quality assurance in radiotherapy using the same set of predefined treatment plans

Seravalli et al. performed at TG-119 type study where they audited 21 Dutch radiotherapy centers. They extended the standardization past TG-119 by also creating standard radiotherapy plans, which were imported into the planning systems, recalculated, delivered, and analyzed using a standard auditing QA phantom(PTW's OCTAVIUS 3D) along with the local QA equipment. In 80% of the evaluated measurements the results of the local QA analysis matched the audit (both failed or both passed). The authors suggest the mismatches may have been largely caused by different QA measuring devices used by the institutions. One of the main hurdles in this study was developing a robust set of standardized plans that could be imported and delivered on the different institutional TPS-linac combinations, which eventually necessitated the generation of different audit plans for Varian and Elekta machines. https://www.sciencedirect.com/science/article/pii/S2405631617300799

12. Relationship between dosimetric leaf gap and dose calculation errors for high definition multi-leaf collimators in radiotherapy

Kim et al. compared the sweep-gap measured DLG values on a Varian Edge machine to the optimal DLG values found by minimizing the TPS-measured dose differences for 5 spine SRS cases. The calculated spine SRS doses were systematically lower when using the measured DLG values. Increasing the DLG value in the TPS resulted in average ion chamber measurement errors less than 1% [-2.2% to 2.3%] and film gamma pass rates (3%/3mm) greater than 97%. Furthermore, DLG values optimized using spine SRS cases also resulted in similar TPS-measurement agreements for TG119 test cases, lung and liver SBRT cases, and SRS brain cases. https://www.sciencedirect.com/science/article/pii/S2405631617300532

13. Retrospective dosimetry study of intensity-modulated radiation therapy for nasopharyngeal carcinoma: measurement-guided dose reconstruction and analysis

Sun et al. investigated a measurement-guided 3D dose reconstruction (3D-MGR) technique for QA'ing nasopharyngeal IMRT plans, and compared that with conventional phantom-based planar dosimetry (2D-PBD). 30 plans and their pre-treatment 2D-PBD data were analyzed. 3D-MGR achieved global gamma pass rates similar to conventional 2D-PBD. However, structure-specific gamma pass rates

significantly decreased under stricter criteria, including the PTV. The average deviation of all inspected dose volumes and volumetric dose parameters ranged from − 2.93% to 1.17%, range [− 15.66%, +6.66%]. Consequently, authors caution that even upon passing the pre-treatment 2D-PBD QA, there could still be a risk of dose errors like under-dose in PTVs and overdose in critical structures, and 3D-MGR is recommended as the more clinically efficient verification for complicated nasopharyngeal IMRT. https://ro-journal.biomedcentral.com/articles/10.1186/s13014-018-0993-2

14. Fraction-variant beam orientation optimization for non-coplanar IMRT

O'Connor et al. compared fraction-variant to fraction invariant beam orientation optimization (BOO) for non-coplanar IMRT treatment planning. Fraction-variant plans were generated using a BOO formulated based on group sparsity that simultaneously optimizes the non-coplanar beam angles in all fractions. For each fraction, 500–700 candidate beams are used. The group sparsity encourages most candidate beams to be inactive to allow for different sets of beams to be active for different fraction. SBRT treatment plans consisting of five fractions were generated for a digital phantom, a prostate case, and a lung case, and a conventional thirty-fraction treatment plan was generated for a head and neck case. Non-coplanar IMRT requires a large number of beams to maximize dosimetric quality increasing treatment time. Fraction variant BOO addresses this disadvantage by considering fewer beams per fraction while a wide range of beam geometries are utilized over the course of treatment. Fraction variant BOO improved dosimetric quality of treatment plans by reducing the OAR mean dose and D2cm values on average by 3.3% and 3.8%, respectively and dose conformality increased or remained constant in all cases. Alternatively, dosimetric quality can be maintained while treatment time is reduced. https://www.ncbi.nlm.nih.gov/pubmed/29351088

15. Spatiotemporal radiotherapy planning using a global optimization approach

Adibi et al. investigated the therapeutic gain obtained by altering the radiation dose distribution for over different fractions using a spatiotemporally planning approach. Spatiotemporal treatment planning is achieved by integrating the fluence map optimization to maximize BED to the target volume and minimize the BED to critical structures. This optimization scheme led to a large scale non-convex problem solved using global optimization technique to obtain tight upper and lower bounds. Equivalent uniform BED was used to compare the results for two tumor sites, prostate and C-shape scenarios. During different fractions, different parts of the target volume are irradiated. Spatiotemporal treatment planning led to therapeutic gain by observing an increase in the BED to the target while the BED to normal tissue is reduced. https://www.ncbi.nlm.nih.gov/pubmed/29328046

16. Evaluation of a commercial automatic treatment planning system for liver stereotactic body radiation therapy treatments

Gallio et al. investigated the automated treatment planning module of the Pinnacle treatment planning system (TPS), specifically for liver stereotactic body radiation therapy (SBRT). Ten liver SBRT cases were studied via six treatment plans. Four of the treatment plans were manual in nature (two Pinnacle manual module and two Monaco TPS) and the remaining two were automated (Pinnacle auto-planning module). Two plans (from different planners) from each TPS were developed to study user dependency. The metrics showing statistically significant differences between Pinnacle and Monaco planning techniques were: the plan average beam irregularity, number of segments, and monitor units. The

metrics showing statistically significant differences between manual and automated planning techniques were the spinal cord doses and human resource planning time. Ultimately, the authors concluded that the automated planning technique generated clinically acceptable plans, half of which were preferred to the manually generated plans with the benefits of decreased human resource planning time and increased consistency in plan quality. The most complex and challenging cases still required human skills and a manual approach. https://doi.org/10.1016/j.ejmp.2018.01.016

17. Quantifying the effect of 3T Magnetic Resonance Imaging residual system distortions and patient-induced susceptibility distortions on radiation therapy treatment planning for prostate cancer

Adjeiwaah et al. investigated the effect of magnetic resonance system and patient-induced susceptibility distortions from a 3T scanner on dose distributions for prostate cancer. Combined displacement fields from the distortions were used to distort 17 prostate patient CT images. VMAT dose plans were initially optimized on distorted CT images and the plan parameters transferred to the original patient CT images to calculate a new dose distribution. Maximum residual mean distortions of 3.19 mm at a radial distance of 25 cm and maximum mean patient-induced susceptibility shifts of 5.8 mm were found using the lowest bandwidth (122 Hz per pixel). Dose difference between the distorted and undistorted images was less than 0.5%. Adjeiwaah et al. concluded that Patient-induced susceptibility distortions at high field strengths in closed bore magnetic resonance scanners are larger than residual system distortions after using vendor-supplied 3-dimensional correction for the delineated regions studied. However, errors in dose due to disturbed patient outline and shifts caused by patient-induced susceptibility effects are below 0.5%. https://doi.org/10.1016/j.ijrobp.2017.10.021

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IMAGING PRACTICE ACCREDITATION SUBCOMMITTEE REPORT

Tyler Fisher, MS | Costa Mesa, CA

AAPM Newsletter — Volume 43 No. 3 — May | June 2018

PROPOSED REVISIONS TO THE JOINT COMMISSION ACCREDITATION REQUIREMENTS FOR FLUOROSCOPY

In early March, the Joint Commission (JC) released proposed requirements related to fluoroscopy use in all JC facilities. At this time, these are proposed requirements and are not final. JC requested comments from interested stakeholders and the AAPM and the Imaging Practice Accreditation Subcommittee has submitted comments from the membership.

While the requirements are not final and changes may occur, it is worthwhile to review the recommendations of the JC and prepare for the eventual implementation of fluoroscopy standards for all facilities. There are four main ideas being advanced by the JC in these proposed standards that are new: annual performance evaluation tests, documentation of dose metrics, expected dose ranges specified in written protocols, and follow-up of procedures exceeding dose ranges. These requirements go above and beyond typical state requirements and will likely require facilities to implement new procedures.

For physicist testing, the proposed standards require the following evaluations annually:

- Beam Alignment and Collimation
- Tube potential/kilovolt peak (kVp) accuracy
- Beam Filtration (half-value layer)
- High-contrast resolution
- Low-contrast resolution
- Exposure rate for typical exams
- Maximum exposure rate

- Patient dose display accuracy (where applicable)
- Automatic dose rate and automatic exposure control performance

As with previous JC standards, the pass/fail criteria are not defined by the JC. Systems must comply with local standards where applicable and where no local standard applies, the physicist may apply their own pass/fail criteria.

The new standards require facilities to document, where available, the reference-air kerma, cumulative-air kerma, or kerma-area product as displayed by the system. For systems that are not capable of displaying these dose metrics, fluoroscopy time and the number of images must be recorded in a retrievable format. Fluoroscopy systems have been required to have this capability since 2006, so the majority of systems are providing this data. While most state regulations still do not require anything other than fluoroscopy time to be recorded, fluoroscopy time has long been known to be a very unreliable indicator of total patient dose. While not perfect, the dose metrics proposed provide much more accurate and meaningful representations of patient dose and the AAPM has encouraged adoption of this standard.

The JC is expanding the requirement regarding written protocols to include fluoroscopy procedures. This is familiar from the current standards regarding CT protocols, but now includes expected ranges for reference-air kerma, cumulative-air kerma, kerma-area product, and fluoroscopy time. This standard will require additional work by physicists, technologists, and radiologists to establish these ranges. Naturally, fluoroscopy expected dose ranges are significantly wider than CT dose ranges. Therefore, facilities should establish expected dose ranges that will encompass the vast majority of patients. These protocols should be reviewed at time periods established by the facility to ensure that they stay current with accepted practices.

Finally, the proposed standards include provisions to follow-up with patients whose fluoroscopy procedure exceeded the facility's established dose or fluoroscopy time ranges as well as to have an internal analysis and review of the procedure. This process should already be in place for facilities to comply with former JC requirements for patients who receive a high-dose fluoroscopy exam that could cause skin damage. However, the new standards let the facility establish the dose alert thresholds for individual procedures that should trigger follow-up.

At this time, the proposed standards do not have an effective date of implementation. If previous JC precedent is followed, the new standards could become effective within 6 to 18 months. The standards may yet change based on the feedback they receive. However, all medical physicists should be aware of the proposed standards and how Joint Commission may begin to regulate fluoroscopy.

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USA SCIENCE & ENGINEERING FESTIVAL

Yusuf E. Erdi, DSc, AAPM-PEC Vice Chair | New York, NY

AAPM Newsletter — Volume 43 No. 3 — May | June 2018

Upper left: Hung Ching, Tom Hu | Lower Left: Tom Hu, Kids | Center: Yusuf Erdi, Jialu Yu | Upper Right: Tom Hu, Jim Deye | Lower Right: Jim Deye, Hung Ching

The biennial USA Science & Engineering Festival (USASEF) is an open-to-public and free science festival that has been held in Washington, D.C. since 2010. The festival is the celebration of science, technology, engineering, and mathematics (STEM) disciplines in the United States.

The 5th USA Science & Engineering Festival was a two–day Expo on April 7-8, 2018 at the Walter E. Washington Convention Center in Washington, D.C. with an additional sneak-peek Friday.

Attendance of 360,000 was estimated for this 3-day event this year with more than 3,000 hands-on activities and over 1000 participating organizations.

AAPM is invited to participate in the USASEF by organizing members of AIP as a part of AIP booth (#5437). This year's AIP theme was "Everyday Physics" so each society, under AIP, selected a topic that uses physics in our daily lives. As AAPM PEC, we adopted "The image of everyday medicine" as a slogan for AAPM section (pictures) of the AIP booth.

We set-up a doctor's office with a portable ultrasound scanner which was graciously donated by Philips Medical Systems. During the 3-day event, we demonstrated the operation of a US scanner to hundreds of kids and adults through our booth volunteers. People that visited our booth, especially mothers, were really impressed with the size and quality of US technology since they can relate to US scans of their child from previous years. We received so many "Ooooo's and Ahaaa's" when we did a scan of their hands to show their finger bones. In addition, we did demo scans of a US phantom (Gammex) to show what an actual medical physicist can do in medical offices and hospitals.

Overall, USASEF was a successful event for AAPM and hopefully we have convinced a couple of bright minds to choose medical physics as their future profession.

AMERICAN ASSOCIATION of PHYSICISTS IN MEDICINE

Improving Health Through Medical Physics

CONFERENCE of RADIATION CONTROL PROGRAM DIRECTORS (CRCPD) UPDATE

Kathleen Hintenlang, PhD | Columbus, OH
Jennifer Elee

AAPM Newsletter — Volume 43 No. 3 — May | June 2018

A meeting was held by the International Atomic Energy Agency (IAEA) on Strengthening of Safety Culture through the Use of Incident Learning Systems.

IAEA TECHNICAL MEETING ON STRENGTHENING OF SAFETY CULTURE IN RADIOTHERAPY THROUGH THE USE OF INCIDENT LEARNING SYSTEMS

The Technical Meeting objectives were to provide Member States, International, Regional and National Organizations an opportunity to evaluate and discuss the use of incident learning systems and how the information can be used to strengthen safety culture in radiotherapy. The meeting explored methods of using incident learning systems, how they can be improved and how they can strengthen Safety Culture in Radiotherapy. The meeting was attended by 50 professionals from 41 countries and seven professional organizations. The participants included regulators, physicists, physicians and radiotherapy technologists from Asia, Europe, Africa, North America, and South America. The meeting allowed the sharing of ideas and activities in an effort to strengthen safety culture in radiotherapy. Participants heard about the many different incident reporting and learning systems available from around the world and how they are using the information to disseminate information to the radiotherapy community. Outcomes of the meeting and future activities include the continuation of sharing information about events and improvements in the processes and how to identify and share best practices at the local, national regional, and international level to improve patient safety in radiotherapy.

The program was broken down into four sessions including:

1. Accidents do Happen,
2. Reporting and Learning Systems,
3. Efforts to Prevent Errors, and
4. Impact on the Use of Incident Learning Systems on Strengthening Safety Culture.

AAPM and CRCPD were able to lend our knowledge of defining an event and our experience with collecting and analyzing radiotherapy events. In addition, AAPM provided information on RO-ILS and TG100 while CRCPD provided information on inspections for the past six years from the USA state reporting programs. Hintenlang also participated in a panel on how the safety culture of a facility can be important to event reporting.

In Session 1, **"Accidents do Happen,"** several presenters discussed major events that have occurred worldwide. These events and the follow up after have led to regulatory event reporting in many countries. In addition, many societies have advocated the use of Incident Learning Systems (ILS) to use at the local level as a way for facilities to track "good catches" and discuss improvements. There were discussions on how tracking events both nationally and internationally can lead to safety improvements in equipment and procedures. At a minimum, it was determined that it would be beneficial if all reportable events were input into IAEA's SAFRON (a web-based voluntary safety reporting and learning system for radiotherapy) at the international level to look for trends and potential issues.

Session 2, **"Reporting and Learning Systems,"** was broken down into two parts:

1. Required Reporting and
2. Voluntary Incident Learning Systems

In the required reporting portion, several presenters, including AAPM and CRCPD, discussed how their country collects and shares events. Most of the countries seem to be collecting the same types of events using somewhat different methods. Several countries disseminate lessons learned via newsletters to

give examples of the types of events that are being reported and to encourage reporting to the national regulatory agency. In the discussion of voluntary ILSes, many ILSes were discussed. The sharing of information from voluntary ILSes is important. Discussions were held on how to improve the narrative in ILSes reports so that enough information is provided to make useful determinations on causes and move forward with improvements. Although the ILSes should be set up so that it is user friendly at the local level where the information is being supplied, there are minimum fields that are important so that events, near events, and good catches can be compared whether that be at the local, national or international level.

In Session 3, **"Efforts to Prevent Errors"**, the group discussed how the safety culture concept can and should relate to event reporting and the use of ILS. Several presenters gave examples of how safety culture relates to radiation safety and to medicine in general. There was discussion on gaps in training and for outreach in error prevention. The concept of getting "buy in" at all levels including the regulatory level is important.

The final session, **"Impact of Incident Learning Systems on Strengthening Safety Culture"**, was a wrap up for the meeting. The importance of strong leadership including having a "physician champion" was discussed. In addition, the role of professional organizations in promoting the use of ILSes and in providing ways for each level of participant in radiotherapy to promote safety culture was discussed. The group finished with reviewing potential activities for collaboration and suggestions for strengthening safety culture.

We'll be participating in a similar special interest session so mark your calendar for the 50th anniversary meeting of the CRCPD May 21-24, 2018 in Charleston, South Carolina, a wonderful venue with a history worth discovering. AAPM will also be providing training on **Shielding-Up Close and Personal** with the assistance of **Ken Vanek, PhD** and **Russ Ritenour, PhD** at the Medical University of South Carolina. To celebrate the special relationship between AAPM and CRCPD, in addition to presentations by **AAPM President Bruce Thomadsen** and **GRAC Chair Bette Blankenship**, AAPM is also providing a session on **Medical Physics: Past, Present and Future**. Meeting details can be located at www.crcpd.org.

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ANNUAL MEETING SUBCOMMITTEE REPORT

Robin Stern, PhD | Sacramento, CA

AAPM Newsletter — Volume 43 No. 3 — May | June 2018

With a record number of abstracts submitted this year to the 2018 Annual Meeting, we're going to have a great program of proffered talks, ePosters, and regular posters to complement our exciting program of invited talks. I want to thank everyone who submitted an abstract, and give a special thanks to all the volunteers who gave their time to review those abstracts. The Annual Meeting works because of these efforts by our members.

To all of you who have commented over the past several years about the size of the printed program, we heard you. This year, in order to save both trees and backs, we will not physically print the abstracts for any of the presentations. The meeting program itself will be printed as always in the June issue of *Medical Physics*, and a copy will also be provided to you upon registration in Nashville. All abstracts will be available electronically through the *Medical Physics* website, the meeting website, and the Annual Meeting mobile app. Please let us know what you think about this change.

The Meeting Program goes live on May 8. Be sure to check it out! Remember that this year we are implementing assigning one category and up to three keywords to each presentation to help you navigate through the program and find those talks that are of special interest to you. No more missing out on a talk because you weren't aware of it.

Looking forward to seeing you in Nashville!

AMERICAN ASSOCIATION of PHYSICISTS IN MEDICINE

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ABR NEWS

J. Anthony Seibert, PhD, ABR Board of Governors
Jerry Allison, PhD, Kalpana M. Kanal, PhD, and Matthew B. Podgorsak, PhD, ABR Trustees

AAPM Newsletter — Volume 43 No. 3 — May | June 2018

THE ABR ORAL EXAM

Introduction

After 40 years of administering the medical physics oral exam in Louisville, Kentucky, the ABR plans to move the exam to Tucson, Arizona, in 2019. (The 2018 oral exam will remain in Louisville.) This transition provides a good opportunity to review the nature and purpose of the oral exam.

Also called Part 3, the oral exam is the final one in a sequence of three exams that together form the basis for ABR certification in medical physics. Material on the oral exam is based on the knowledge and skills that a competent medical physicist should have upon completion of a medical physics residency. This material is essentially the same as that on the Part 2 computer-based exam, but with a stronger emphasis on clinical medical physics, clinical judgment, and communication. Successful completion of Parts 2 and 3 demonstrates the level of achievement necessary for a medical physicist to practice independently. The content guide for the oral exam is available on the ABR website.

THE STRUCTURE OF THE EXAM

The questions on the oral exam are in five categories, given by five examiners in five 30-minute sessions. Each examiner asks one question from each category, and the order is varied to ensure equal coverage of each category. This schedule is shown in the table below.

Examiners	Question Order				
Examiner 1	Q1	Q2	Q3	Q4	Q5

Examiners	Question Order				
Examiner 2	Q2	Q3	Q4	Q5	Q1
Examiner 3	Q3	Q4	Q5	Q1	Q2
Examiner 4	Q4	Q5	Q1	Q2	Q3
Examiner 5	Q5	Q1	Q2	Q3	Q4

All ABR exam scoring is criterion referenced, meaning that a passing standard is established in advance of the exam. The exam is not graded on a curve, and there is no set percentage of failures.

ENSURING FAIRNESS

One of the concerns candidates have about an oral exam is the possibility of subjective grading. Another concern is expressed as, "What if I don't hit it off with an examiner?" We will address both concerns below.

The first step in producing a fair exam is to establish an equitable and relevant method for developing each question. A committee of volunteer medical physicists who have recognized expertise in one of the three medical physics specialties develops the questions. These committees also critically analyze the questions to ensure they are clear, unambiguous, and do not have a regional bias. Committee members develop answers to guide the examiners, suggest follow-up questions, and select the questions for each Part 3 exam. A content grid for each of the three medical physics specialties ensures each exam is properly balanced. For diagnostic medical physics, the content grid also establishes the correct balance of MRI and ultrasound for each Part 3 exam.

When the examiners gather before the exam, all who will ask each question meet to discuss the it, including any nuances of which they should be aware. After a question is given as part of an exam, we analyze how it performed by asking, "What is the average score for each question?" We also analyze the discrimination, a statistic that compares the performance of the top scorers with the performance of the bottom scorers for each question. Clearly, we expect the better overall performers to receive higher scores on each question.

Examiners also receive extensive training before the administration of the exam. Topics include:

- putting candidates at ease,
- supporting candidates who are struggling with a question,
- scoring questions,
- managing time during the exam administration, and
- many others.

New examiners are given extra training and must observe experienced examiners before they are allowed to examine.

To ensure fairness, we randomly assign candidates to the available time slots; thus, first-time takers and returning candidates are grouped together. The only information the examiners and panels have about a candidate is his or her name. We also take specific actions to ensure there is no significant personal or professional relationship between an examiner and a candidate.

Several times during the exam, the ABR trustees and governor conduct a formal observation of each examiner to be sure they are examining as we expect. Finally, to reduce examiner fatigue, no examiner sees more than three candidates in a row.

The examiners are grouped in panels of five. Following each exam session, the panel meets to review the session and discuss each candidate's performance. Because each examiner asks one question from each category, the effect of any one examiner on performance results in any one category is minimized.

STATISTICS

The ABR keeps statistics for each question, as well as statistics for each examiner. We track the average score each examiner assigns to candidates and the percentage of high scores and low scores. We also keep statistics for each panel, which demonstrate that the histogram of panel performance is quite narrow. The variation in performance from panel to panel is very small.

As mentioned by **Dr. Kanal** in the last newsletter, there is no statistical difference between the exam results of female and male candidates. The scores from recent years are shown below:

First-Time Takers				
Exam Dates	Average Percentage Conditioning	Average Percentage Failing	Average Percentage Passing	Average Total Examinees
2014-2016	13%	20%	67%	230

A failure in one of the five categories on the Part 3 oral exam results in "conditioning" the exam, and the candidate must retake the failed category.

We are always happy to receive comments about the exam. If you wish to provide comments or have questions, we encourage you to contact us at any time.

AMERICAN ASSOCIATION of PHYSICISTS IN MEDICINE

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IROC REPORT

David Followill, PhD | Houston, TX

AAPM Newsletter — Volume 43 No. 3 — May | June 2018

IMAGING AND RADIATION ONCOLOGY CORE HOUSTON'S (IROC-H) COLLABORATION WITH THE INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA) TO IMPROVE SMALL FIELD DOSIMETRY

The IROC-H QA Center is funded to provide radiation oncology core support and quality audit programs for the National Cancer Institute's (NCI's) clinical trials. These programs include an independent peer review of dosimetry practices at participating institutions. Since 2007, IROC-H has been making small field dosimetry measurements (down to a field size of 2 x 2 cm^2) to verify each institution's ability to measure and model small field output factors in their treatment planning systems (TPS) during onsite visits. These measurements were compiled to generate a standard data set which was published back in 2012.[1,2] The standard data values allow an institution to perform treatment planning system (TPS) calculations under the same conditions the standard data measurements were made and then perform their own comparison as a redundant verification of their TPS's commissioning for small field dosimetry. The 2012 publication provides guidance for parameters to examine to improve TPS and measurement agreement for Pinnacle, and also refers the reader to an additional publication that gives guidance for Eclipse users.[3] Such efforts are important for physicists to undertake because even for such relatively large fields such as 2 x 2 or 3 x 3 cm^2, errors are very common: 59% of institutions assessed by IROC-H has at least one output factor that disagreed by 3% or more with their TPS calculated value.[4]

The IAEA has also conducted many Coordinated Research Projects (CRPs) that have identified remote QA audit tools that Low and Middle Income Countries (LMIC) can use to perform peer reviews of their radiation therapy institutions. These projects range from simple output checks under reference conditions to more complex capabilities such as MLC performance, heterogeneity correction verifications and small field dosimetry. One of these developed IAEA audits is the use of IROC-H's standard small field dosimetry data. The multinational results of this specific audit have been accepted

for publication[5] and show the need for identifying and assistance with correcting small field dosimetry discrepancies. On a national level, the IAEA's audit revealed that many of the small field output factors analyzed were outside of a generous 3% criterion.

The Medical Physics community worldwide has realized that what we were doing in the past for small field dosimetry measurements was often wrong, even for relatively large 2 x 2 cm^2 fields. For even smaller fields the challenges are often greater; ion chambers are too big and need volume averaging corrections, and even very small detectors such as diodes required specific output correction factors that can be substantial. Through many publications, presentations and most recently the *IAEA/AAPM Technical Report Series No. 483 "Dosimetry of Small Static Fields Used in External Beam Radiotherapy", an international Code of Practice for Reference and Relative Dose Determination*[6], medical physicists are making and implementing the required small field dosimetry corrections. As seen in Figure 1, there seems to be a shift in of IROC-H's remote single small field output audit results that occurred towards the end of 2013 after the implementation of new published correction factors. IROC-H encourages all medical physicists to read the IAEA/AAPM report 483 and make the appropriate changes to their small field dosimetry practice.

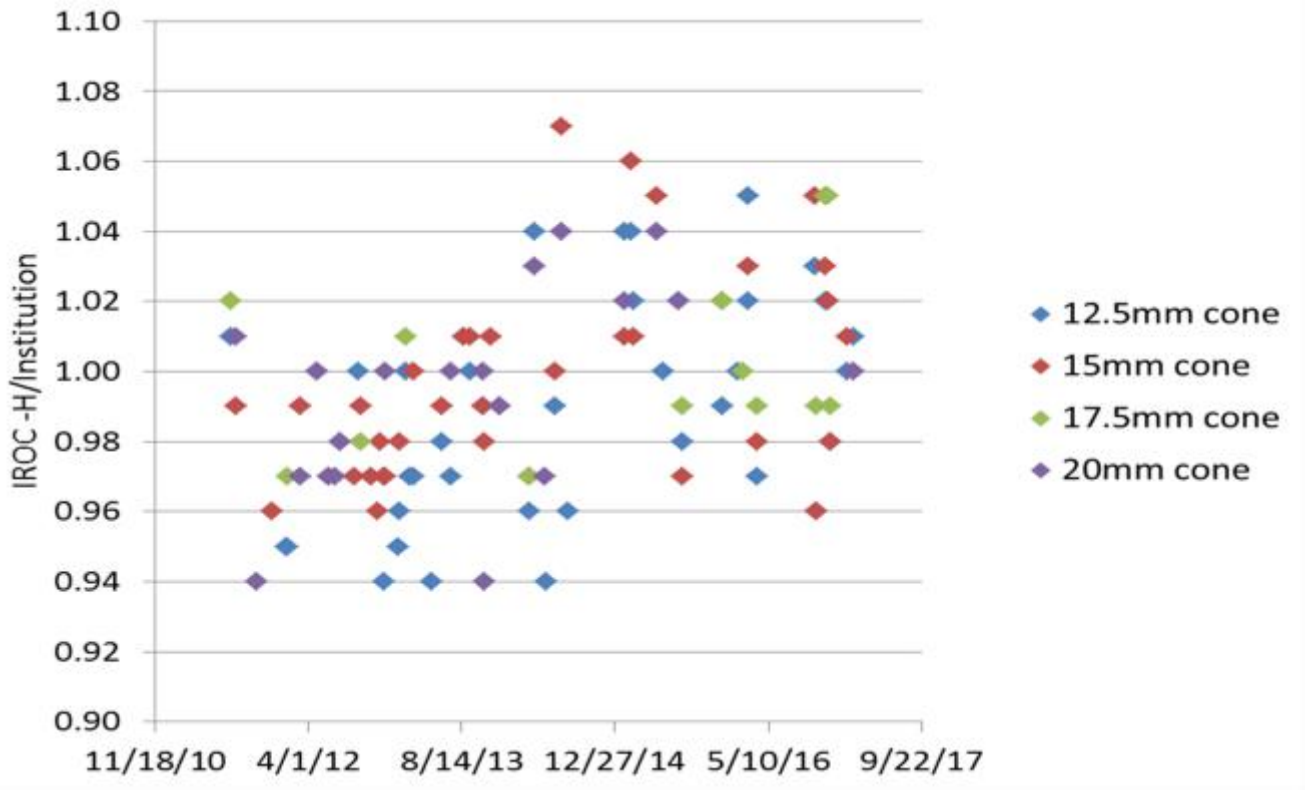

Figure 1. IROC-H single small filed remote audit results from 2010 to 2017.

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AMERICAN ASSOCIATION of PHYSICISTS IN MEDICINE

Improving Health Through Medical Physics

LEGISLATIVE & REGULATORY AFFAIRS REPORT

Richard Martin, JD | Alexandria, VA

AAPM Newsletter — Volume 43 No. 3 — May | June 2018

On March 1, 2018, **Richard Martin** (AAPM) and **Matt Reiter** (Capitol Associates) represented AAPM at the quarterly meeting of the Source Security Working Group (SSWG). The SSWG is a coalition of stakeholder organizations to advocate for access to radiological sources in civilian applications. The SSWG includes organizations from the medical field (AAPM, ASTRO, Elekta) and other industries including source suppliers and producers.

The group hosted several important government officials. We met with staff from the Senate Energy and Natural Resources Committee to discuss the CS-137 legislative proposal introduced by **Rep. Jeff Fortenberry** (R-NB-01) that would direct the National Nuclear Security Administration (NNSA) to develop a voluntary program for owners of CS-137 blood irradiators to replace these devices with blood irradiators that do not use CS-137. Under this program, NNSA would reimburse these owners for 50 percent of the replacement cost and 100 percent of the disposal cost. The ultimate goal of this program will be to replace all CS-137 irradiators with those using alternative technologies by 2025. We will be closely monitoring this legislation.

In addition, we met with the Government Accountability Office (GAO) to discuss their upcoming report on 10 CFR Part 37 implementation. We also met with the National Nuclear Security Administration (NNSA) to discuss their Cesium Irradiator Replacement Project (CIRP). Finally, the group met with the Department of Homeland Security (DHS) to discuss the forthcoming Alternative Technologies White Paper. During this meeting, AAPM offered the expertise of our members to serve as subject matter experts for this paper. We expect the full paper to be published in final form next year.

If you have any questions or would like additional information on this issue, please contact Richard Martin, JD, AAPM Government Relations Program Manager.

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EDUCATION COUNCIL REPORT

Jim Dobbins, PhD | Durham, NC

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The Education Council recently held its annual retreat, and I am pleased to offer this brief summary of items looking back over the past year and ahead to high priority items for our efforts in the coming year.

We reviewed the key challenges and opportunities for each of our major committees and subcommittees, and I will mention just a few items of note for each group. The Public Education Committee is developing a website and "ask the expert" tool to facilitate public education and highlight the role that medical physicists play as experts in medical use of radiation. They also received this year a grant from the American Institute of Physics to partially underwrite the cost of developing these web materials. The Medical Physics Education of Allied Health Professionals Committee is currently working with 7-8 outside organizations, and providing expert opinion to such allied organizations in drafting materials for their own constituencies. The Committee on Medical Physicists as Educators has planned a summer workshop to be held on July 26-27, just prior to the Annual Meeting, to revisit important contemporary approaches to education. The Medical Physics Education of Physicians Committee is working to encourage the involvement of medical physicists in residency training curricula in cardiology and interventional radiology. The Continuing Professional Development Committee is working on a business plan for improved utilization of our available online educational resources and is looking at ways to enhance the role of the MOC subcommittee beyond approving SAM questions. The Education and Training of Medical Physicists Committee is looking at standardizing characteristics of DMP programs and is working on means to provide additional support for establishment of diagnostic physics residency programs. The International Educational Activities Committee is working on prioritizing international education efforts and coordinating education and training with other organizations and societies. The Subcommittee on the Oversight of MedPhys Match is working on identifying ways in which MedPhys Match and the common residency application process (MP-RAP) can be better integrated. In short, our many committees and subcommittees have accomplished a lot this past year and have identified important work for the year ahead.

We also continued our efforts at three of our major themes:

1. collecting data to assess the number of graduates and residents completing CAMPEP accredited programs relative to the perceived workforce demand,
2. determining how many additional residency slots are required, and
3. working on ways to address the educational implications of medical physics of the future.

We also discussed several specific items, including a concern raised at the spring 2017 Board of Directors meeting regarding a perception that some graduates of CAMPEP accredited graduate programs lack adequate preparation when applying to residency programs. Data were collected to explore this perception and a report was prepared for the board; a large majority (81%) of residency program directors reported that the preparation of graduate students for residencies was either good or had modest variability among programs. We also discussed means to increase the number of diagnostic residencies, the training of students for non-clinical careers, and opportunities for inclusion of basic review course material in our continuing education offerings.

In summary, the retreat reminded us of the considerable work done by many in AAPM to support high standards of education and training across many types of learners. I am particularly grateful to the chairs and vice-chairs of our many committees and subcommittees who put in considerable effort to advance education in medical physics. We would welcome any thoughts or suggestions you would have to help us further enhance our value to AAPM and its members.

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Our Condolences

Harvey V. Culbert • ***Jarod C. Finlay*** • ***Peter Dunscombe*** • ***Weimin Chen***

Our deepest sympathies go out to their families. We will all feel the loss in the Medical Physics community.

If you have information on the passing of members, please inform HQ ASAP so that these members can be remembered appropriately.

We respectfully request the notification via e-mail to: 2018.aapm@aapm.org

Please include supporting information so that we can take appropriate steps.