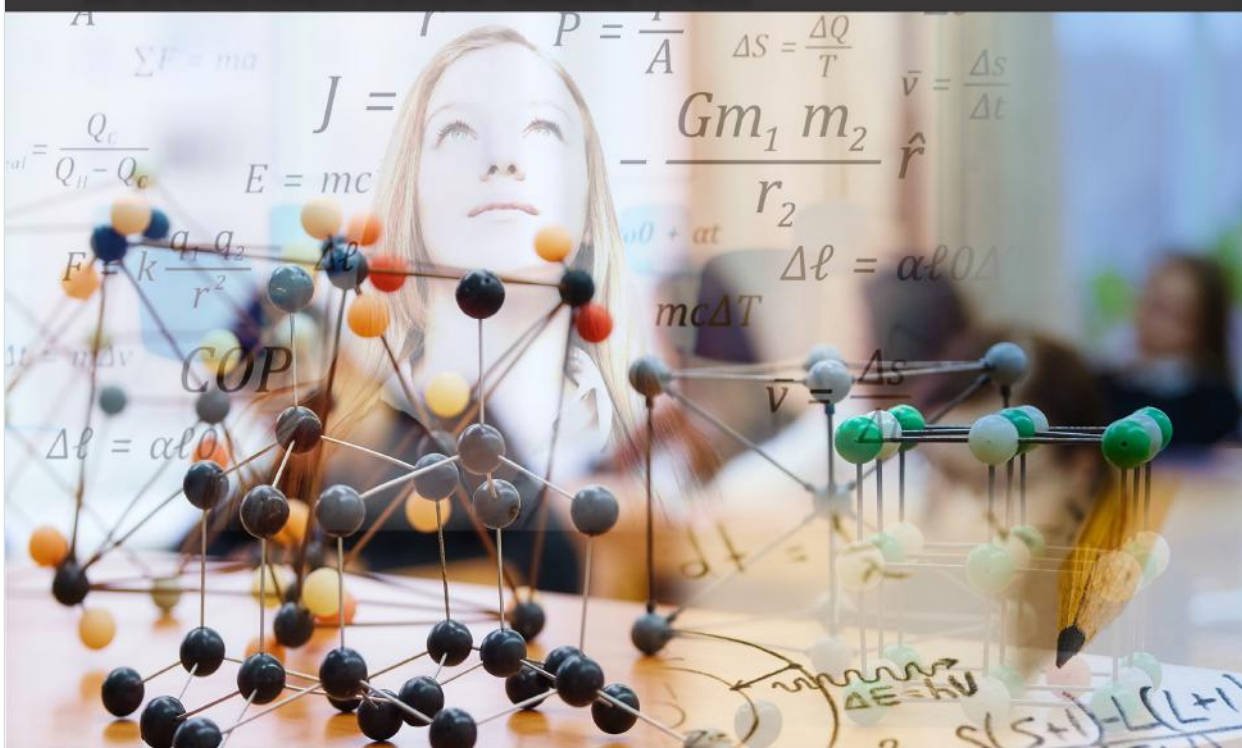


AAPM NEWSLETTER

IMPROVING HEALTH THROUGH MEDICAL PHYSICS



**Special Interest Group Report:
ABR EXAMS [How to Apply and Take Parts 1 & 2]**

IN THIS ISSUE:

- ▶ President's Report
- ▶ Education Council's Report
- ▶ Website Editor's Report
- ▶ Meetings Coordination Committee's Report
- ▶ SEAAPM Chapter Meeting Overview
- ▶ US Nuclear Regulatory Commission's Report
- ▶ IHE-RO Connectathon
- ▶ AMSC Report
- ▶ American Board of Magnetic Resonance Safety (ABMRS) and more...

Special Interest Group Report

ABR Exams

- ▶ [How to Prepare to Apply for and Take Board Exams - NPSC / PMWG \(4401_24.php\)](#)

Articles In This Issue

- ▶ [President's Report - Cynthia McCollough \(4401_1.php\)](#)
- ▶ [Executive Director's Report - Angela R. Keyser \(4401_2.php\)](#)
- ▶ [Treasurer's Report - Mahadevappa Mahesh \(4401_3.php\)](#)
- ▶ [Education Council's Report - Joann Prisciandaro & Nesrin Dogan \(4401_4.php\)](#)
- ▶ [Legislative & Regulatory Affairs Report - Richard Martin & Matt Reiter \(4401_5.php\)](#)
- ▶ [Website Editor's Report - George Kagadis \(4401_6.php\)](#)
- ▶ [ABR News - ABR Trustees \(4401_7.php\)](#)
- ▶ [ACR FAQs - Dustin Gress \(4401_9.php\)](#)
- ▶ [Health Policy & Economic Issues - Wendy Smith Fuss \(4401_10.php\)](#)
- ▶ [Imaging Practice Accreditation Subcommittee's Report - Tyler Fisher \(4401_11.php\)](#)
- ▶ [Meetings Coordination Committee's Report - Christopher Serago \(4401_12.php\)](#)
- ▶ [SEAAPM Chapter Meeting Overview - Ehsan Samei \(4401_13.php\)](#)
- ▶ [US Nuclear Regulatory Commission \(NRC\) - Sarah Lopas \(4401_14.php\)](#)
- ▶ [AAPM - ISEP/IOMP Therapy Course - Joanna E. Cygler, Božidar Casar & Robert Jeraj \(4401_15.php\)](#)
- ▶ [UI/AAPM-ISEP/ACOMP Imaging Physics Course 2018 - Cheng Shaw & Supriyanto Pawiro \(4401_16.php\)](#)

Articles In This Issue

- ▶ IROC Report - Paige A (Summers) Taylor (4401_17.php)
- ▶ Medical Dosimetry Certification Board (MDCB) Update - Jennifer Smilowitz and Minsong Cao (4401_18.php)
- ▶ IHE-RO Connectathon - Bruce Curran & Walter Bosch (4401_20.php)
- ▶ Annual Meeting Subcommittee's Report - Ingrid Reiser (4401_21.php)
- ▶ Person In the News : Heidi Edmonson (4401_23.php)

Announcements in This Issue

- | | |
|--|--|
| ▶ AAPM Funding Opportunities | ▶ AAPM ESTRO Membership |
| ▶ 2019 AAPM Spring Clinical Meeting | ▶ Career Services |
| ▶ 2019 AAPM Summer School | ▶ 2019 Annual Meeting & Exhibition |
| ▶ SAFRON Update | ▶ 2019 Special Elections |
| ▶ 2019 DREAM Program | ▶ Virtual Library & Online Learning Center |
| ▶ 2019 AAPM BEST Award | ▶ Focus on our Future |
| ▶ Journal App | ▶ RSNA - AAPM Graduate Fellowship |
| ▶ ICONRADEM - 2019 (Download Only)
(/newsletter/docs/ICONRADEM-2019.pdf) | ▶ Summer Undergraduate Fellowship Program |
| ▶ FUTURE AAPM ENDORSED, CO-SPONSORED & SPONSORED MEETINGS
(https://www.aapm.org/meetings/default.asp) | ▶ 2019 SEAAPM Symposium |
| ▶ Our Condolences (4401_8.php#Condolences) | |

AAPM PRESIDENT'S REPORT

Cynthia McCollough, PhD | Rochester, MN

AAPM Newsletter — Volume 44 No.1 — January | February 2019

Before I comment on the topic of the article, I want to say thank you to some very special AAPM members and staff.

Melissa Martin has completed three years of extraordinary service to AAPM as part of the presidential chain, completing her term as Chair of the Board at the end of 2018. In addition to running a successful consulting business, Melissa has made volunteering a major focus of her professional career. Her many contributions to medical physics have been widely recognized. In addition to being a Fellow of the ACMP, AAPM and (as of 2018) the IOMP, Melissa received the Marvin M.D. Williams Professional Achievement Award in 2009 and the Edith H. Quimby Lifetime Achievement Award in 2015. As a past liaison to the CRCPD, IOMP, ACR, RSNA, ARRT and AHRA, Melissa has built relationships with physicians, administrators, technologists, and regulators that have advanced the field of medical physics and enhanced the standing of AAPM. Thank you, Melissa, for your commitment to our field and to serving our community!

Another officer that I would like to acknowledge is **Bruce Thomadsen**, who served AAPM tirelessly in 2018 as its president. Throughout his presidential year, Bruce made it a priority to listen and respond to membership, initiating action on many of the topics raised in the 2016 member survey. In general, the survey showed that members are pleased with AAPM and value membership and the many associated benefits. That doesn't mean, however, that we didn't get feedback. Bruce read each and every comment in the 180-page report, led discussions as to what strategy might be taken to address the various concerns, and then followed up with the appropriate committee or group to initiate action to respond in a positive way to the feedback received. Thank you Bruce for your servant leadership. Thanks also for your help in "learning the ropes" this past year.

Finally, two of our leaders at AAPM Headquarters reached major milestone anniversaries this year. Both our Executive Director, **Angela Keyser**, and our Director of Meetings and Programs, **Lisa Rose Sullivan**, celebrated 25 years with AAPM! As an officer, I work very closely with our Headquarters' staff, who are a highly motivated, talented, and resourceful group of individuals, most of whom have been with AAPM for the majority of their careers. The low turn-over rate, positive environment, and can-do attitude at Headquarters are a testament to Angela's leadership skills. We have a great team

at Headquarters who work on our behalf daily (and often nights and weekends too). The next time you see someone from Headquarters, please stop and introduce yourself, and thank them for their service. Everyone likes to be appreciated, and we definitely want to retain this terrific team.

Now let me turn to the topic of diversity. One of the recently approved strategic goals (<https://w3.aapm.org/org/objectives.php>) for AAPM focuses on diversity. Specifically, our goal is to ***Champion equity, diversity, and inclusion (EDI) in the field of medical physics***. The first objective under this goal is to *Evaluate EDI in AAPM organizational structure and activities*. As this objective implies, we need to know where we are currently in terms of diversity within our membership, our volunteers, and our leadership. Without knowing our baseline status, we can't assess what needs exist or monitor if any implemented strategies are having a positive impact.

Diversity covers many characteristics, including (but not limited to): age, race and ethnicity, gender and sexual orientation, political and religious beliefs, physical abilities, socioeconomic and geographic status, and education level. To embrace diversity is to welcome a heterogeneous mix across these (and perhaps other) characteristics. Again, to assess how we are doing on this matter as an organization, we need some method of quantifying these characteristics amongst our members. We do better at this for some characteristics than in others.

For example, of our 8985 members, 8910 chose to disclose their gender. Of these, we have 2066 females (23% of our membership). This percentage has steadily increased over time, climbing from 9%, for members over age 65, to 45%, in members age 26-35! This is a phenomenal achievement, showing that for those entering our field, we have essentially attained a balance in terms of gender. (I'd also like to note that in 2018, four of the six members of EXCOM were women!)

We do not, however, currently ask members about sexual orientation or provide gender identity choices other than male and female, although in our recent survey on diagnostic medical physics services, we received help from the Diversity Committee to determine what expanded classifications to use for that survey. Should we change our membership database to include this expanded list of options (male, female, trans male or trans man, trans female or trans woman, nonbinary or gender nonconforming, different identity than listed)? If yes, is this information that members are comfortable disclosing to a professional society? Similarly, do members believe that AAPM should ask about political and religious beliefs?

Interestingly, date of birth (i.e., age) does not seem to be a sensitive data element, as with the exception of staff and honorary members, nearly 99% of our members have disclosed this information to AAPM. Similarly, very few members chose not to disclose their ethnicity (Hispanic vs. non-Hispanic) or race (white, black or African American, American Indian, Asian Indian, Chinese, etc.).

As we increase our efforts toward creating an equitable, diverse and inclusive organization, it is likely that a greater amount of personal information may be requested of membership. Leadership would like to hear your thoughts on this topic. **Julianne Pollard-Larkin** is the chair of our Diversity and Inclusion Subcommittee and **Laura Cervino** is the chair of our Women's Professional Subcommittee. I encourage you to contact them, or me, to share your thoughts on how we can best measure the diversity of our membership, without being too intrusive.

Thank you for taking the time to check out the newsletter this month. As always, if you have other thoughts, suggestions or insights to share, please feel free to contact any member of leadership or Headquarters staff.

Wishing everyone a happy, healthy and productive New Year.

-- Cynthia



([//w3.aapm.org/newsletter/index.php](http://w3.aapm.org/newsletter/index.php))

Improving Health Through Medical Physics

EXECUTIVE DIRECTOR'S REPORT

Angela R. Keyser | Alexandria, VA

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

Medical Physics App Now Available

AAPM now offers access to *Medical Physics* Journal via iOS

(<https://itunes.apple.com/us/app/american-association-of-physicists-in-medicine/id1238691934#?platform=iphone>) and Android (<https://play.google.com/store/apps/details?id=com.wiley.jas.aapm>) apps.

- Readable, print-like experience enhanced with dynamic figures, tables, and references
- Rapid access to breaking research: Early View articles updated as they publish
- Adjustable text and table sizing with "pinch and zoom"
- Download articles and issues for offline perusal
- Save your favorite articles for quick and easy access
- Convenient alerts when new issues are available

Your Online Member Profile

This is a reminder to keep your AAPM Membership Profile information up to date by going here (<http://www.aapm.org/memb/profile/>) and making 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 AAPM Conflict of Interest Policy (<http://www.aapm.org/org/policies/details.asp?id=373&type=PP>).

New AAPM Publications

Two new AAPM publications are available online:

- Considerations for the Use of Handheld Image Viewers: The Report of AAPM Task Group 260 (<https://www.aapm.org/pubs/reports/detail.asp?docid=178>)
- MPPG 10: Scope of Practice for Clinical Medical Physics published in JACMP (<https://aapm.onlinelibrary.wiley.com/doi/full/10.1002/acm2.12469>)

AAPM HQ – Great Location for Group Meetings

I am writing this article on December 7, the third anniversary of the move to AAPM HQ offices in Alexandria, Virginia. One of the many benefits to AAPM of the HQ building is the ability to host meetings in-house, avoiding hotel pricing for technology and catering services. The HQ meeting space offers the latest in technology, including a dedicated wireless network for in-house meetings with speeds of 150 Mbps down/30 Mbps up.

- The Large Conference Room has four 90" screens driven by a Crestron system that allows you to connect to one or more screens by HDMI, VGA, or AirMedia Wireless connection. There is also an Apple computer with wireless keyboard and trackpad. The room is equipped with ceiling-mounted speakers and mics and can be used to either make a conference call, or with the in-room computer via services like GotoMeeting. There is a printer just outside the Large Conference Room accessible from AAPM Guest network.
- The Executive Conference Room has one 80" screen driven by a Crestron system that allows you to connect via HDMI, VGA or AirMedia Wireless connection. The room also has an Apple computer with wireless keyboard and trackpad. The room is equipped with ceiling mounted speakers
- There is a wireless only 60" screen located in AAPM Café and several 60" screen monitors located in various teaming rooms throughout the space that can allow you to connect via HDMI, or VGA as well.
- All of the screens at AAPM feature AirMedia Wireless connections that allow you to connect your computer to display wirelessly.

Numerous successful meetings have been held each year, with quite a number already planned for 2019, including:

January 10 – 12	Education Council Retreat
January 12 – 13	Administrative Council Retreat
January 25 – 26	Professional Council Retreat
February 27 – March 1	Science Council Retreat
March 14 – 15	CAMPEP Board Retreat
March 21	Data Science Roundtable
April 7 – 9	Imaging Physics Committee Retreat

APSIT Benefits for AAPM Members

AAPM members are offered a range of insurance products through APSIT (<http://apsitinsurance.com/>) – The American Physical Society Insurance Trust because of AAPM's affiliation with the American Institute of Physics (AIP). APSIT was founded in 1969 to provide members with a convenient source for quality, affordable insurance. Since that time, APSIT has expanded to include a broad range of insurance options that meet the needs of our sponsoring organizations' members.

Plan premiums are regularly more affordable than what's available through competitors, thanks to the power of group purchasing. Since AIP society members usually have higher education levels and tend to live more conservative lives, APSIT group rates are very competitive in the market. APSIT's governing board, charged with making decisions about which plans to provide, comprises representatives from participating member societies. I've been fortunate enough to serve on the APSIT board since 2009 and am currently Chair of the group.

Pearl Insurance is the Program Administrator for APSIT. With over 60 years of industry experience, Pearl Insurance has acted as a third-party program administrator for several national firms and associations. Pearl Insurance's team can be reached Monday through Friday, 7:00 AM – 7:00 PM CST, at **800-272-1637**.

Currently, members of any AIP society are eligible to purchase the following plans through APSIT:

- Group Term Life
- Group 10-Year Level Term Life
- Group Disability Income
- Group Accidental Death and Dismemberment
- Long-Term Care
- Discount RX Card

While it remains your decision as to whether any of these insurance products fit your own needs, I encourage everyone to take advantage of the plans that are right for you. Visit apsitinsurance.com (<http://apsitinsurance.com/>) for more information on each plan.

2019 Dues Renewal

2019 dues renewal notices were distributed in late October. You may pay your dues online or easily print out an invoice and mail in your payment. I am pleased to report that all 21 AAPM Chapters have elected to have HQ collect chapter dues. We hope that you will appreciate the convenience of paying your national and chapter dues with one transaction!

The AAPM Rules are very specific regarding the cancellation of membership if dues are not paid by the deadline and the fees required for reinstatement. As the administrative staff of AAPM, we must consistently enforce the rules of the organization. It would be very difficult to make exceptions for some members and enforce such fees on others. If you need any assistance or have any questions about the dues process, please contact Janelle Priestly (<mailto:janelle@aapm.org>), 571-298-1216.

Staff News

Join me in wishing **Aaron Rudd** and his bride, Renisha, many happy years as husband and wife. The couple wed on Saturday, October 20. Our very own **Robert McKoy** officiated the ceremony.

It is with great pride and pleasure that I announce that **Rachel Smioldo** has recently received the designation of "Certified in Exhibition Management" (CEM). The CEM is a globally recognized designation that demonstrates the highest professional standard throughout the exhibition and event management arena. It was first created in 1975 to raise professional standards in the event industry and it continues to be the premier mark of professional achievement. The designation is obtained by completion of nine courses and exams. Rachel joins an elite group of professionals! I'm sure you will join me in offering Rachel our most sincere congratulations!

Who does what on AAPM HQ Team? See a list with contact information and brief descriptions of responsibilities online (<https://www.aapm.org/org/contactinfo.asp>). An Organization Chart (<https://www.aapm.org/intranet/board/documents/orgchart.pdf>) is also provided.



(//w3.aapm.org/newsletter/index.php)

Improving Health Through Medical Physics

TREASURER'S REPORT

Mahadevappa Mahesh, PhD | Baltimore, MD

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

Happy New Year to all of you. I like to start the new year with pleasant news about the AAPM finances. AAPM finances continue to be on solid grounds, still it is essential to watch our revenues and expenses along with the overall trends in the fixed expenses of our association. The current year has been quite active in terms of the implementation of both Financial Management System (FMS) and the Association Management System (AMS). We were able to roll out the two systems on time, despite some challenges, thanks to our dedicated staff, who spent a considerable amount of time on this project. In spite of the enormity of the task, I am happy to report that the process of identifying, selecting and implementing the two systems (AMS and FMS) happened in record time. For this I would like to compliment and recognize the efforts of all of the AAPM staff.

Financial Position and Estimates for 2018

As of October, we anticipate that AAPM will finish the year with a modest surplus from operations. This is after factoring a reduced spending pattern within the councils and committees through the end of the year and overall historical spending in the last two months of the year. Even so, we will not know the final numbers for the next several weeks.

Compared to approved budgeted revenue of \$9.45 million and expenses of \$10.40 million, the revenue and expenses are estimated at \$9.63 million and \$10.52 million respectively. For the year, annual meeting expenses came in nearly \$150,000 below budget, contributing to a net favorable return to the association of nearly \$151,000. Additionally, membership dues for year exceeded the budget by a little over \$60,000. Offsetting these positive variances, certain costs associated with the Association Management System (AMS) and Financial Management System (FMS) conversions had to be immediately expensed according to Generally Accepted Accounting Principles (GAAP). It was anticipated during the budget process that these costs could be capitalized and written off over several years. It should be noted that the entire process is coming in below budgeted costs.

At present, AAPM's investment portfolio has experienced gains and losses during the course of the year. As of October 31, 2018, the reserve fund balance exceeds \$13.8M.

2019 Budget

I would once again like to thank the Council and Committee Chairs and their liaisons who worked extremely hard together in developing their budgets. The entire Finance Committee reviewed the 2019 budget with the Council Chairs and eventually approved the initial draft of the budget. After hearing appeals from the councils, the final budget was approved and submitted to the Board. The Board approved the 2019 budget during its meeting in Chicago at RSNA.

The 2019 budget summary is included with this report. Revenue projections total \$10.13 million and expenses total \$11.11 million, with a budgeted deficit of \$976,927. The statistical model predicted a deficit of \$946,670 which is based upon AAPM complying with the financial covenants established by TD Bank, the mortgage holder for the new HQ building. Given our normal under-spending patterns, the Finance Committee felt that the approved deficit would allow for AAPM to operate and still meet the bank covenants and operate at or near break-even from Operations.

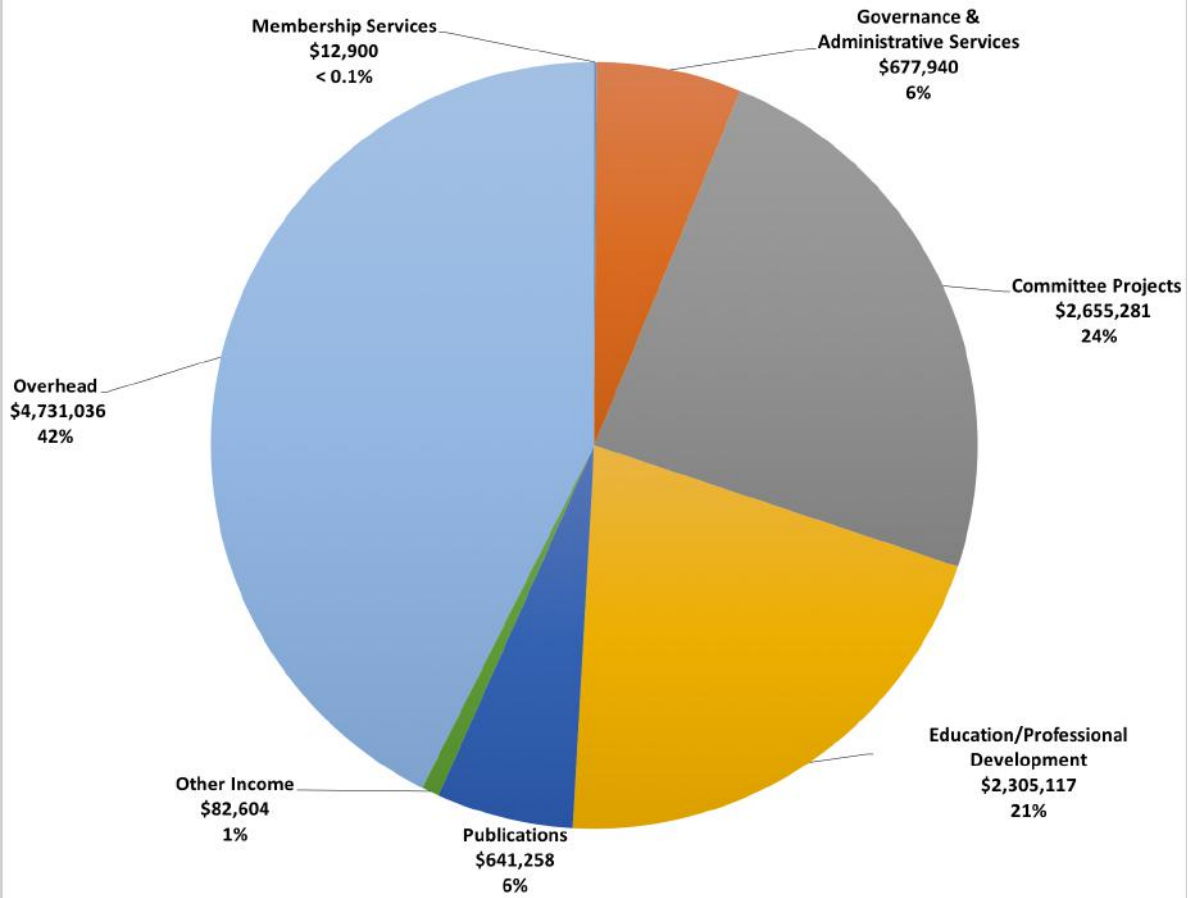
AAPM's Finance Committee, Strategic Planning Committee and the Board feel that this conservative budget allows for AAPM to achieve its strategic initiatives and yet meet its fiscal responsibilities to the bank at the same time.

Below you will find a graphical presentation of the 2019 budgeted revenues by category (including which programs are included in the various categories).

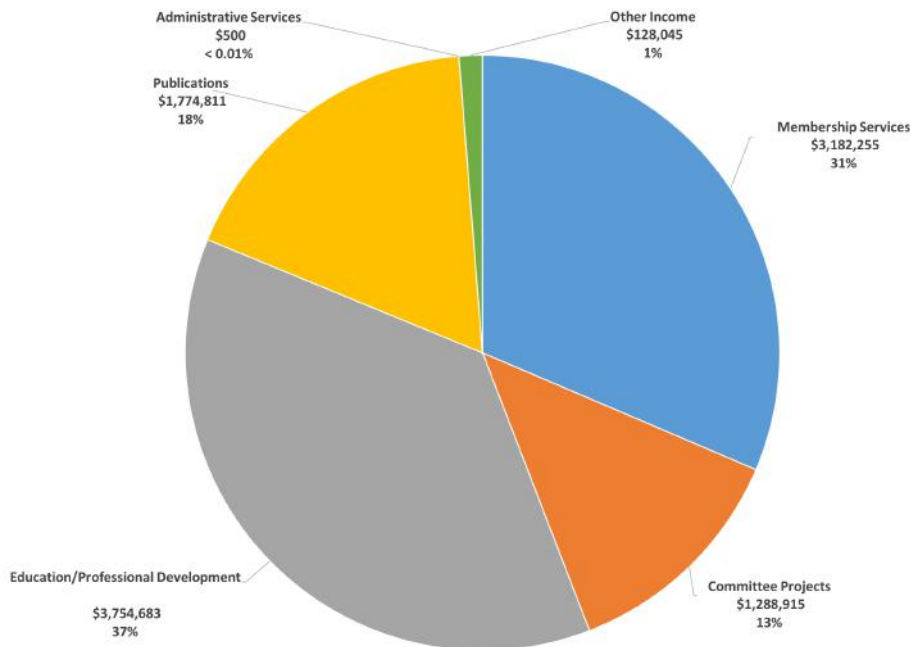
In closing, I would like to thank **Robert McKoy** and all the AAPM Finance staff for all their help during this past year, and in making the budgeting process and the job of Treasurer manageable. Please feel free to reach out to me via email me (<mailto:mmahesh@jhmi.edu>) or call me at 410-955-5115 or tweet me (<https://twitter.com/@mmahesh1>) if you have any questions concerning this report.

	A	B	C	D	E	F
1	2019 Final Budget Approved By Board					
2						
3						
4		Revenue	Expenses			Net
5	<i>Final Budget Approved by Board 11.28.18</i>		Direct	Overhead	Total	
6	Membership Dues					
7	Dues	3,161,055	12,900	83,711	96,611	3,064,444
8	Reinstatement Fees	6,200	0	0	0	6,200
9	Applications Fees	15,000	0	0	0	15,000
10	Subtotal	\$3,182,255	\$12,900	\$83,711	\$96,611	\$3,085,644
11	Membership Services					
12	Member Inquiries/Services	0	0	118,097	118,097	(118,097)
13	Membership Directory	0	0	1,772	1,772	(1,772)
14	AAPM Web Site	0	0	612,803	612,803	(612,803)
15	Subtotal	\$0	\$0	\$732,672	\$732,672	(\$732,672)
16						
17	Organizational					
18	Governance	0	253,465	182,007	435,472	(435,472)
19	Governance - Contingency	0	15,000	0	15,000	(15,000)
20	Subtotal	\$0	\$268,465	\$182,007	\$450,472	(\$450,472)
21						
22	Councils and Committees					
23	Administrative Council	45,000	727,547	381,683	1,109,230	(1,064,230)
24	Education Council	384,790	476,375	132,155	608,530	(223,740)
25	Professional Council	416,125	326,292	130,141	456,433	(40,308)
26	Science Council	443,000	1,055,672	201,276	1,256,948	(813,948)
27	Committees Reporting to the Board	0	67,945	115,418	183,363	(183,363)
28	Liaisons with other Organizations	0	1,450	0	1,450	(1,450)
29	Subtotal	\$1,288,915	\$2,655,281	\$960,673	\$3,615,954	(\$2,327,039)
30						
31	Education & Professional Development					
32	Annual Meeting	3,159,197	1,775,447	659,424	2,434,871	724,326
33	Summer School	291,785	206,194	49,818	256,012	35,773
34	Spring Clinical Meeting	297,701	205,676	75,714	281,390	16,311
35	RSNA	6,000	117,800	80,936	198,736	(192,736)
36	Specialty Meetings	0	0	0	0	0
37	Subtotal	\$3,754,683	\$2,305,117	\$865,892	\$3,171,009	\$583,674
38						
39	Publications					
40	Journals	1,774,811	641,258	60,542	701,800	1,073,011
41	Subtotal	\$1,774,811	\$641,258	\$60,542	\$701,800	\$1,073,011
42						
43	Administrative Services					
44	Administration/Prof Services/AIP	500	244,000	42,184	286,184	(285,684)
45	General Operations /Prince Street	0	165,475	1,736,274	1,901,749	(1,901,749)
46	Subtotal	\$500	\$409,475	\$1,778,458	\$2,187,933	(\$2,187,433)
47						
48	Other Income & Expense					
49	AAPM Mailing Lists	11,400		23,390	23,390	(11,990)
50	Membership Certificates	100	0	0	0	100
51	Investment Earnings & Fees	5,000	0	0	0	5,000
52	CAMPEP	100,500	0	39,325	39,325	61,175
53	RSEA	0	0	0	0	0
54	Services to other organizations (COMP, SDAMPP, etc.)	11,045	0	4,366	4,366	6,679
55	Contributions and Donations	0	8,000	0	8,000	(8,000)
56	Dues and other payments/AIP	0	74,604	0	74,604	(74,604)
57	Miscellaneous	0	0	0	0	0
58	Subtotal	\$128,045	\$82,604	\$67,081	\$149,685	(\$21,640)
59						
60						
61	TOTAL FROM OPERATIONS	\$10,129,209	\$6,375,100	\$4,731,036	\$11,106,136	(\$976,927)
62						
63						
64	AAPM Education & Research Fund	225,700	290,325	2,722	293,047	(67,347)
65	Investment Income	145,000	43,000	0	43,000	102,000
66						
67						
68	Grand Total	\$10,499,909	\$6,708,425	\$4,733,758	\$11,442,183	(\$942,274)
69				2019 Model to Break-Even		(\$945,065)
70				2019 Model Debt Service		(\$946,670)
71				2019 Debt Service Loss		(\$3,412)

2019 AAPM Budget Expenses (Overhead Unallocated)



2019 AAPM Budgeted Revenue



EDUCATION COUNCIL'S REPORT

Joann I. Prisciandaro, PhD | Ann Arbor, MI & Nesrin Dogan, PhD |
Miami, FL

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

Residency Program Interviewer Etiquette

A residency interview should be performed in a professional and respectful manner and adhere to proper interview etiquette. Unfortunately, reports of unethical behavior during resident interviews have surfaced. In 2017, Hendrickson et al. ^[1] published the results of a survey conducted by the University of Washington following the initial two years of the MedPhys match to assess the "application, interview, and post interview experience, match results, and overall satisfaction with the process ^[1]." All candidates and program directors that participated in the match were contacted via email, and approximately 30% and 57%, respectively, voluntarily responded. Based on the responses, candidates reported that at least once during their interview process they were asked about their marital or relationship status (40% in 2015 and 49% in 2016), whether they had or planned to have children (23% in 2015 and 28% in 2016), where else they were interviewing (69% in 2015 and 79% in 2016), and how highly they intended to rank a given program or which program they intended to rank first (13% in 2015 and 20% in 2016) ^[1]. Not only are these questions uncomfortable for candidates, but they are also inappropriate.

Interview questions should be focused specifically on determining whether a candidate's qualifications and personal characteristics align with a given position, and if the candidate will work well with the existing team. The U.S. Equal Employment Opportunity Commission (EEOC) prohibits employers from requesting information pertaining to an applicant's race, color, religion, gender/gender identity, childbearing status, sexual orientation, national origin, age, or disability ^[2]. Further, according to the National Matching Services (NMS) Inc. agreement, neither the program or applicant "may solicit the intention for ranking from the other party" or solicit "information regarding the positioning of any applicant or program on a Rank Order list ^[3]." Although NMS rules do not prohibit interviewers from asking an applicant about other programs to which they have applied or intend to apply, candidates have indicated they felt uncomfortable answering this question ^[1]. In 2017, the National Resident Matching Program (NRMP) did prohibit medical residency programs from asking this question ^[1, 4].

To ensure appropriate interview etiquette is followed, programs should:

- Avoid any questions that could be construed as discriminatory;
- Educate all faculty and staff participating in the interview process on appropriate conduct and questions that may be asked, explicitly instructing participants not to initiate topics prohibited by the EEOC; and
- Eliminate post interview communication to minimize the risk of divulging or soliciting rank intent information.

Additionally, programs should avoid:

- Making offers or requiring commitments from applicants;
- Asking applicants about their ranking intention;
- Informing the candidate about how they intend to rank them;
- Asking the applicant where else they are interviewing; and
- Offering incentives such as a future clinical or faculty position.

A sample code of conduct agreement that could be adopted by programs is available in Figure 10 of Hendrickson et al. ^[1]. Similar rules should be followed when interviewing students for graduate school.

Oftentimes inappropriate questions are asked unintentionally, possibly because the interviewer is unaware the question is illegal or the interviewer is attempting to initiate conversation with the applicants in a more social setting (e.g., over lunch or dinner) ^[1, 5]. If faced with such questions, the candidate may choose to ^[7, 8]:

- Politely answer the question;
- Politely answer the question by addressing its intent versus substance;
- Redirect the question to highlight their attributes, and what they can contribute to the position;
- Answer the question they wished they were asked; or
- Refuse to answer the question.

Practicing appropriate interview etiquette reflects respect and professionalism of both the individual conducting the interview and the program they are representing. As we enter the next MedPhys match cycle, let us strive to practice and model this behavior within each of our respective institutions, and ensure that an already stressful activity is a little less intimidating for our candidates.

References:

1. Hendrickson, K.R.G., T.Juang, A. Rodrigues, and J.W. Burmeister, "Ethical violations and discriminatory behavior in the MedPhys Match," J Appl Clin Med Phys 2017; 18(5): 336 – 350.
2. <https://www.eeoc.gov/laws/practices/index.cfm>, last accessed December 12, 2018.
3. <https://natmatch.com/medphys/rules.html>, last accessed December 12, 2018.
4. <http://www.nrmp.org/communication-code-of-conduct/>, last accessed December 12, 2018.
5. Antolak, J.A. and T.D. Solberg, "The dark side of the MedPhys Match," J Appl Clin Med Phys 2017; 18(5): 4 – 5.



([//w3.aapm.org/newsletter/index.php](http://w3.aapm.org/newsletter/index.php))

Improving Health Through Medical Physics

LEGISLATIVE & REGULATORY AFFAIR'S REPORT

Richard Martin, JD | Alexandria, VA & Matt Reiter, Capitol Associates, Inc. | Washington D.C.

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

Capitol Hill Prognosticator Contemplates Mid-Terms' Impact on Medical Physicists

Healthcare was the top issue in many House races, says **Matt Reiter**, AAPM's lobbyist consultant. Matt and I recently spoke about what the mid-terms might mean for medical physicists. Here are some of Matt's thoughts on what lies ahead in the new Congress.

Healthcare Prices

Many Democratic candidates found success by running on a platform of reducing healthcare costs and protecting the Affordable Care Act's (ACA) provisions for health insurance coverage of preexisting conditions. With the Democrats winning control of the House largely on this message, they will now be expected to deliver results to their constituents. Prescription drugs should be the main focus of efforts to reduce healthcare prices. President Trump has expressed a strong desire to address this issue meaning there is certainly plenty of opportunity for bipartisanship on prescription drug prices. It remains to be seen exactly what legislative solutions will be introduced.

High prices for prescription drugs administered by healthcare providers in an office setting (Part B Drugs) are also drawing scrutiny. Most of the efforts on this issue, however, are being driven by the Administration through rulemaking. Specifically, the Administration proposed to replace the current Part B drug reimbursement methodology with one that pegs the price Medicare pays to an international price index. It is important to note that oncology treatments and diagnostic imaging would be among the most impacted procedures affected by this policy according to a 2015 GAO Report (<https://www.gao.gov/assets/680/673304.pdf>) analyzing Part B drug prices. It is not clear if Democrats will unite to support this policy. The Obama Administration proposed its own revision

to the Part B drug policy but ultimately chose not to finalize its proposal due to industry opposition. However, Democrats often compare the prices we pay for drugs with the prices other countries pay which would make the Trump Administration's proposal appealing.

Funding for Low-Dose Radiation Research

Earlier this year, both Chambers of Congress passed H.R. 589, the Department of Energy Research and Innovation Act, and it was signed into law by President Trump. This bill included a provision that requires the Department of Energy (DOE) to restart its low-dose radiation research program. The bill, however, does not authorize a funding level for the program which means the House and Senate Appropriations Committees will decide how much funding to give the DOE for this program. AAPM was a strong supporter of this legislation and will continue to support efforts to fund the DOE's low-dose radiation research program for the next fiscal year.

Continued Bipartisan Support for Research Funding

Despite a highly partisan political environment, one issue that has consistently enjoyed bipartisan support is funding for medical research. Congress has consistently increased funding for the National Institutes of Health (NIH) including about \$2 billion in extra funding for the 2019 fiscal year. The National Cancer Institute (NCI) within NIH received a \$479.1 million increase for FY 2019, bringing its total budget to \$6.14 billion for the fiscal year. This funding will help support the NCI's National Cancer Moonshot Initiative, which funds new research, studies new innovations and improves research data sharing. The new Congress is primed for many political fights but NIH funding should continue to receive bipartisan support.

Source Security

Recent federal source security efforts have focused on reducing the use of CS-137 where alternative technologies are equally efficacious and available. We expect to see a continuance of certain programs that incentivize a shift to alternative technologies that replace traditional sources. These efforts have mainly targeted applications that use CS-137— specifically blood irradiator devices. An amendment to the 2018 National Defense Authorization Act (NDAA) directed the National Nuclear Security Administration (NNSA) to set a voluntary goal for eliminating the use of cesium chloride in blood irradiators by 2025. This is in addition to an existing voluntary program sponsored by the NNSA that subsidizes some of the cost for replacing CS-137 blood irradiators with devices that do not use CS-137.

Absent a security incident that prompts Congressional action, it is less likely that we see a successful legislative initiative to limit the use of source materials in medical or industrial applications. There has not been much of an appetite for such a measure in Congress outside of three Democratic senators who have little ability to meaningfully advance legislation without the support of Republican colleagues. Despite the House of Representatives switching to Democratic control, there has historically been bipartisan opposition in the House to past legislative attempts to drastically limit or eliminate the use of source material.

AAPM Government Relations will keep you updated as the new Congress progresses through the year. Please contact **Richard J. Martin**, JD, AAPM Government Relations Program Manager, at richard@aapm.org (mailto:richard@aapm.org) if you have any questions.

WEBSITE EDITOR'S REPORT

George C. Kagadis | Rion, Greece

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

This issue of the Newsletter is being published just after the RSNA 2018 Annual Meeting which took place November 25–30, 2018 in cold but architectural Chicago, IL (Figure 1). As in all previous RSNA years, AAPM has had a lot of sessions and meetings advancing our science, education, and professionalism, and I am sure that everyone that attended it has really enjoyed it.

The current report is dedicated to the communication technologies that AAPM has adopted and is serving to the membership. This is a summary of previous reports detailing the technologies we are using for the benefit of our society.

Our main line of communication with our membership is e-mail. During the past year, this came into jeopardy with our EU (European Union) members due to GDPR (General Data Protection Regulation). We took steps to ensure that we are in compliance with GDPR, our new AMS (Association Management Software) being a big help with that. We welcome you to check your e-Preferences (<https://www.aapm.org/memb/profile/mailcodes.asp?show=e-prefs>) periodically as we are always updating with additional campaigns so that you are able to be more granular about what e-mail communications you receive from AAPM.

Our webpage has changed a lot during the past few years, including our look, feel, and structure. The AAPM Information Services (IS) team and I have put a lot of effort into making the webpage cleaner and more easily accessible by our membership. Our IS personnel are working to streamline information as they work to convert to the new look and feel. The transition to the new website is an ongoing process and isn't over yet. You will continue to experience advances as time goes by.

Furthermore, with regard to our social media presence, we are available on Facebook (<https://www.facebook.com/AAPM.org>), Twitter (<https://twitter.com/aapmHQ>), Instagram (<https://www.instagram.com/aapmHQ/>), LinkedIn (<http://www.linkedin.com/groups?gid=2006026>), and Flickr (<http://www.flickr.com/photos/96369280@N00/sets/>). Facebook is an online social media and social networking service. Twitter is an online news and social networking service on which users post and interact with messages known as 'tweets.' Instagram is a photo and video-sharing social networking service. LinkedIn is a business and employment-oriented service that operates via websites and mobile apps. Flickr is an image and video hosting service.

I am pleased to report that as of December 10, 2018 we have 821 followers on Instagram, 45,470 images posted to AAPM's Flickr, 9,536 follows on Facebook, 10,285 members on LinkedIn, and 7,189 followers on Twitter.

In order to ensure that our presence on social media runs as smoothly and faultlessly as possible, AAPM announced a policy governing social media groups (<https://www.aapm.org/org/policies/details.asp?id=364&type=AP>) in 2015. This Policy aims to ensure that all AAPM-related content on social media sites is consistent with the organization's mission and objectives. I would suggest that anyone wishing to post on our Social Media instances reads the AAPM Social Media Policy, as well as the Terms and Conditions (<http://www.aapm.org/terms.asp>), available in the footnote on every AAPM page. We have drafted the following 'Good Practice Guidelines' about the appropriateness of the content you wish to post on any of our web pages:

- a. You are personally responsible for whatever you post online. If you use your capacity as an AAPM member (of any type, i.e. full member, student member, Fellow member, etc.), ensure that what you say looks professional.
- b. Do not post advertisements, promotions, or solicitations for products and/or services including those related to jobs without written permission from the AAPM Website editor.
- c. Only post accurate and reputable information. If you are in doubt about the reliability of the information's source, consider not using it and/or ask for advice from the AAPM Website editor.
- d. AAPM followers of our Social Media presence expect the most up-to-date and reliable information. Please post information with "as of" date only in your area of expertise and please review the already available posts to avoid redundancy and/or errors.
- e. Always avoid posting provocative statements and/or giving irritable, angry responses to posted material. Please point out any observed errors, but never disparage the person.
- f. Do not redistribute members-only content (journal articles, videos, member newsletters, etc.) to a wider audience.
- g. Be respectful of the privacy of others. Avoid publishing or citing personal details and photographs of individuals without their permission.
- h. Comments are a foundational aspect of conversations in social media. Don't delete comments just because you disagree with the commenter's opinion. Please, monitor your social media account/sub-account and delete only comments that are obviously spam, abusive, obscene or contain links to irrelevant or inappropriate blogs or websites.

The AAPM IS staff and I (Figure 2) are pleased to serve you and advance the web presence of our society. Please, do not hesitate to contact us should you need any further clarification about AAPM communication technologies.

I hope you find the AAPM website useful, visit it often, and send me your feedback or contact me (<mailto:george@aapm.org>) directly.



Figure 1: The Rookery stairwell, Chicago, IL.



Figure 2: The AAPM IS staff, and the Website Editor. Pictured left to right: Yan-hong Xing, Ashley Zhu, Zailu Gao, Michael Woodward, Farhana Khan, Abby Pardes, George Kagadis. Not Pictured: Tammy Conquest and Rohan Tapiyawala.

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 44 No. 1 — January | February 2019

The American Board of Radiology (ABR) has been using the oral examination as part of its evaluation process since it began in 1934. The oral exam is seen to provide a number of advantages:

- Provide direct personal contact with candidates
- Provide a way to evaluate how candidates communicate with peers
- Provide opportunity to the candidate to explain how they would mitigate
- Provide flexibility in moving from candidate's strong areas to weak areas and vice-versa
- Require the candidate to formulate his/her own replies without cues
- Provide opportunity to question the candidate about how he/she arrived at an answer

There are some obvious weaknesses in the oral exam format:

- Lack of standardization (everyone gets a slightly different test).
- Reproducibility of results are difficult to establish and assess.
- Perceived to enable favoritism toward certain candidates.
- Potentially influenced by irrelevant factors.

The ABR believes in the strength of the oral exam especially since there are substantial differences in the training of oral exam candidates.

This newsletter article will discuss the many ways the ABR insures the fairness, reliability, and validity of the oral exam. This process begins with the organization of the exam. Each medical physics specialty (DMP, NMP and TMP) has an oral exam committee that writes new oral exam questions and reviews existing questions in the oral exam question bank each year to ensure that the available oral exam questions are both relevant and current. They also review the supplementary material given to each examiner. They then assemble the actual oral exam question sets. Each of the three specialty exams has five categories with five questions in each category. The questions for each category are selected to fill in an established grid. The questions

in each category are distributed among the examiners. This means a candidate gets one question in each category from each examiner. The five examiners give five differing perspectives on the candidate's performance in each category.

Another way to ensure fairness is to recruit diverse examiners with respect to gender, degree (MS and PhD), and practice environment (academic and private practice).

All examiners are ABR certified and participate in ABR MOC. Each examiner goes through training to ensure that they understand the exam procedures. More importantly, they are taught to treat each candidate in the same fashion and to avoid comments on how the candidate is doing. New examiners must observe experienced examiners before they are allowed to examine. Each examiner is encouraged to provide comments on each question.

At the end of each examination period the group of examiners, called a panel, gets together to check the scores and verify the final assessment (pass, condition, or fail).

Each examiner is observed by an ABR Trustee, ABR Governor, or Panel Chair several times to ensure they are adhering to ABR policies about how exams should be conducted. If any discrepancies are noted, examiners are counseled as soon as practicable. There are also additional ABR staff observers that observe the exam processes to ensure that administration of exams is uniform. The ABR is always accepting of examinee comments (oral or written) on the conduct of the exam. Each comment is thoroughly reviewed by the ABR.

From a statistical point of view, we review each examiner's scores to determine their average score and compare that to the other examiners. After many years of doing this we know that it is almost unheard of that an examiner is significantly different than their colleagues. If that were to happen the trustees would consider the matter and either counsel the individual or remove them from the examiner pool. As part of this review we also check that an examiner does not give an unusually high percentage of high or low scores.

We also review the performance of the panels to ensure there are no panels that behave significantly differently. Experience has shown that the average scores for each panel are very close and statistically identical.

We review the performance of each question and compare the average score of each category to be sure there are no anomalies.

The ABR believes the oral exam is of the utmost importance and does everything it can to be sure it is effective, properly administered, and fair.

ACR ACCREDITATION: FREQUENTLY ASKED QUESTIONS FOR MEDICAL PHYSICISTS

Dustin A. Gress, MS | Reston, VA

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

In each issue of this newsletter, I'll continue Penny's tradition of presenting frequently asked questions (FAQs) or other information of particular importance for medical physicists. You may also check out the ACR's accreditation web site portal (<http://www.acraccreditation.org/>) for more FAQs, accreditation application information, and QC forms.

The ACR recently released its 2018 Digital Mammography QC Manual with 2D and Digital Breast Tomosynthesis. The following are select FAQs pertaining to the new manual. These and more FAQs can be found on the ACR Digital Mammography QC Manual Resources web page (<https://www.acraccreditation.org/resources/digital-mammography-qc-manual-resources>), where you can also find updated Microsoft Excel forms for technologist and medical physicist QC, free to download. Please contact us (<mailto:mamm-accred@acr.org>) if you have questions.

Q. Does the 2018 edition of the manual supersede the 2016 edition?

A. Yes.

Q. Is the ACR Digital Mammography QC Manual available to all ACR-accredited facilities at no charge?

A. Yes. A link to download the ACR Digital Mammography QC Manual at no charge was emailed on November 19, 2018 to accreditation facility contacts at all ACR-accredited mammography facilities. They were instructed to share the link with their colleagues at the facility, including their medical physicists. Corrections and updates will periodically be sent to all accredited facility contacts as they become available. Consequently, it is important to check that all your facility's contact information, including email addresses, are up to date in the ACR accreditation database (ACRedit). Go to <http://www.acraccreditation.org/Login> (<http://www.acraccreditation.org/Login>) to log in.

Q. I am the medical physicist for several ACR-accredited mammography facilities. Can ACR directly send me the link to download the ACR Digital Mammography Quality Control Manual?

A. No. You must obtain the link to download the ACR Digital Mammography Quality Control Manual from one of your ACR-accredited facilities. A link to download the manual at no charge was emailed to accreditation facility contacts at all ACR-accredited mammography facilities. They were specifically instructed to share this link with their medical physicists. Contact your mammography facility and ask them to send you the link.

Q. I have tried to download the ACR Digital Mammography Quality Control Manual from the link that the ACR sent, and I am unable view or save the manual. What do I do?

A. There are several possible solutions to this problem:

- Clear the browser cache and cookies, and refresh the page.
- Try opening the file with a different browser by copying the link and pasting it into the search bar of the new browser. (We've tested both Chrome and Firefox with good results.)
- If the above suggestions do not work, you may need to reconfigure your browser, which may require assistance from your IT team.

Q. I am not affiliated with an ACR-accredited facility. How may I obtain a copy of the manual?

A. Individuals not associated with ACR-accredited facilities may purchase the manual from the ACR catalog.

Q. Our facility has a digital mammography unit that only performs 2D imaging. Will we be allowed to use the ACR Digital Mammography QC Manual instead of our manufacturer's QC manual for QC on this unit?

A. Yes.

Q. Our facility has a mammography unit that performs 2D imaging using computed radiography (CR). Will we be allowed to use the ACR Digital Mammography QC Manual instead of our CR manufacturer's QC manual for QC on this unit?

A. Yes.

Q. Our facility has a digital mammography unit that performs both 2D imaging and DBT. Will we be allowed to use the ACR Digital Mammography QC Manual instead of our manufacturer's manual for QC of the 2D applications of our digital mammography unit and then follow our manufacturer's QC manual for tomosynthesis?

A. Yes.

Q. Is a full mammography equipment evaluation (MEE) required to begin using the ACR Digital Mammography QC Manual for 2D and DBT?

A. No. An annual survey is required for facilities transitioning from a manufacturer's QC program to the ACR DM QC Manual. However, MEE test data obtained under the facility's previous QC program should be maintained and available for baseline, comparison, and troubleshooting purposes until those tests are performed for the first time under the ACR Digital Mammography QC procedures. If data for the MEE tests are not available for baseline, comparison, and troubleshooting purposes, a full MEE must be done in order to make those data available.

Q. Must the initial medical physicist's annual survey using the manual and phantom be performed on the digital mammography unit and display devices on the same day?

A. No. The medical physicist may choose to perform the digital mammography unit and display device annual surveys on the same day or on different days. The QC technologist should perform the routine QC on the digital mammography unit using the manual and phantom after the medical physicist's testing is complete on the unit. Likewise, the QC technologist should perform the routine QC on the display devices using the manual and phantom after the medical physicist's testing is complete on the display devices. However, it is preferable that mammography units and display devices located at the same geographical location be tested by the medical physicist on the same day.

Q. Our facility has display devices that are geographically distant from the mammography units. Is there a time limit between transitioning our mammography units to the ACR Digital Mammography QC Manual program and these distant display devices?

A. Yes. The display devices must have annual surveys performed for transition at the next regularly scheduled annual survey, or earlier. The existing manufacturer's QC program for the distant display devices must be followed until the transition annual survey is completed, and clear documentation should be kept to identify transition dates for each device.

HEALTH POLICY & ECONOMIC ISSUES

Wendy Smith Fuss, MPH | Delray Beach, FL

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

CMS Updates Radiation Oncology Supply and Equipment Pricing

The Centers for Medicare and Medicaid Services (CMS) recently released the 2019 Medicare Physician Fee Schedule (MPFS) final rule. The MPFS specifies payment rates to physicians and other providers, as well as technical payments for freestanding cancer centers. It does not apply to hospital-based facilities. All policies and payments are effective January 1, 2019.

CMS updated the current conversion factor of \$35.99 to \$36.04 in 2019, which results in a small payment increase for many radiation oncology codes.

CMS initiated a contract with StrategyGen to conduct an in-depth and robust market research study to update the direct practice expense (PE) inputs for medical supply and equipment pricing beginning in 2019. These supply and equipment prices were last systematically developed in 2004–2005. After consideration of public comments, CMS finalized the policy to update the StrategyGen pricing recommendations for approximately 1,300 supplies and 750 equipment items. Given the potentially significant changes in payment that may occur, CMS will phase-in the use of the new direct practice expense input pricing over a 4-year period from 2019 through 2022.

Based on public comment, CMS did revise the pricing for approximately 60 supply and equipment codes, including six equipment items used in radiation oncology (see table below). This policy significantly decreases future reimbursement for stereotactic body radiation treatment (SBRT) delivery.

Equipment Item	CPT Codes	Current 2018 Price	Proposed 2019 Price	Final 2019 Price
SRS System, SBRT, six systems, average	77373	\$4,000,000	\$3,232,991	\$3,743,430

Equipment Item	CPT Codes	Current 2018 Price	Proposed 2019 Price	Final 2019 Price
HDR Afterload System, Nucletron-Oldelft	77767, 77768, 77770, 77771, 77772	\$375,000	\$309,106	\$314,394
Brachytherapy Treatment Vault	77767, 77768, 77770, 77771, 77772	\$175,000	\$165,000	\$179,529
IMRT Treatment Planning System (Corvus w-Peregrine 3D Monte Carlo)	77301, 77338	\$350,545	\$302,257	\$312,220
Power Table	77750	\$6,154	\$5,975	\$6,092
Ultrasonic Cleaning Unit	77778	\$895	\$19,853	\$895

The 2019 final rule policies result in an overall one percent payment decrease to radiation oncologists and freestanding cancer centers and no payment change to radiologists.

A complete summary of the final rule and impact tables is on the AAPM website (http://aapm.org/government_affairs/CMS/2019HealthPolicyUpdate.asp).

CMS Finalizes Medicare Hospital Outpatient Prospective Payment System Changes for 2019

The Centers for Medicare and Medicaid Services (CMS) recently released the 2019 Hospital Outpatient Prospective Payment System (HOPPS) final rule, which provides facility payments to hospital outpatient departments. All policies and payments are effective on January 1, 2019. This rule does not impact payments to physicians or freestanding cancer centers.

CMS estimates an overall 1.35 percent increase in hospital outpatient facility payments in 2019. Final 2019 payment changes for radiation oncology related Ambulatory Payment Classifications (APCs) range from negative 6.2 percent to a 2.4 percent increase in payment. Payment for medical physics consultation codes 77336 and 77370 have a nominal 1.3 percent payment decrease in 2019.

CMS did not implement AAPM's request to discontinue the Comprehensive APC (C-APC) payment policy for several brachytherapy device insertion procedures and single session stereotactic radiosurgery (SRS) procedures. CMS stated that they continue to believe that the C-APC policy is

appropriately applied to these surgical procedures for the reasons cited when the policy was first adopted and note that the commenters did not provide any empirical evidence to support their claims that the existing C-APC policy does not adequately pay for these procedures.

CMS will continue in 2019 to pay separately for the 10 planning and preparation services (CPT codes 70551, 70552, 70553, 77011, 77014, 77280, 77285, 77290, 77295, and 77336) adjunctive to the delivery of the stereotactic radiosurgery treatment using either the Cobalt-60-based or LINAC based technology when furnished to a beneficiary within one month of the SRS treatment.

CMS is exercising its authority under the law to utilize a method to control unnecessary increases in the volume of covered hospital outpatient department services by applying a Medicare Physician Fee Schedule (MPFS)-equivalent payment rate for the clinic visit (G0463) service when provided at all off-campus provider-based departments (PBDs) that are paid under the HOPPS. The clinic visit is the most common service billed under the HOPPS and is often furnished in the physician office setting. CMS is implementing this policy in a non-budget neutral manner. CMS will phase-in the application of the reduction in payment for HCPCS code G0463 in this setting over two years. This policy will result in lower copayments for beneficiaries and savings for the Medicare program in an estimated amount of \$380 million for 2019.

Below is a summary of the final HOPPS APC payments for 2019.

Summary of 2019 Radiation Oncology HOPPS Payments

APC	Description	CPT Codes	2018 Payment	2019 Payment	Payment Change 2018-2019	Percentage Change 2018-2019
5611	Level 1 Therapeutic Radiation Treatment Preparation	77280, 77299, 77300, 77331, 77332, 77333, 77336, 77370, 77399	\$125.35	\$123.77	(\$1.58)	-1.3%

APC	Description	CPT Codes	2018 Payment	2019 Payment	Payment Change 2018-2019	Percentage Change 2018-2019
5612	Level 2 Therapeutic Radiation Treatment Preparation	77285, 77290, 77306, 77307, 77316, 77317, 77318, 77321, 77334, 77338	\$323.09	\$321.82	(\$1.27)	-0.4%
5613	Level 3 Therapeutic Radiation Treatment Preparation	32553, 49411, 55876, 77295, 77301, C9728	\$1,186.68	\$1,191.92	\$5.24	0.4%
5621	Level 1 Radiation Therapy	77401, 77402, 77789, 77799	\$124.73	\$116.99	(\$7.74)	-6.2%
5622	Level 2 Radiation Therapy	77407 , 77412, 77600, 77750, 77767, 77768, 0394T	\$219.83	\$224.46	\$4.63	2.1%

APC	Description	CPT Codes	2018 Payment	2019 Payment	Payment Change 2018-2019	Percentage Change 2018-2019
5623	Level 3 Radiation Therapy	77385, 77386, 77423, 77470, 77520, 77610, 77615, 77620, 77761, 77762	\$522.31	\$519.85	(\$2.46)	-0.5%
5624	Level 4 Radiation Therapy	77605, 77763, 77770, 77771, 77772, 77778, 0395T	\$714.11	\$704.72	(\$9.39)	-1.3%
5625	Level 5 Radiation Therapy	77522, 77523, 77525	\$1,053.52	\$1,078.97	\$25.45	2.4%
5626	Level 6 Radiation Therapy	77373	\$1,677.22	\$1,690.57	\$13.35	0.8%
5627*	Level 7 Radiation Therapy	77371, 77372, 77424, 77425	\$7,565.69	\$7,644.24	\$78.55	1.0%

*Comprehensive APC

BOLD = APC Reassignment for 2019

A complete summary of the final rule and impact tables is on the AAPM website (http://aapm.org/government_affairs/CMS/2019HealthPolicyUpdate.asp).

IMAGING PRACTICE ACCREDITATION SUBCOMMITTEE'S REPORT

Tyler Fisher, MS | Costa Mesa, CA

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

The new ACR Digital Mammography Quality Control Manual for Tomosynthesis Has Arrived!

On November 19, 2018, the ACR released the *2018 Digital Mammography Quality Control* manual that includes testing procedures for Digital Breast Tomosynthesis (DBT). The previous manual, released in 2016, was not applicable to DBT, but after significant effort by the ACR Committee on Mammography Accreditation, the new manual has been approved by the FDA as an alternative standard under MQSA. A link to download the new manual was sent to each accredited facility and can be shared with the supporting physicist.

There are a number of important points to note about the new quality control manual before we address some of the specifics:

- Implementation of the new manual is NOT REQUIRED. It was approved as an alternative standard. A facility may choose to continue using the manufacturer's QC program.
- The new manual REQUIRES the use of the new ACR FFDM phantom. The FFDM phantom is 31 x 19 cm and allows artifact evaluation with the phantom score. The phantom includes more fibers, speck groups, and masses than the old phantom and these objects are manufactured to a higher tolerance than the previous phantom. This new phantom is available from a number of retailers, listed on the ACR website (<https://www.acr.org/>).
- If your facility chooses to implement the new manual, the entire manual must be implemented. You are not allowed to use some parts of the manufacturer's QC program and parts of the ACR program. However, facilities must maintain any manufacturer-specified calibrations at their specified intervals (i.e., flat field calibration, geometry calibration, etc.)

- Prior to a facility implementing the new QC program, the medical physicist MUST PERFORM a full annual survey using the new ACR QC manual. This will allow the physicist to establish baselines and review the technologist QC program prior to implementation.

The ACR has posted a very helpful FAQ regarding the new QC manual, as well as Excel versions of the medical physicist forms. The Excel forms include functional graphs, testing instructions, and basic pictures to help demonstrate the testing methodology. The use of these forms is highly encouraged.

While many of the tests in the new QC manual are familiar, there are some notable changes and additions to the standard manufacturer QC programs.

- The minimum passing score for the new phantom is 2 fibers, 3 speck groups, and 2 masses. This score represents the same level of visualization from the previous phantom, but due to the new phantom specifications, the largest objects from the previous phantom were omitted. The ACR also provides new guidance for what must be visualized to count a test object. For example, to score a full fiber, at least 8 mm of the fiber must be visible, it must be in the correct location, correct orientation and 1 break is allowed as long as it is less than or equal to the width of the fiber. A half fiber must be greater than or equal to 5 mm in length.
- Artifacts should be inspected using the ACR FFDM phantom. Clinically relevant artifacts that can obscure clinical information will cause a facility to fail accreditation. With the old phantom, reviewers were not permitted to fail a facility due to artifacts that were visible on the submitted phantom.
- There is a test for Z-resolution. This test requires placing ROIs over the specks in the largest speck group and recording the maximum signal for the best slice, as well as the three slices before and after. The provided Excel forms will calculate the FWHM resolution and this value will be compared to the initial baseline annually.
- Spatial resolution Pass/Fail limits are 4 lp/mm in 2D mode, 6 lp/mm in magnification mode, and 2 lp/mm in 3D mode.
- AEC testing requires the calculation of SNR for 2, 4, 6, and 8 cm phantoms. The annual results must be within 15% of the MEE. Density step testing has been removed.
- For systems that display a computed Average-Glandular Dose, the ACR recommends that the displayed value be within 25% of the physicist measured value.
- There are QC requirements for the acquisition display monitor. This includes maximum and minimum luminance, luminance uniformity, and contrast response.
- Beam Quality (HVL) and kVp accuracy and reproducibility are now required at MEE and for troubleshooting only. They are not required for annual physics testing.

The ACR will be scheduling webinars for facilities, technologists, and physicists in the coming months to help facilities implement the new QC manual. There are new requirements as well for technologist QC, as well as a section helping the lead interpreting physician to better understand and oversee the full quality control program. For more information, click here (<https://www.acraccreditation.org/Resources/Digital-Mammography-QC-Manual-Resources>).

Finally, if you have implemented the new manual or intend to do so in the future, please reach out (<mailto:tyler@therapyphysics.com>) to me. There may be interest in having early adopters share their experiences at future AAPM meetings.

MEETINGS COORDINATION COMMITTEE'S REPORT

Christopher F. Serago, PhD | Jacksonville, FL

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

Please Book "Within the Block" at AAPM Meetings

When you stay at a hotel while attending an AAPM meeting, there are benefits to you and to AAPM if you book a room "within the block" of hotels contracted by AAPM for the meeting.

Benefits to you

- Every registrant who books a stay through the contracted housing management site for AAPM Annual or Spring Clinical Meeting will be entered in a drawing for a complimentary registration at the 2019 Annual or Spring Clinical Meeting. (One winner will be selected at random and the winner's registration fee will be refunded after the drawing.)
- Guest room Wi-Fi is included in your room rate. While some hotel brands already include Wi-Fi as part of the room rate, other hotels charge as much as \$12.95 per day.
- When you reserve a hotel room in the meeting contracted block, you will be the last to be 'walked' or relocated in an oversell situation. You may save a few dollars when reserving hotel rooms through bargain websites, but they will not protect you in an oversell situation.
- Our hotels tend to be the closest to the convention center at discounted rates.

Benefits to AAPM

- Our room block history (rooms booked and attributed to AAPM) is shared when contracting future venues. The better our room block history, the better leverage we have for lower room rates and fewer contracted penalties in the future.
- Our room block history impacts the amount of meeting space a city or venue is willing to hold as well as the cost. An excellent pick up history results in better leverage when negotiating with both hotels and convention centers for meeting space.

We know there are often attractive alternative hotels or reward programs that provide incentives. Please think twice before booking 'outside the block' and we will continue to negotiate the best conventions center and the best hotels at the best rates for future AAPM meetings. You can help us.

SEAAPM CHAPTER MEETING OVERVIEW

Ehsan Samei, PhD | Durham, NC

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

Leadership Has a Structure

Leadership is a human mechanism for collective progress. Our world, our disciplines, our workplaces, our homes, all need leadership. Progress, solutions to stubborn problems, peace, and one's own human prospering all hinge on effective leadership. How can one practice and excel in leadership? Leadership is often characterized in terms of attributes, of which there may be tens, if not hundreds, such as ownership, imagination, and courage. A good leader is expected to embody and practice these attributes. But how one can master so many attributes, many of which are related to one another and not all of which are equally important?

A deep interrogation of the heterogeneous space of leadership reveals an underlying structure. This structure can be instructional if one is to understand and perhaps more efficiently advance in the art and practice of leadership. At the foundation of leadership, there are a set of core virtues, deep within the "self" of the leader. These are *vision, love, action, honesty*, and the *stewardship* of pain. These virtues inform the more outward manifestations of leadership, which we call key traits, such as *communication, humility, and courage*. These traits are important and integral to leadership, but they are not foundational; they actually stem from the core virtues. Some directly stem from one virtue while others may stem from multiple (e.g., *agility from action* but *trust* from nearly all five virtues). Effective exercise of these traits requires a certain mindfulness of their origin. Finally, in practicing these traits, specific skills are invoked, skills that can be taught and learned, such as how to run a meeting. The core virtues, their reflection in traits, and their practice through skills form the structure of leadership.

Endorsed by the **Medical Physics 3.0** Initiative and the **Medical Physics Leadership Academy**, the Southeast chapter of AAPM (SEAAPM) is conducting a symposium titled **Imagination, failure, and love: the journey of the leader**. Through lectures, dialogues, and exercises, this 1.5 day symposium aims to encourage an effective practice of leadership by way of a curriculum that is rooted in this three-part structure. The content covers each of the core virtues and more:

- Leadership from the ground up (by **Ehsan Samei**)

- Vision: imagining and inspiring the possible (by **Benjamin Sintay**)
- Love: the heart of the leadership (**Russ Ritenour** and **Carnell Hampton**)
- Action: from the clouds to the grounds, how to execute a vision (**Josh Wilson**)
- Honesty: the safeguard against delusion (**Jerry White**)
- Stewardship of pain: the refinement of the diamond (**Michelle Wells**)
- Context: Personalization, prioritization, and alignment in situational leadership (**Jennifer Johnson**)

The symposium will be held Feb. 21–22, 2019 in Savannah, GA. Additional information can be found on the website (<http://www.seaapm.org>). Consider participating if your schedule permits.

NUCLEAR REGULATORY COMMISSION'S REPORT

Sarah Lopas, NRC Project Manager | Baltimore, Maryland

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

The Nuclear Regulatory Commission is Seeking Your Input on its Evaluation of Training and Experience for Authorized Users

The U.S. Nuclear Regulatory Commission (NRC) is evaluating its regulations for training and experience (T&E) required for a physician to become an authorized user for medical uses under Subpart E, "Unsealed Byproduct Material—Written Directive Required," of Title 10 of the Code of Federal Regulations (10 CFR) Part 35, "Medical Use of Byproduct Material."

On October 29, 2018, the NRC published a series of questions on T&E in the Federal Register, the daily journal of the Federal government that contains government agency rules, proposed rules, and public notices. With the publication of these questions, the NRC opened a three-month public comment period seeking feedback on whether there is a need to change its T&E regulations under Subpart E of 10 CFR Part 35.

The T&E requirements in Subpart E of 10 CFR Part 35 provide three ways that a physician can currently be authorized to administer unsealed byproduct materials or radiopharmaceuticals requiring a written directive:

1. A physician can be certified by a medical specialty board, whose certification process is recognized by the NRC or an Agreement State.
2. A physician can complete a structured educational program and supervised work experience under an alternate pathway. The 700 hours required for authorization under this alternate pathway consists of a minimum of 200 hours of classroom and laboratory training and 500 hours of supervised work experience.

3. A physician can be authorized if previously identified as an authorized user on an NRC or Agreement State license or permit (i.e., grandfathered).

The NRC staff is considering whether another pathway should be created or if the alternate pathway should be revised. Specifically, the staff is evaluating: (1) whether it makes sense to establish tailored T&E requirements for different categories of radiopharmaceuticals; (2) how those categories should be determined (such as by risks posed by groups of radionuclides or by delivery method); (3) what the appropriate T&E requirements would be for each category; and (4) whether those requirements should be based on hours of training and experience, or focused more on competency.

The NRC encourages all individuals and organizations interested in the T&E evaluation to read the Federal Register notice and submit written comments on the notice using the Federal rulemaking website (<https://www.Regulations.gov>). On Regulations.gov (<https://www.Regulations.gov>), search for Docket Number NRC-2018-0230. The deadline for submitting comments is January 29, 2019.

The NRC is also holding four public meetings where it will accept oral comments. The meetings will be accessible for remote participation and are scheduled for January 10 and January 22, 2019. The NRC's public meeting page (<https://www.nrc.gov/pmns/mtg>) has participation details. Contact Sarah Lopas, Project Manager in the NRC's Office of Nuclear Material Safety and Safeguards, for questions about the T&E evaluation: Sarah.Lopas@nrc.gov (<mailto:Sarah.Lopas@nrc.gov>) and (301) 415-6360.

AAPM - ISEP/IOMP THERAPY COURSE

Joanna E. Cygler, PhD | Ottawa, ON & Božidar Casar | Ljubljana, Slovenia & Robert Jeraj, PhD | Madison, WI

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

Challenges in Modern Radiation Therapy Physics

The purpose of this article is to report on the joint AAPM-ISEP/IOMP Therapy Course that took place July 3–7, 2018 in Ljubljana, Slovenia. The course was given in collaboration with the Institute of Oncology in Ljubljana and Faculty of Mathematics and Physics at the University of Ljubljana. The Ljubljana Institute of Oncology and its associated hospital are modern, well equipped institutions. The Faculty of Mathematics and Physics runs a dynamic educational and research program of medical physics and many future medical physicists thrive in its stimulating environment.

The title of the course, "*Challenges in Modern Radiation Therapy Physics*," well reflected the topics that included modern radiation dose calculation algorithms, treatment modalities including proton and heavy ion beams, imaging, and dosimetry. The course directors were **Joanna Cygler**, **Božidar Casar** (local arrangements) and **Robert Jeraj** (scientific content).

Lectures were given by several faculty sponsored by AAPM: **Thomas Bortfeld**, **Joanna Cygler**, **Saiful Huq**, **Rock Mackie**, and **David Rogers**. They were supplemented by three local speakers from Ljubljana Institute of Oncology: **Božidar Casar**, **Robert Jeraj**, and **Ignacio Mendez**.



Course Faculty

Special guest lectures were delivered by **Stine Korreman** (IGRT), **Bert van der Kogel** (radiobiology), and **Slavik Tabakov** (medical physics global workforce).

Ervin Podgoršak, currently a Professor Emeritus of McGill University in Montreal, Canada, attended the course as a special guest of honor. Ljubljana holds a special place in his heart, since Prof. Podgoršak not only grew up there, but he also started his prominent career in the Faculty of Mathematics and Physics at the University of Ljubljana. He delivered a lecture on "Professional Issues in Medical Physics," the ever-important topic in the constantly evolving careers of medical physicists. A special highlight of the course was AAPM TG 100 Workshop given by Saiful Huq. The participants also enjoyed the demos of the Virtual Environment Radiotherapy Training (VERT) system for radiotherapy professionals training, organized and run by Andy Beavis. At the end of the course, practical demonstrations were organized for participants at the Institute of Oncology including patient specific QA/QC procedures for VMAT, IGRT procedures, execution of Winston-Lutz test and presentation of TBI translation coach technique on linear accelerators.



Ervin Podgoršak

You can find more information about the course program on its web page (<http://www.aapm-isep.si>).



Participants

The course progressed very smoothly, which no doubt was due to the excellent Local Committee work, especially the energetic and ever-present **Maruša Turk** and her fellow medical physics PhD students, Fig.7.

The course had a truly international flair, as its 80 participants came from over 20 different countries from four continents. The attendees enjoyed the lectures and interactions with the faculty during coffee breaks and lunches consisting of excellent local food and pastry. The pastry was truly irresistible and caused me a noticeable weight gain.

All had fun at the social picnic held at a farm-like venue outside the city, where the good local food and beer were served and the faculty were challenged in volleyball and basketball competitions. All lectures and events were diligently recorded by the official course photographer, **Ana Marin**.

Overall the course got excellent evaluations not only for scientific content and quality of the lectures, but also for its organization. What is also important, everybody had fun learning and playing together. I am sure we will all cherish memories of Ljubljana, hoping we will return there some day.



Engaged Audience



Social event



Joanna Cygler presents the AAPM Recognition Plaque to Božidar Casar



Maruša Turk and her team skillfully running daily course operations



([//w3.aapm.org/newsletter/index.php](http://w3.aapm.org/newsletter/index.php))

Improving Health Through Medical Physics

UI/AAPM-ISEP/ACOMP IMAGING PHYSICS COURSE 2018

Cheng Saw, PhD | Harrisburg, PA & Supriyanto Pawiro, PhD |
Depok Indonesia

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

UI/ISEP-AAPM/ACOMP Imaging Physics Course 2018

Hall B101 FMIPA UI Depok, West Java, Indonesia

October 4 – 7, 2018

The four-day UI/AAPM-ISEP/ACOMP Imaging Physics Course 2018

(<https://medphys.wixsite.com/ipc2018>), with the aim of assisting diagnostic medical physicists in South-East Asia—in particular Indonesia—to improve their skills in playing their roles in radiation medicine, was held at Hall B101, Faculty of Mathematics and Natural Sciences (FMIPA), Kampus UI – Depok, University of Indonesia, West Java, Indonesia on October 4–7, 2018. This imaging physics course (IPC) 2018 was organized by the Department of Physics (through the Medical Physics and Biophysics Division), Faculty of Mathematics and Natural Sciences, University of Indonesia in collaboration with the International Scientific Exchange Program (ISEP) of American Association of Physicists in Medicine (AAPM), and International Organization for Medical Physics (IOMP). The organizers for this imaging physics course were **Cheng Saw**, PhD, FAAPM serving as the Program Director on behalf of ISEP/AAPM and **Supriyanto Pawiro**, PhD as the Host Director on behalf of the Department of Physics, University of Indonesia.

The trend in the use of medical diagnostic x-ray has been increasing worldwide. As of 2017, the Nuclear Energy Regulatory Agency had issued more than 7000 licenses for medical diagnostic x-ray devices in Indonesia, and the number of new license applications is anticipated to increase rapidly. While the public is the beneficiary of the increased access to better healthcare, stakeholders like the natural authorities, clinicians, technicians, and scientists are subjected to stress in which their roles and significance are being tested.

While the recent economic conditions in Indonesia are favorable, they have led to the rapid acquisition of digital imaging technology. This transition to the digital era placed an enormous burden on the medical physicists to gain not only experience but also a deep understanding of the scientific background of the procedures as well as the clinical consequences they bring. The ease, comfort, and practicality of digital medical x-ray imaging are unchallenged, however the stakeholders have to adapt to the transition with new ways of dealing with image formation, storage of images in the clouds, networks, and the operation and use of digital printers. The use of film to capture x-ray images, once the most dominant and important process in the diagnostic imaging department, is now obsolete. The transition is so vivid that what was used yesterday seems no longer valid today. While many are happy to embrace this digital revolution, the scientists and medical physicists are experiencing a rather different ambience—a great challenge indeed. Developing nations like Indonesia are allowing digital imaging systems to gain popularity with such an abrupt scale that medical physicists need to adapt quickly in order to keep themselves updated.

Different physical characteristics of imaging systems from manufacturers present challenges with overwhelming tasks to the medical physicists. Diagnostic medical physicists whose primary duties are to ensure the quality and safety of any device are now tasked with dealing with new and different and complex varied digital algorithms of images. The different breadth of physical characteristics and dose-response curves requires special attention of medical physicists. With the abundance of digital imaging systems due to their popularity, the digital planar x-ray imaging systems with computed radiography and digital flat-panel image receptors deserve attention to ensure that adequate, diagnostic-quality images are produced with minimum radiation dose to the patients that is being optimized.

There are more complexities that follow with other modalities employing digital technologies. CT scanners are now dominated by multi-detector configurations allowing wide-beam scanning to be used—one that requires special attention in radiation dosimetry. Breast imaging is now getting popular with tomosynthesis volume imaging, presenting challenges to the medical physicists regarding dosimetry and quality control methods. In angiography, volumetric imaging known as three-dimensional rotational angiography has left medical physicists struggling with novel dosimetry methods and image quality evaluation. Hybrid imaging systems with radiotherapy and nuclear medicine applications are getting far more common as the walls between medical physics subspecialties begin to collapse. In short, this transition to digital age genuinely requires deep understanding in the physical characteristics on the recent technologies to enable medical physicists to master the situation and secure their significance.

With the above narrative from the local committee, the requests for medical physicists and their expertise were overwhelming. There is currently a shortage of medical physicists in Indonesia that will continue into the near future. The current concern is the lack of knowledge of the new technology and how to perform quality assurance and quality control on the vast number of existing imaging systems in Indonesia. The focus of the imaging physics course was on the recent technology and developments of digital medical imaging and its physical principles. The roles of digital imaging physics in diagnostic and interventional radiology, radiation oncology, and nuclear medicine was highlighted. The discussion sessions included clinical perspectives needed to emphasize the need of

principles and practical knowledge in these areas (a) digital radiology systems, (b) modern mammography, (c) computed tomography dosimetry, (d) interventional radiology principles and optimization, (e) hybrid imaging systems, and (f) imaging in radiation oncology.

The faculty members from AAPM participating in this imaging physics course were **Cheng B Saw**, PhD from Northeast Radiation Oncology Centers, PA, **Frank Dong**, PhD from Cleveland Clinic, OH, **Tinsu Pan**, PhD from MD Anderson Cancer Center, TX, and **Douglas Pfeiffer**, MS from Boulder Community Health, CO. Prof **Kwan Hoong Ng** from University of Malaya with expertise in imaging physics also participated in this imaging physics course. Dr. Saw's expertise is in radiation therapy, and he gave presentations on the integration of imaging into treatment planning, image quality and quality assurance for imaging systems used in radiotherapy, and description of various imaging systems used for image-guided radiation therapy (IGRT). Dr. Frank Dong presented image quality and quality control in advanced technologies in CT, dose and image quality optimization in CT, and clinical responsibilities of medical physicists in CT. Dr. Tinsu Pan covered innovations in nuclear imaging, advanced image analysis methods in nuclear medicine, and hybrid imaging systems. Mr. Doug Pfeiffer covered physical and technical principles of interventional imaging, advanced techniques in interventional radiology, image quality assessment, dosimetry, and quality control in mammography, and clinical responsibilities of medical physicists in interventional imaging and mammography. Dr. Ng presented physical principles of planar digital imaging systems, clinical responsibilities of medical physicists in the use of CR and DR, and physical and technical principles of advanced mammography. Local faculty members for this imaging physics course included **Gregorius Prajogi**, MD, Cipto Mangunkusumo Hospital, Jakarta – radiotherapy, **Hussein Kartamihardja**, MD, Padjajaran University, **Bandung Kardinah**, MD, Dharmas National Cancer Center, Jakarta – diagnostic imaging, **Sunarya Soerianata**, MD, Harapan Kita National Cardiovascular Center, Jakarta – interventional cardiology, **Choirul Anam**, PhD, Diponegoro University, Semarang – CT, **Lukmanda Lubis**, MS, Universitas Indonesia, Depok – imaging, **Ika Bayuadi**, MS, LFMB UI, Depok – imaging. The physicians presented their clinical perspectives and concerns in their medical sub-specialties entering the digital era. Dr. Anam presented the advanced dosimetry methods in CT. Mr. Lubis presented dose and image quality optimization in interventional radiology and cardiology. Mr. Bayuadi discussed quality control and dosimetry in CR and DR.

The opening ceremony for this imaging physics course 2018 commenced on October 4, 2018 with the welcoming address delivered by **Dr.rer.nat Agus Salam** Chairman of the Department of Physics, Faculty of Mathematics and Natural Sciences, University of Indonesia, Depok, Indonesia. This was followed with the message from Cheng Saw, PhD. Dr. Saw thanked the participants for attending this course. Without their support and participation, this course would not be possible. Dr. Saw also thanked the Host Director, Dr. Supriyanto Pawiro for undertaking this project and conducting the course. Dr. Saw also thanked the faculty for traveling long distances to volunteer their efforts and times to participate in the project.

There were 180 registered participants with representatives from Philippines, Malaysia, and Vietnam. With the inclusion of the staff who was primarily students, there were over 200 attendees for this imaging physics course.

On behalf of the ISEP/AAPM, the Program Director, Dr. **Cheng Saw** wishes to thank the Host Director, Dr. **Supriyanto Pawiro** of University of Indonesia to undertake this project and the hospitality of his staff extended to the AAPM members in Indonesia. The Host Directors also wish to thank the AAPM members for their willingness to travel to Indonesia to participate in this educational project.



UI/ISEP-AAPM/ACOMP Group Photo

IROC REPORT

Paige A (Summers) Taylor, MS | Houston, TX

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

A Pilot Study of IROC Houston's Proton Head & Neck Phantom

The proton Head & Neck (H&N) phantom is IROC Houston's most complex anthropomorphic phantom design for proton therapy, and closely mirrors the IMRT H&N phantom that is used for clinical trial credentialing. The H&N phantom was created with proton-equivalent plastics and an embedded human skull. The phantom contains a horseshoe shaped target, meant to mimic an oropharyngeal tumor, and spinal cord and parotid organs at risk (see Figure 1). The insert also contains TLD and radiochromic film for point and planar dosimetric measurements. The phantom is simulated, planned, and irradiated using the institutions' clinical procedures. Ninety-five percent of the target is to receive 6.6 Gy(RBE). The close configuration of the target and OARs provides a realistic planning challenge for proton TPSs. The criteria for point dose agreement between the TLD and the treatment plan was $\pm 7\%$, and the criteria for percent of film pixels passing a 7%/4 mm gamma analysis was 85%. The institutions' treatment plans were also assessed for how well they met target and OAR dose constraints.

Despite the high phantom pass rate (87%) for the TLD and film measurements, an analysis of clinical dose constraints for the target and OARs showed only 33% of institutions were able to meet all three dose constraint criteria used for clinical trials (see Table 1), and even the institutions that did pass were in the "variation acceptable" category for at least one constraint.

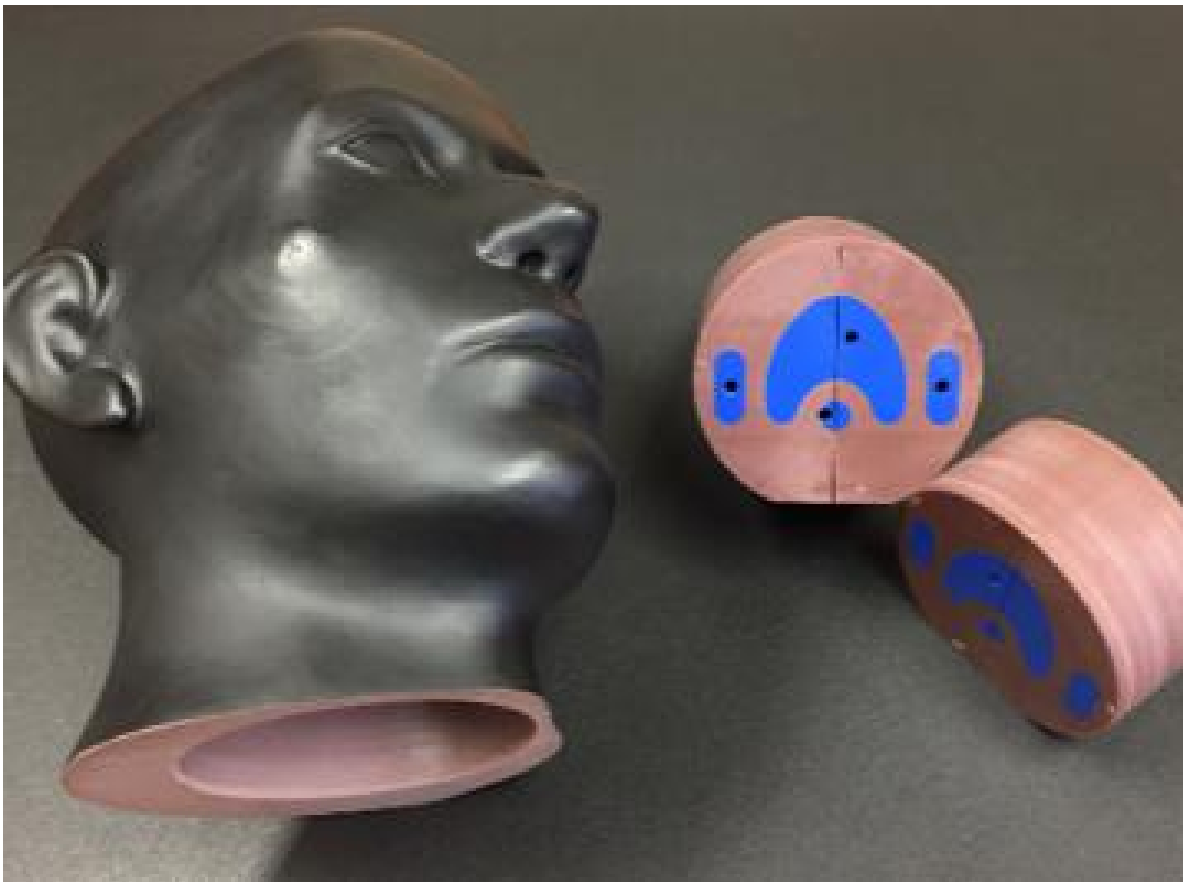


Figure 1. The anthropomorphic proton H&N phantom shown with insert (right). The target, cord, and parotid structures can be seen in blue.

Planning Constraints

6.6 Gy(RBE) covers $\geq 95\%$ of the PTV (variation acceptable $\geq 90\%$)

Max dose to 0.03 cc ≤ 4.5 Gy(RBE) (variation acceptable ≤ 5.0 Gy(RBE))

Mean dose to both parotids ≤ 2.6 Gy(RBE) (variation acceptable ≤ 3.3 Gy(RBE))

Institution	Modality	% of PTV covered by 6.6 Gy(RBE) Rx dose	Cord volume [cc] receiving >4.5 Gy(RBE)	Mean dose to Parotids [Gy(RBE)]	Film & TLD Pass?
A	PBS	98.8%	5.85	3.3	Pass
B (MC algorithm)	PBS	87.0%	0.00	1.4	Pass
B (PB algorithm)	PBS	87.0%	0.00	1.4	Pass
C	PBS	95.0%	0.21	2.3	Fail
C (2nd irradiation MC algorithm)	PBS	95.0%	0.00	3.0	Pass
C (2nd irradiation PB algorithm)	PBS	97.0%	0.00	3.0	Pass
D	PBS	90.0%	0.00	3.2	Pass
E	PBS	85.0%	0.00	3.3	Pass
F	PBS	80.0%	0.01	3.6	Pass
G	Scattered	91.0%	0.00	5.3	Fail
H	PBS	90.0%	0.00	3.5	Pass
I	PBS	86.0%	0.00	3.6	Pass
J	PBS	85.0%	0.00	4.1	Pass
K	Scattered	92.0%	0.00	2.0	Pass

Table 1. DVH characteristics for the H&N phantom irradiations. Cells in green pass the criteria for current clinical trial dose constraints; cells in orange are variation acceptable; cells in red fail to meet the dose constraints. MC=Monte Carlo; PB=Pencil Beam algorithm

Many proton centers are able to deliver what they plan to this phantom, however many struggle to meet typical clinical dose constraints for H&N disease. There is a tradeoff between target coverage and OAR sparing in the phantom, just as there is for real patient cases. It may be that some

institutions don't try as hard to meet dose constraints on a phantom study as they would with a patient case (despite instructions to treat the phantom like you would a patient). However, these data may encourage clinical trial PIs to add extra scrutiny of proton therapy H&N plans, or they may request that IROC include planning dose constraints as part of the phantom pass/fail criteria. There can be a lot of variability among proton institutions when it comes to target coverage and treatment conformity, largely driven by variations in machine delivery capabilities, but also by clinical experience and treatment planning skill. Clinical trial groups should proceed with caution when adding proton therapy as a modality for H&N trials.

MEDICAL DOSIMETRY CERTIFICATION BOARD (MDCB) UPDATE

Jennifer B. Smilowitz, PhD | Madison, WI & Minsong Cao, PhD | Los Angeles, CA

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

Greetings from your MDCB liaisons. We wanted to update you on a few items of interest from the MDCB, the certifying body for our Certified Medical Dosimetrist (CMD) colleagues (analogous to ABR for physicists.) First, for an overview of MDCB, please read the recent editorial by members of the MDCB, including our predecessor, **Emilie Soisson**: "*Update on Requirements for Medical Dosimetry Certification in the United States.*" (**Soisson E, Lembesis F., Baacke D., DeMarco ML., and Herman J.,** *Int J. of Rad. Bio. Phys.*, 2018; 102(2) 251-253.) Since that publication, the MDCB has recently completed a Job Task Analysis (JTA). To ensure that the exam continues to have relevance to current dosimetry practice, a JTA is conducted every five years in accordance with best practices standards by MDCB's test development partner Prometric. The April 2019 exam will reflect the test matrix derived from the recent JTA: Treatment Planning techniques (40%), Radiation Physics (16%), Dose Calculation Methods (15%), QA & Standard of Care (8%), brachytherapy (6%), localization (8%) and Radiation Protection (7%).

Another update is a change in the administration frequency of the exam. Since 2012, the CMD exam has been administered twice annually. In 2019 there will only be a single administration. The most important factor in determining the number of exam administrations is to ensure the reliability of exam scores by maintaining a minimum number of candidates to fairly assess an equated cut (pass) score. In 2017, the exam requirements changed to allow for only one eligibility route. Training from a JRCERT accredited dosimetry program and a minimum of a bachelor's degree is now required for MDCB certification, resulting in a smaller candidate pool. The MDCB Directors, therefore, made the difficult decision to conduct only one exam administration in 2019. Although the candidate pool has decreased, the pass rate has significantly increased since the transition to one eligibility route. As the field of radiation oncology continues to advance, the MDCB will continue to assess the needs of the dosimetry exam to best serve the dosimetry community and support quality patient care. For more information please refer to the MDCB website ([//www.mdcb.org](http://www.mdcb.org)) or reach out to one of the AAPM MDCB liaisons.



Front row:

Kristen Vu, CMD; A. Paige Dalton, CMD; MaryLou DeMarco, CMD; Felicia Lembesis, Executive Director, Diana Baacke, CMD; Destiny Jacobs, CMD; Jennifer Smilowitz, PhD; Marvene Ewing, CMD **Back row**

Pierre Beaunegre, CMD; Joseph Herman, MD; Julie Bradley, MD; Emilie Soisson, PhD; Robert Inshetski, CMD; Cory Neill, CMD; Benjamin Johnson (public member) **New Members missing from photo:**

Minsong Cao, PhD; George Arnould, CMD; Michael Manteuffel, CMD; Allison McCarthy, CMD; Teresa Meier, MD

IHE-RO CONNECTATHON UPDATE

Bruce Curran, MEng | Richmond, VA & Walter Bosch, DSc | Saint
Louis, MO

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

AAPM HQ Hosts Successful 2018 IHE-RO Connectathon

IHE-RO (Integrating the Healthcare Enterprise – Radiation Oncology) held its 2018 Connectathon at AAPM headquarters in September 2018. IHE-RO is a domain under the more global IHE umbrella that works to identify and solve integration problems between different computer systems in the radiation oncology arena. The IHE-RO Planning Committee, comprising physicians, physicists, and vendors, works to identify and prioritize issues in the radiation oncology process that negatively affect its effectiveness. These issues are then reviewed by the IHE-RO Technical Committee, made up of physicists and vendors, whose job is to identify potential solutions to the issue, determine if an effective solution can be made through better integration of computer systems, and, if so, develop a protocol (known as a Technical Profile) that provides that solution. Developers in the radiation oncology domain then are asked to implement these solutions and prove their applications meet the requirements of the Technical Profile in a Connectathon.

The IHE-RO Connectathon is a week-long testing session where different applications in the radiation oncology arena are tested under the watchful eyes of monitors, generally medical physicists, who evaluate the interactions between different applications and determine whether the communication between the systems meet the requirements of a Technical Profile. Systems that show they can receive information correctly from multiple vendors downstream of their application and send information to several vendors upstream of their application are acknowledged to have passed that Connectathon.

Three Integration Profiles were tested formally during the 2018 IHE-RO Connectathon. All three of these Profiles are currently in Trial Implementation status:

- **Basic RT Objects-II (BRTO-II)** – image segmentation, simple treatment planning, dose review

- **Multi-Modality Image Registration in Radiation Oncology-III (MMRO-III)** – spatial registration, registered segmentation, registered segmentation, and dose review
- **Treatment Planning-Plan Content (TPPC)** – plan content with multiple beam techniques

Successful results of the Connectathon are as follows:

- Accuray –
 - Passed **BRTO-II**
- Brainlab –
 - Passed **MMRO-III**
 - Passed **TPPC**
- RaySearch –
 - Passed **BRTO-II**
 - Passed **MMRO-III**
 - Passed **TPPC**
- Varian –
 - Passed **BRTO-II**
 - Passed **MMRO-III**
 - Passed **TPPC**
- ViewRay
 - Passed **BRTO-II**

Additional information on the specific actors for each vendor, application and version, and profile for the 2018 Connectathon, as well as more information about IHE-RO can be found at the following sites:

- www.aapm.org/IHERO (`//www.aapm.org/IHERO`)
- www.ihe.net (`//www.ihe.net`)
- www.ihe-ro.org (`//www.ihe-ro.org`)



IHE-RO takes over AAPM HQ



Judging the results



Everyone hard at work solving problems

ANNUAL MEETING SUBCOMMITTEE'S REPORT

Ingrid Reiser, PhD | Chicago, IL

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

You might think it's early to start thinking about the 2019 Annual Meeting, but the Annual Meeting Subcommittee has already been hard at work putting together another great program. **Kristy Brock** heads the Scientific Program. **Carri Glide-Hurst** and **Ke Sheng** are the Scientific Therapy Track Director and Co-Director, and **Web Stayman** and **Ioannis Sechopoulos** are the Director and Co-Director for the Scientific Imaging Track. Carri and Web are also the Co-Directors for the Multidisciplinary Track. **Chris Diederich** and **Tian Liu** are Co-Directors for the Specialty Track on Ultrasound. On the Education side, **Tyler Fisher** is the Education Program Director. **Georgeta Mihai** and **Frank Dong** are Director and Co-Director for the Education Imaging Track, while **Robin Miller** and **Dave Carlson** fill those roles for the Education Therapy Track. **Brian Wang** is Practical Track Director, and Tyler serves as the Co-Director. For the Professional Program, **Jeff Limmer** is the Program Director, with **Eileen Cirino** as Professional Track Director and **Erin Angel** as Professional Track Co-Director. **Norman Brown** is in charge of Technical Exhibits as well as the Partners in Solution and Guided Tours programs. Behind the scenes, **Tyler Blackwell** heads the Analysis and Evaluation team.

What's new for 2019? First off, we're changing the Joint Imaging Therapy Track to the Multidisciplinary Track, to better reflect its purpose of breaking down silos and showcasing the synergies between imaging and therapy. This is more than just a cosmetic name change. The track directors are carefully selecting topics that will be of interest to all physicists. To ensure that the sessions are truly multidisciplinary, each session will have one therapy and one imaging physics organizer, and there will be at least one speaker from each discipline.

We're finally leaving paper behind and moving to 100% eposters. No more schlepping or shipping posters, or hoping they get printed in time. View all the posters you're interested in from one spot. Best in Physics and Campus poster presentations will continue in the ePoster Theater, and additional eposter viewing kiosks will be set up throughout the exhibit hall.

Navigating the meeting keeps getting easier. The taxonomy categories that were introduced for invited sessions last year will be expanded in 2019 to all sessions, including the proffered talks. These will make your searches easier and more productive. In addition, we'll be introducing roadmaps that will provide guidance and focus on specific topics or tracks.

The meeting will be held in the newly expanded San Antonio Convention Center. Yes, it'll be warm in Texas in July, but you can cool off in the evenings enjoying a frozen margarita along the Riverwalk. San Antonio offers a large variety of restaurants with cuisines ranging from barbecue to Tex Mex to fine dining. And don't forget the Alamo!





([//w3.aapm.org/newsletter/index.php](http://w3.aapm.org/newsletter/index.php))

Improving Health Through Medical Physics

PERSON IN THE NEWS

Cynthia McCollough, PhD | Rochester, MN

AAPM Newsletter — Volume 44 No. 1 — January | February 2019

The new President of the ABMRS is **Heidi Edmonson**, PhD, who is an Assistant Professor of Medical Physics at the Mayo Clinic in Rochester, MN and a member of the AAPM for over 12 years. Heidi is currently the vice chair of AAPM's Working Group on MR Safety. Thank you, Heidi, for investing your time and energy towards ensuring the safety of the MR environment and for your leadership role in the ABMRS.

The ABMRS is a non-profit organization with the exclusive mission of credentialing MRI safety professionals. The ABMRS' MR Safety Certification™ currently represents the only formal Board Certification at the individual-level in the knowledge and practices of MRI safety. Three internationally recognized roles are evaluated, including that of MR Medical Director (MRMD), MR Safety Officer (MRSO), and MR Safety Expert (MRSE). While the 1,500 individuals currently certified by the ABMRS are predominantly American practitioners, individuals from Canada, South America, Asia, Europe, and the Middle East have come to the United States to sit for the ABMRS credentialing examination.

Further information on the ABMRS and its Board Certifications in MRI safety are available on the organization's website (<http://www.abmrs.org/>). If you have questions, or would like to see more MR Safety courses offered at AAPM meetings, please contact Heidi directly.

HOW TO PREPARE TO APPLY FOR AND TAKE BOARD EXAMS

From the New Professionals Subcommittee and Professional
Mentorship Working Group

AAPM Newsletter — Volume 43 No. 5 — September | October 2018

General Board Exam and Certification Questions

Why would I want to become board certified?

- Required for many jobs
- Required for some state licenses
- Gives you a competitive edge
- Allows you to become a radiation safety officer
- ABR certification allows you to become an authorized medical physicist on a materials license
- May give you a salary bump
- Helps you become a Qualified Medical Physicist
- Demonstrates your commitment to the field and to patient safety

What's the typical timetable?

- Most people take Part I during graduate school and Part II immediately after residency
- ABMP Parts I and II are often taken at the same time with Part III the following year
- ABSNM Parts I and II are often taken at the same time

Which board exams will I need to take?

- It depends on what you want to do
- If you want to be a therapy physicist, take the ABR exams
- If you want to be an MRI physicist, ABMP MRI exams may be easier for you, but ABR diagnostic exams would also be okay

- If you want to be a nuclear medicine physicist, you will need to take either ABSNM or ABR nuclear medicine exams
- If you want to be a radiation safety officer, any of these exams (except ABMP MRI) is appropriate (there's also a Certified Health Physics exam)
- If you want to be a diagnostic physicist, take the ABR diagnostic exams

What preparation do I need to take the exams?

- Visit the website to be sure, since requirements vary among the ABR, ABMP, and ABSNM
- Undergraduate coursework and documentation
 - You may need an official transcript
 - Two semester calculus-based introductory physics course
 - Three higher-level physics courses with particular course content (see each website)
- Graduate coursework and documentation
 - You will need an official transcript
 - It is also wise to keep a photo or digital copy of your diploma
 - Degree in medical physics, physics, nuclear engineering, or closely related fields
- If your education was in a country other than the United States and Canada, then you might be required to have your transcripts reviewed by a company that verifies U.S. equivalency
- You might be required to complete a CAMPEP-accredited certificate program, graduate program, and/or residency program
 - For ABR exams, you will need a CAMPEP-accredited program.
 - ABMP and ABSNM do not require a CAMPEP program.
- See specific sections below for what to study for each exam.

Which people will need to help me with my application?

- You will typically need 2–3 board-certified medical physicists or physicians in closely related fields who have knowledge of your experience in the field to fill out a form and/or write a letter about their knowledge of your experience
- If you're in a CAMPEP-accredited program, that program will need to attest for you

When should I take the exam?

- As soon as you're eligible.
 - Exam eligibility for all three Part I exams lasts for a period of time, not a number of attempts
 - This means that you may take the exam as many times as necessary during the time window
 - You may also defer taking Part I after being approved to take it
- Take the exams during graduate school or residency while the material is fresh in your mind
- Taking the exam following qualifiers or residency competency exams to combine studying efforts
- Other times when you'd need to study basic medical physics content

How to Apply to Take Board Exams

ABR

- Part I applications due Sept - Nov for the following August exam
 - Which application form you fill out depends on your status regarding CAMPEP programs (the most recent one you're in or graduated from)
 - You must submit documentation that you are either currently in or have completed a CAMPEP program
 - You must submit an official transcript for your highest degree
- Part II applications due Dec - Jan for the following August exam
 - You may postpone taking the exam by a year or two, etc.
 - After passing Part I, you have 10 years to be approved by ABR to take Part II
 - You will have several weeks to respond to the invitation.
 - Verify that your email address is correct in MyABR or you may miss the email
- Part III invitations will be sent around January after you have passed part II.
 - You may postpone taking the exam by a year
 - You will have several weeks to respond.
 - Verify that your email address is correct or you may miss the email

ABMP

- Exam Applications are typically due in mid-May
- As of the writing of this document, the current dates and locations of the exams are as follows:
 - The next Part I MRI exams are
 - Saturday, May 11, 2019 in Montreal, Canada
 - Saturday, July 6, 2019 in Orlando, FL
 - Saturday, July 13, 2019 in San Antonio, TX
 - The next Part I MHP exams are
 - Saturday, May 11, 2019 in Montreal, Canada
 - Saturday, July 6, 2019 in Orlando, FL
 - Saturday, July 13, 2019 in San Antonio, TX
 - The next Part II MRI exams are
 - Sunday, May 12, 2019 in Montreal, Canada
 - Sunday, July 7, 2019 in Orlando, FL
 - Sunday, July 14, 2019 in San Antonio, TX
 - The next Part II MHP exams are
 - Sunday, May 12, 2019 in Montreal, Canada
 - Saturday, July 6, 2019 in Orlando, FL
 - Sunday, July 14, 2019 in San Antonio, TX
 - Then next Part III MRI oral exams are Saturday, July 13 and Sunday, July 14, 2019 in San Antonio, TX
 - Dates for the next Part III MHP oral exams have yet to be determined
- For updated information, please see the ABMP website

ABSNM

- Applications are due in mid-March
 - You must select one of four specialties
 - You must provide contact information for supervisors who can attest to your training
 - You must submit your CV
 - You must submit an official transcript of your Master's or Ph.D.
 - You must ask at least one supervisor to fill out a form attesting to your experience
 - You must submit a recent photo of yourself
 - You must have a Notary Public witness your signing and sealing the envelope to mail
 - The whole exam is taken one day
 - The next exam date is Friday, June 21, 2019 in Anaheim, CA

General Board Exam Preparation

When should I start studying?

- Now!
 - Keep your graduate school and residency notes/exams.
- 3-4 months in advance: Start studying an hour a day to get familiar with concepts.
 - Earlier if you'd like, but be careful of burnout.
- Ramp up to ~4 hours per day 2 months before the exam.
 - Adjust as necessary based on your comfort level with the subject.

How should I study?

You know your learning style best, but some general tips that may be helpful:

- Begin by organizing all of your references and materials.
- Look at the content guide, have you got all of your bases covered?
- Identify your own weaknesses and/or gaps in knowledge.
- Use Raphex exams as a guide to subject areas, but study more complex problems than presented there.
- When reviewing your practice problems, be sure to understand why the correct answers are correct as well as why the incorrect answers are incorrect.
- Discuss study strategies with a mentor or another person who has passed the exam.
 - Do not expect specific test content, as revealing such is an ethical breach.
- Practice solving problems QUICKLY. Time is limited. You should be able to recall problem solving strategies easily.
- Download the Pearson Vue Tutorial and Demo for the ABR Parts I and II. Practice navigating the test environment so you're comfortable with it before test day.
 - Be familiar with the test calculator (TI-30XS), you may practice with it on the practice exam. There are tutorial videos available on YouTube as well.
 - Turn on number lock on the keyboard so you can use the number pad
 - You may bring your own physical calculator. It must be the TI-30XS and have no markings. Pearson Vue staff will inspect the calculator prior to the exam.

- Dry erase booklets are provided during the test. Be comfortable using them.
- Practice, practice, practice! ...the more you practice, the faster you get.
- Starting earlier is always better, spending any amount of time on a regular basis (one hour every Wednesday, for example) is far better than beginning later.
- Do you need a partner? Having a study partner is good to keep each other on track.

- Where do you start? Start by reviewing the content guide on ABR website. Then jump straight into practice with the ABR sample questions. This will allow you to get a feel of what a complex vs simple question may look like.
- Questions from your medical physics homework set (e.g., MU calcs, shielding questions, and radioactive decay) are great for practicing "complex-type" questions. Book questions from those listed in the resources section are also a good resource.
- ABRphysicshelp has great "cliff notes" of relevant material. In addition to abbreviated lecture notes, there are practice sets of questions that represent both simple and complex question types.
- Write out formulas and problems as you solve them. This will allow you to efficiently review past problem sets as you get closer to the exam.
- Making notecards or a "formula sheet" is great way to condense material to have handy while studying in addition to reviewing for your final preparation.
- When practicing problems, think of alternative spins of each question. For example, how to calculate if the units were different or how to calculate a beam match angle if the patient were prone instead of supine.
- Units save lives!! Sometimes answers are very obvious, please keep units and orders of magnitude in mind.
- During the test, do not be alarmed if there is a typo. Do your best with the information given.
- Be aware of the "new type" of questions that ABR is introducing. These include "case-based" questions, which will not allow the test taker to flip back to prior questions in the respective series of the case. Please see the ABR website for more details and examples of the case-based questions.

What other skills are useful?

- Dimensional analysis
 - If one of the answers has the wrong units, it's the wrong answer
- Unit conversion
 - If you don't remember the formula, can you combine the given information to get a result with the right units?
- Calculus and basic trigonometry
 - Basic derivatives and integrals
 - SOHCAHTOA and unit circle
- Practice tests and timing yourself

- Psychology (test taking best practices)
 - Arrange to take the whole day off
 - While you're taking those practice tests, practice staying calm
 - If you can study with someone, having them ask questions and you answer, that might help you learn to remain calm while answering questions
 - Spend the extra money to stay in a hotel near your testing center the night before the exam.
 - Drive by the exam center so you're sure you know where it is
 - Get a good night's sleep before the exam
 - Have a balanced meal before the exam.
 - Get up early enough on exam day that you don't have to worry about getting to the exam site
 - Probably all the test takers will be as nervous as you are, but if there is someone trying to psych you out, try to move away from them
 - Be kind to yourself after the exam - you need to live your life for several weeks while waiting for the results - assume you did well and give yourself a break from studying for it
- Memorize products of combinations of conversion factors.
 - Johns and Cunningham Table 1.1, p. 5
 - Be aware of what is provided on the test by the ABR and ABMP (see content guide)

What resources are available?

- If your employer will pay for your continuing education, consider attending a review class
 - AAPM Summer Meeting has Therapy, Diagnostic, and Nuclear Medicine review courses
 - Check Chapter Meetings for reviews
- ABMP MRI Content Description
- ABMP MHP Content Description
- ABR Content Guide
- ABSNM Specialty Areas
- We Passed
- ABR Physics Help
- Raphex
- Yahoo study group
- Textbooks—keep in mind when reading this list that it is not suggested that one reads every text. Some will find a text more readily understood and helpful than others.
 - Khan, "The Physics of Radiation Therapy"
 - Attix, "Introduction to Radiological Physics and Radiation Dosimetry"
 - Hendee, "Radiation Therapy Physics"
 - Turner, "Atoms, Radiation, and Radiation Protection"
 - Hashemi and Bradley, "MRI: The Basics"
 - Johns and Cunningham, "The Physics of Radiology"

- Hall, "Radiobiology for the Radiologist"
- Bushberg, "The Essential Physics of Medical Imaging"
- Huda, "Review of Radiological Physics"
- Podgorsak, "Compendium to Radiation Physics for Medical Physicists"
- Cherry, "Physics in Nuclear Medicine"
- Knoll, "Radiation Detection and Measurement"
- Mettler, "Essentials of Nuclear Medicine Imaging"
- Hacke MRI book
- Elman MRI book clinical
- Haaga CT and MR book
- Basic Human Anatomy and Physiology Book
- Books of cross-sectional anatomy

How to Study for ABR Part I and ABMP General MP Part I ?

The ABR Medical Physics Part I exam is the first step toward board certification common to every medical physics specialty. The ABMP General Medical Physics Part I can be the starting point for MRI (alternatively, there's also an MR Science exam) and is the starting point for Medical Health Physics. Methods of preparation may be different from individual to individual. In this guide you will find general information to help create a plan for success.

What topics should I study?

- For the most comprehensive and up-to-date listing of topics, see the links to the content guides at the bottom of this document.
- General Section
 - Atomic / Nuclear Physics, Sources of Radiation, Interaction of Radiation with Matter
 - Radiation Instrumentation and Measurement
 - Diagnostic Medical Physics
 - Nuclear Medical Physics
 - Therapeutic Medical Physics (ABR only)
 - Radiation Protection and Safety
 - Professionalism and Ethics
 - Mathematics - Statistics
 - Image Processing - Analysis, Informatics
- Clinical Section
 - Anatomy
 - Cross-sectional anatomy (CT and MRI)
 - Disease states in images
 - Appearance of cancer in images
 - Relative positions of organs
 - Radiation Biology
 - Human Physiology
 - General Medical terminology
 - Prefixes and suffixes
 - General Radiology terminology
 - General Radiation Therapy Terminology
 - Clinical Procedure Applications
 - Radioactive package sending/receiving and transport procedures
 - Pathology

Working fast is especially important on Part I!

- Set a timer and give yourself only 3 minutes per problem!
- Set a timer and complete a bunch of problems in a set amount of time!

What are the last minute things I need to remember?

- Take your photo ID with you. This ID must be valid (not expired) and have a signature.
- Be aware that you might not be able to start the exam at the exact time you were asked to report; if they're screening people one at a time, you might have to wait
- Be prepared for technical bugs and stay calm. If you have a technical problem with the test, Pearson Vue personnel are available to stop the test and help if warranted.
- Bring a sweater, test centers are often kept cold.
- ABR Part I is split into 2 sections, General (80 - 120 questions in 4 hours) and Clinical (75 questions in 1.5 hours) with an optional break (30 min) in between
- Complete as many questions as possible. Do not spend too much time on one question -- Make an educated guess, flag it and return to it if there is time remaining at the end.
- Read each question carefully and ensure you're giving the answer to the question asked.
- Eat before you go to the exam
- Take food and with you to the exam, put this in your locker to eat between the sections
- Do not turn on your phone during the break between sections!

How to Prepare for ABR Parts II and III

The American Board of Radiology (ABR) Medical Physics Parts II and III therapy exams are the second out of a three-part series of exams towards completion of board certification. Once certified, a physicist is considered a qualified medical physicist (QMP). The Part II exam is specialty-specific, this guide attempts to group these exams together where possible and share what may be different for each in other places. Methods of preparation may be different from individual to individual. In this guide you will find general information to help create a plan for success. Please note that board certification content and policies are subject to change, for current board certification policies and procedure please visit the ABR website at www.theabr.org

When Am I Eligible to Sit for ABR Part II and How Do I Register?

- The ABR therapy medical physics exam is offered once a calendar year, typically in August at Pearson VUE testing centers.
- Candidate eligibility is based on completion of a CAMPEP-accredited residency unless a candidate began the process before 2012. Please visit ABR website for current guidelines.
- If you completed a CAMPEP-accredited residency prior to the year that you are applying for the Part 2 exam, you must also provide documentation of current employment as a medical physicist.
- Applicants will apply approximately the winter preceding the exam and will receive notification from the ABR once their application has been approved.
- Since Pearson VUE testing centers are limited in the capacity (with not only Part II's but other test takers), it is recommended to sign up immediately once you have been approved to register for the exam with Pearson VUE. Note that you may be required to place more than one choice for testing center location.

What Are the Testing Logistics for Part II?

- Where -- The exam is a computer-based exam that is administered over several hours at a Pearson VUE testing center.
- Calculator -- The only approved calculator is the Texas Instruments TI-30XS. We recommend to purchase the calculator in advance to allow the opportunity to gain familiarity. Note there is also a backup calculator on Pearson VUE software, but a physical calculator will be the preferred choice for most. The backup calculator is a virtual version of the Texas Instruments TI-30XS, so you may want to become familiar with the operation of this model before you take the test.
- Breaks -- There are allowable breaks (i.e., bathroom, get snack). Note that breaks may be "on the clock" and take away from your test time if you take one that is not scheduled. Testing center personnel may clarify as needed.
- Scratch paper -- There is no scratch paper or anything on your person allowed into the testing room. A marker and dry erase notepad will be provided at the start of the exam. Note that if you fill up your dry erase notepad, you can raise your hand and the proctor will bring an additional notepad to you. It is advantageous not to erase past problems so that you can double check your work at the end if time permits. If your dry erase marker stops working, the proctor can also supply you with another.
- Software -- On the ABR website is a link to download the Pearson VUE software to simulate the testing experience. It is recommended to do so in order to learn how to flag questions and navigate the online testing experience.
- ID -- Bring a valid (not expired) government issued ID. Note that if you recently changed your legal name on your ID, then update your name with ABR, as the identification must match your ABR registered name.
- Locker -- Upon arrival, you will have a locker number assigned to you. You can put snacks, a bottle of water, etc. in here, which you will be allowed to access during the breaks. Consider putting a sweater in your locker if you decided to not wear one.
- Constants and Physical Values -- A list of constants and physical values that will be provided on the day of the exam is provided on the ABR website. Please note that it may be required to convert to other units and this list is not exclusive.
- Time -- Do not spend too much time on any individual question. If you do not know the answer, take an educated guess and move on. Note that if you finish the exam before the allotted time is up, you can return to previously answered questions. Flagging questions is helpful to highlight certain questions you would like to review at the end. Note that some of the "new type" of questions may not allow you to "go back" to a prior question if in a series of questions.
- Disabilities -- Please see ABR website for details on how to apply for disability accommodations.

When Am I Eligible to Sit for ABR Part III and How Do I Register?

- You have six years from the end of residency or when you are approved to take Part II to pass Part III

- The January or February after you pass Part II, you'll receive an invitation from ABR to sit for Part III
- You need to respond to this invitation
- A month or two later, you'll receive a bill, which you need to pay promptly
- At this point, you should strongly consider taking Part III, no matter what happens (because they charge extra to cancel)

What Are the Testing Logistics for Part III?

- Fly in at least the day before your exam. The ABR will attempt to accommodate examinees in the event of delayed arrival outside of the examinee's control. But it's best to arrive on time.
- When you arrive at the facility, you'll see signs indicating where the exams are and that you should not go into the testing area until it is time for your exam
- Bring your ID and nothing else to the exam; note that you will have to leave your phone and watch in your backpack or in a box in the orientation room
- In the orientation room, you will receive a list of your examiners and be asked to immediately report any conflicts of interest with these
- After orientation, you will stand outside the door of your first examiner's room until the examiner invites you in
- In each room, one examiner will sit next to you at a table; there will be a computer in front of you on which the questions are displayed, one at a time
- Each examiner will ask you five questions, many of which will be multi-part questions; you have approximately 5 minutes per question
- The examiner is not allowed to give you any feedback during your exam, other than check the time
- There will be scratch paper and a pen in each room. You are encouraged to write, draw, and calculate with these
- Be aware that each test giver is watching the time and may move you along to the next question before you finish - this is to your benefit
- If you don't know the answer to the question, you can write or talk through your thoughts on the subject or ask to be allowed to answer this question last in this room
- If you have time left over after you've answered the 5 questions, you can then ask to go back to an earlier one (within the same room)
- Note that there will be people supervising the examiners walking around during your exam, and they might come into the room to watch your examiner and monitor the test-taking environment; ignore them.
- Bells will chime after you've had 25 minutes with one examiner, and that is the signal to wrap up your answer and go stand outside the next room
- There are restrooms available during the test— ask. If you can, do this during the 5-minute passing period between rooms
- There is water available if you need it— ask
- After your exam, you will be asked to leave the exam area

How to Prepare for ABR Parts II and III Therapy

The ABR content guide (therapy) lists the relevant material of the ABR Part II and III medical physics exam and includes:

- Reference and Relative Dosimetry
- Treatment Machines
- Therapy imaging and room design
- Patient safety
- Data transfer and integrity
- Professionalism and ethics
- Treatment planning for photons, electrons, SRS, SBRT, inter- and intra-fraction variations
- Planning system safety
- Brachytherapy
- Radiation protection and radiation biology
- Patient-Related Measurement
- Calibration, Quality Control, Quality Assurance
- Image acquisition, processing, and display
- Equipment for QC and QA
- Part III is more clinically applied than Part II

Resources (Note some helpful resources, not a complete list)

- Textbooks: McGinley, Khan, Bushberg, Khan lectures, Karzmark
- AAPM Task groups: TG 51 and its Addendum, TG 142, TG 40, MU Calc (TG71), TG 66, TG 132, TG 43 Revision, TG 25 and TG 70, etc.
- Publications: NCRP 151, NRC regulations
- Review Materials: ABRPhysicsHelp, Wepassed, Raphex, Yahoo Med Phys Board Preparation
- AAPM virtual library
- Your CAMPEP-medical physics class and residency notes

How to Prepare for ABR Parts II and III Diagnostic

The ABR content guide (diagnostic) lists the relevant material of the ABR Part II medical physics exam and includes:

- Radiography, mammography, DBT, stereo, fluoroscopy interventional imaging, CT, MRI, and ultrasound
- Informatics, image display, and image processing
- Detectors
- Radiation biology
- Dosimetry
- Radiation protection and safety
- MRI safety
- US safety

Resources (Note some helpful resources, not a complete list)

- Textbooks: Khan, Bushberg, Hall, Knoll
- AAPM Task groups: TG 65, 93, 96, 100, 111?, .25, 144?, 151, 190, 196, 204, 220, 232, OR03

- NCRP 147, 160, 168, 172, 174, others???
- Bier
- Wagner
- Regulations: 21 CFR 1020.30, 10 CFR 20,
- Review materials: Wepassed, Raphex,
- AAPM virtual library
- Your CAMPEP-medical physics class and residency notes
- Know how all the equations in your survey forms work and why

How to Prepare for ABSNM and ABR Parts II and III Nuclear Medicine Exams? What topics should I study?

- Many of the same topics listed above for Part I ABR and ABMP
- AAPM TG 52, 96, 108, 144, 160, 181, 211, OR03
- NCRP 147, 160, 161, 164, 174
- See the ABR and ABSNM study guides

How to Study for the ABMP MRI Exams?

From the New Professionals Subcommittee and Professional Mentorship Working Group With Dave Jordan

For ABMP Parts I and II, many of the logistics are similar to ABR Parts I and II, so read those strategies for test taking. You will have to travel to the exams, so plan ahead and travel early in case there are airline issues.

What Are the Testing Logistics for Part III?

- You will stand in front of a three-examiner panel
- There is an easel you can use during your answers
- There are seven topic areas; if you fail only one or two, you will condition

What topics should I study?

- Many of the same topics listed above for Part I ABR and ABMP
- See the preparation instructions on the ABMP website for Part I, Part II, and Part III
- AAPM TG 20, 28, 34, 77, 78, 100, 118, 196
- Chemistry and biochemistry relevant to contrast agents
- Siting issues
- ACR siting white paper
- ACR MRI QC manual
- Clinical applications
- Deep clinical awareness
- Close work with technologists, if this is possible
- MR safety
- Panych and Madore MR safety article
- Handbook of MRI Pulse Sequences
- K-space in the Clinic review article

- Mostly you'll need to know non-manufacturer-specific material
- Pick a favorite manufacturer and know their sequences in detail for the oral exam

What are the last minute things I need to remember?

- Make sure you know where the exam rooms are in advance of your exam time