

**Report from AAPM Liaison to RSNA Education Council**  
**James T. Dobbins III, PhD, FAAPM**  
**3/21/18**

I attended the 2018 RSNA Education Council meeting and shared reflections from AAPM on our priorities in education.

See the appendix for the formal written report that I filed with RSNA prior to the meeting.

**Broad topics discussed at the meeting**

1. Update from the executive director on member statistics.
2. Update from the Board of Directors of RSNA on priorities related to education.
3. Proposals for new ideas pertaining to education at the annual meeting
4. Annual meeting education programming
5. Discussion of 3D surface reconstructions or 3D printing in talks and presentations and the requirements from HIPAA to mask the identity of the patient
6. Discussion of a number of informatics based classes and hands-on activities at the annual meeting
7. Presentation by AAPM (see my comments below)
8. Discussion of Radiographics journal
9. Discussion of Radiology journal
10. Decision to add new content codes for fluoro and machine learning
11. Discussion of adding medical physics to the list of educational objectives. They will discuss how to word those objectives and will contact AAPM as needed.

**Summary of my verbal comments on behalf of AAPM**

1. We very much appreciate the great relationship AAPM has with RSNA. This is a very significant relationship to us that has gone on for many years and we are very grateful for the wonderful way in which our two organizations partner and collaborate on a number of important initiatives related to imaging.
2. In terms of our collaborations related to educational matters, there are three items that I would like to mention briefly.
  - a. AAPM members provide a number of physics courses during the RSNA meeting. I have listed these in the AAPM Liaison report. These are generally of very high quality and provide important scientific content to meeting attendees, both physicists and radiologists.
  - b. The RSNA/AAPM online educational modules. These provide online educational content for use by both radiologists and physicists and are again, generally of very high quality. They are particularly useful in the education of radiology residents. These modules have been revised and updated, which is a joint effort of RSNA and AAPM.

- c. There was support by RSNA 5 years ago to enable us to start 8 new imaging residencies. These residencies were jointly funded by RSNA and AAPM and have resulted in 8 CAMPEP-accredited residency programs in imaging physics. More about residency slots in a minute.
- 3. In terms of educational themes that are important to both AAPM and RSNA, let me give you an idea of my three top priorities for the EC of AAPM. Our top three goals are:
  - a. To evaluate the balance of educational program output (number of graduate students and residents) versus the workforce needs. There has anecdotally been the opinion expressed by some that we are producing more graduate students than can be supported by the marketplace. This has some reality in that not all graduates get residencies, but this is a bit misleading in that not all physicists in medicine work in clinical practice. We are trying to emphasize with our students career options available to them including doing academic research to push the frontiers of medicine, work in industry, and work in government, such as at the FDA. We are forming a task group to collect more reliable data on the workforce issue.
  - b. Second, is to understand if additional residencies still need to be created. We currently have 53 accredited graduate programs; 121 accredited residency programs, with an average of about 1.5 resident slots per year per program; and 4 DMP programs. This compares very well to the roughly 175 that we initially estimated 10 years ago would be needed. However, a problem is that the vast majority of these are in radiation oncology; we have on 22 accredited programs in imaging physics, and in 2016 (the last year with full survey data) those programs had 18 new residents enrolled, though we might expect that number to grow in the next few years to about 30 imaging residency slots per year. We hear from individuals that they have a hard time finding credentialed and certified diagnostic physicists to hire, so our sense is that there is an undersupply of qualified imaging physicists. This is likely to become worse as a large number of imaging physicists are over the age of 55. Therefore, we feel that it is important to increase the number of imaging physics residencies or else we face a significant shortage in the coming years. The AAPM board has taken the step to designate \$70,000 of funding per year to establish 2 new imaging or nuclear medicine residency slots for 2 years, with the idea that this funding will be given to programs to develop sustainable programs that will live beyond the funding period. We see this as the first step in increasing the number of such residency slots. We sent to the RSNA board in February of this year a letter requesting that RSNA consider joining us in this endeavor by providing matching funding. In particular we proposed to the RSNA board that RSNA collaborate with AAPM to share costs to establish 12 new imaging physics residency positions between 2019-2026, with 50% funding coming from recipient institutions. We hope the RSNA board will respond

favorably. We would really like to see the number of imaging physicists increase across the country.

- c. Third is to position education to address changes in the direction of physics in medicine. As medicine matures, and we expect more molecular therapeutics and diagnostics, the role that physicists may play in developing medicine of the future is likely to be different than it is today. We need to be determining what role physics should play in medicine in the next 30 or 40 years. This is an important initiative of AAPM. There will be educational implications from these new directions in medicine, and we need to know how to plan so that we can produce the scientists needed to advance the field and the physicist practitioners to implement that.
4. This brings me to a comment on the balance of science versus professional practice. The field of medical physics has undergone a significant professionalization in the past 20 years. This was largely driven by the requirement of the ABMS that we develop a standardized residency practice to accompany our board certifications by the ABR. As a result, we have developed a number of new residencies and so our new graduates receive a level of clinical training that is much more consistent than it was a few years ago. However, we need to be sure that we do not diminish our role as scientists that will move forward innovations in medicine. I'm afraid that some of the emphasis on professionalization has caused a diminished view of the role we play in science, but there are some of us at the highest levels of AAPM pushing back against that. This will involve active work in identifying the role that physics can play in developing and accelerating quantitative, biomarker based medicine of the future. We also have developed a new educational and professional approach called MP 3.0 to train new physicists how to offer better value as part of the team in a radiology department, including providing quantitative and scientific approaches to improving image quality and diagnostic performance.
5. I want to again thank RSNA for the great cooperation we have had in educational and scientific ventures in the past, and we look forward to that continuing. I would be happy to answer any questions.

## APPENDIX

### **Report to RSNA Education Council March 21, 2018**

**James T. Dobbins III, PhD  
Chair, AAPM Education Council**

#### **RSNA AAPM Educational 2017 Activities: 2017 RSNA Program**

##### **AAPM Medical Physics Tutorial Session 1** (Organizer: Thaddeus A. Wilson, PhD)

Digital Breast Tomosynthesis, Andrew D. Maidment, PhD

CT Breast Imaging, John M. Boone, PhD

TMIST Update, Martin J. Yaffe, PhD

Stereotactic Breast Biopsy, Ingrid Reiser, PhD

##### **AAPM Medical Physics Tutorial Session 2** (Organizer: Thaddeus A. Wilson, PhD)

Ultrasound Breast Imaging, Wendie A. Berg, MD, PhD

MRI Breast Imaging, Donna M. Reeve, MS

Contrast Enhanced Mammography, John M. Lewin, MD

Molecular Breast Imaging, Michael K. O'Connor, PhD

##### **AAPM/RSNA Basic Physics Lecture for the RT: Standardizing Image Quality in Digital Radiography** (Organizer: Scott J. Emerson, MS)

Presenter: Alisa Walz-Flannigan, PhD

##### **Physics Symposium: Proton** (Organizer: Holly Lincoln)

Introduction: History & Advances in Proton Therapy, Indra J. Das, PhD

Proton Therapy: Promises, Principles, and Proof, Nancy P. Mendenhall, MD

Miniaturization Technology and Proton Machines, Vladimir Derenchuk, MSc

Advances in TPS and Optimization, Tony Lomax

Pencil Beam Scanning, Ronald X. Zhu, PhD

Administrative Hurdles of Setting Up Proton Beam, Anita Mahajan, MD

Proton Therapy for Ocular Cancers, Alexei V. Trofimov, PhD

Proton Imaging: Advances, Promises and Peril, Katia Parodi

Motion Management in Particle Therapy, Shinichiro Mori

Neutrons in Proton Beam, Chee-Wai Cheng

##### **Case of the Day: Physics** (David Gaunt, PhD)

#### **PHYSICS TRACKS**

##### **TRACK 21**

Coordinators: Ehsan Samei, Ph.D. and Norbert J. Pelc, DSc.

### **Advances in CT: Technologies, Applications, Operations—CT System**

#### **Advances**

Closed Gantry Systems Advances in X-ray Sources and Detectors, Norbert J. Pelc, ScD

Open Gantry Systems: Advances, Challenges, and New Applications, Jeffrey H.

Siewerdsen, PhD

Novel CT Acquisition Techniques, Lifeng Yu, PhD

### **Advances in CT: Technologies, Applications, Operations—Spectral CT**

Data Acquisition and Image Formation Methods for Multi-Energy CT, Cynthia H.

McCollough, PhD

Applications, Sebastian T. Schindera, MD

Future Prospects—Photon Counting, Taly G. Schmidt, PhD

### **Advances in CT: Technologies, Applications, Operations—Functional CT**

Contrast Administration for Cardiovascular Imaging and Beyond, Dominik Fleischmann, MD

Perfusion Techniques and Applications—Stroke and Cancer, Ting-Yim Lee, MSc, PhD

Perfusion Techniques and Applications—Cardiac, Aaron So, PhD

### **Advances in CT: Technologies, Applications, Operations—CT Operation**

Statistical and Iterative Reconstruction and Image Domain Denoising, Norbert J. Pelc, ScD

Protocol Optimization and Management, Mannudeep K. Kalra, MD

Dose Monitoring and Analytics, Joshua Wilson, PhD and Ehsan Samei, PhD

### **Advances in CT: Technologies, Applications, Operations—Special Purpose CT**

Breast, John M. Boone, PhD

MSK, Wojciech Zbijewski, PhD

Interventional, Charles M. Strother, MD

### **Advances in CT: Technologies, Applications, Operations—CT Performance**

Dose and Risk Characterization, Ehsan Samei, PhD

Image Quality Estimation, Guang-Hong Chen, PhD

Performance Evaluation, TG233, Ehsan Samei, PhD

### **Advances in CT: Technologies, Applications, Operations—Quantitative CT (QIBA)**

**Volumetry**, Michael F. McNitt-Gray, PhD

**Material Identification**, Daniele Marin, MD

**Texture Characterization**, Samuel G. Armato III, PhD | Maryellen L. Giger, PhD

## **TRACK 22**

Director: Kristy Brock

### **Imaging for Personalized Medicine: Head and Neck** (Moderator: Robert Jeraj)

Anatomical Imaging for Personalized Medicine in the Head and Neck, Emilie Soisson, PhD

Functional Imaging for Targeting and Adaptation in the Head and Neck, Robert Jeraj

**Imaging for Personalized Medicine: Thorax** (Moderator: Martha M. Matuszak, PhD)

Anatomical Imaging for Personalized Medicine in the Thorax, Geoffrey Hugo, PhD  
Functional Imaging for Targeting and Adaptation in the Thorax, Martha M. Matuszak, PhD

**MRI: Imaging for Radiation Treatment Planning** (Moderator: Eric Paulson)

MRI for Anatomical Definition, Eric Paulson  
MRI for Functional Definition, Uulke A. van der Heide, PhD

**Imaging for Personalized Medicine: Abdomen** (Moderator: Kristy K. Brock, PhD)

Anatomical Imaging for Personalized Medicine in the Abdomen, Kristy K. Brock, PhD  
Functional Imaging for Personalized Medicine in the Abdomen, Laura A. Dawson, MD

**MRI: Imaging for Radiation Treatment Guidance and Verification**

(Moderator: John E. Bayouth, PhD)  
In-Room MRI for Treatment Guidance, John E. Bayouth, PhD  
Integrating MRI: The Clinician Perspective, Caroline Chung, MD, FRCPC

**Imaging for Proton Treatment Planning** (Moderator: Jon J. Kruse, PhD)

Uncertainties in Imaging for Proton Therapy Dose Calculations, Andrew Wroe, PhD  
Uncertainties in Motion for Treatment Planning, Heng Li

**Imaging for Proton Treatment Guidance and Verification** (Moderator: Jon J. Kruse, PhD)

Pre- and Intra-treatment Imaging Strategies for Patient Alignment, Jon J. Kruse, PhD  
Advanced Imaging Techniques for Range Verification, Brian A. Winey, PhD, MS

## **TRACK 23**

Organizer: James Kofler, PhD

**Molecular Imaging Mini-Course: Basics of Molecular Imaging**

Developing Molecular Imaging Agents, Martin G. Pomper, MD, PhD  
Instrumentation (PET and CT) and Image Reconstruction, John Sunderland, PhD  
Basic Clinical Applications, Hubert J. Vesselle, MD, PhD

**Update on the Maintenance of Certification Program (MOC) for ABR Medical Physics Diplomates** (Director: G. Donald Frey, PhD)

Speakers: G. Donald Frey, PhD, J. Anthony Seibert, PhD, Matthew B. Podgorsak, PhD

**MR Safety**

Case Review of Real MR Safety Incidents, Armen Kocharian, PhD  
MRI Safety of Deep Brain and Other Simulators, Yunhong Shu, PhD  
MRI Conditional Pacemakers: What to Do?, Anshuman Panda, PhD  
MRI Safety in the MR-Guided Interventional Environment, Krzysztof Gorny, PhD

**Molecular Imaging Mini-Course: Advanced Molecular Imaging**

Novel Tracers, Timothy R. DeGrado, PhD

Novel Instrumentation (PET/MR), Ciprian Catana, MD, PhD

Molecular Imaging with MR, Peter D. Caravan, PhD

**Clinical Applications of Molecular Imaging: Neuro MRS and PET**

Oncology Applications, Hyunsuk Shim, PhD

Functional Applications, Satoshi Minoshima, MD, PhD

**Evolving Perspectives on Ultrasound Safety** (*new for 2017, first run*)

(Director: J. Brian Fowlkes, PhD)

Ultrasound Safety: Understanding the Potential Bioeffects, J. Brian Fowlkes, PhD

Ultrasound Safety: What You Should Tell the Clinicians, Jacques S. Abramowicz, MD

Diagnostic Ultrasound Regulation: Substantial Equivalence, Novel Technologies, and Reasonable Assurance of Safety and Effectiveness, Shahram Vaezy, PhD

**Molecular Imaging Mini-Course: Clinical Applications of Molecular Imaging—Oncology**

Diagnosis, Terence Z. Wong, MD, PhD

Staging, Dominique Delbeke, MD, PhD

Evaluation of Treatment, David A. Mankoff, MD, PhD

**TRACK 25**

Organizer: Michael F. McNitt-Gray, PhD

**Radiomics Mini-Course: Promise and Challenges** (Moderators: Sandy Napel, PhD and Michael F. McNitt-Gray, PhD)

An Overview of Radiomics, Maryellen L. Giger, PhD

From Radiomics to Radiogenomics, Hugo Aerts, PhD

Challenges for Radiomics and Radiogenomics, Karen Drukker, PhD

**Radiomics: Mini-Course: Oncologic Applications** (Moderators: Sandy Napel, PhD and Michael F. McNitt-Gray, PhD)

Breast Cancer with PET-CT, Richard L. Wahl, MD

Radiogenomics of Lung Cancer, Neema Jamshidi, MD, PhD

Brain Cancer: Radiomics, Radiogenomics, and Big Data, Rivka R. Colen, MD

**Radiomics Mini-Course: From Image to Omics** (Moderators: Sandy Napel, PhD and Michael F. McNitt-Gray, PhD)

Image Annotation and Semantic Labeling, Daniel L. Rubin, MD, MS

Image Feature Computation and Considerations, Sandy Napel, PhD

Correlating Image Features with Multi-Omics Data, Olivier Gevaert, PhD

**Radiomics Mini-Course: Informatics Tools and Databases** (Moderators: Sandy Napel, PhD and Michael F. McNitt-Gray, PhD)

The Role of Challenges and Their Requirements, Jayashree Kalpathy-Cramer, MS, PhD  
Quantitative Image Analysis Tools: Communicating Quantitative Image Analysis Results, Andriy Fedorov, PhD  
Public Databases for Radiomics Research: Current Status and Future Directions, Justin Kirby

**Quantitative Imaging Mini-Course: Promise and Challenges** (Moderator: Michael F. McNitt-Gray, PhD)  
The Perspective of the RSNA Quantitative Imaging Biomarkers Alliance (QIBA), Edward F. Jackson, PhD  
NCI's Quantitative Imaging Network (QIN) Perspective, Robert J. Nordstrom, PhD  
Clinical Trials Perspective, Lawrence H. Schwartz, MD

**Quantitative Imaging Mini-Course: Image Modality Specific Issues** (Moderator: Michael F. McNitt-Gray, PhD)  
Quantitative Imaging for Computed Tomography: Applications and Future Directions, Samuel G. Armato III, PhD  
Quantitative Imaging for PET-CT: Applications and Future Directions, Robert Jeraj  
Quantitative Imaging for DCE-MRI: Applications and Future Directions, Yue Cao, PhD

**Quantitative Imaging Mini-Course: Modality Independent Issues** (Moderator: Michael F. McNitt-Gray, PhD)  
The Role of Physical Phantoms in Quantitative Imaging, Paul E. Kinahan, PhD  
Digital Reference Objects, Daniel P. Barboriak, MD  
CT Image Analysis and Sources of Variation, Binsheng Zhao, DSc

**Quantitative Imaging Mini-Course: Statistical Analysis/Metrology Issues** (Moderator: Michael F. McNitt-Gray, PhD)  
The Role of Metrology in Quantitative Imaging, Hyung J. Kim, PhD  
Methods for Technical Performance Assessment: What to Assess and How, Nicholas Petrick, PhD  
Statistical Methods and Principles for Algorithm Comparison Assessment, Gene Pennello, PhD



## **RSNA AAPM Educational 2018 Activities: 2018 RSNA Program**

### **AAPM/RSNA Medical Physics Tutorial Session 1** (Organizer: Thaddeus A. Wilson, PhD)

PET/CT Introduction and Clinical Applications, Osama R. Mawlawi, PhD

PET/MR Introduction and Clinical Applications, Robert A. Pooley, PhD

Quantitative SPECT, Benjamin M. Tsui, PhD

### **AAPM/RSNA Medical Physics Tutorial Session 2** (Organizer: Thaddeus A. Wilson, PhD)

The Nuts and Bolts of Dosimetry in Medicine and its Application, Michael G. Stabin, PhD

Theranostics Introduction and Applications, Hossein Jadvar, MD, PhD

### **AAPM/RSNA Basic Physics Lecture for the RT**

(Organizer: Scott J. Emerson, MS)

Basic Dual Energy CT Applications in Radiation Therapy, Jessica Miller, PhD

### **Physics Symposium: Highlights of Medical Physics Leadership Academy (MPLA)**

#### **Summer School** (Organizer: Holly Lincoln)

Jennifer Lynn Johnson, PhD

Daniel Pavord, MS

Robert J. Pizzutiello JR, MS

Michael Howard, PhD

### **Case of the Day: Physics** (Karen Brown)

## **PHYSICS TRACKS**

### **TRACK 21**

#### **RC121 Advances in CT: Technologies, Applications, Operations-Quantitative CT (QIBA)**

Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.

Volumetry, Michael F. McNitt-Gray, PhD

Material Identification, Daniele Marin, MD

Texture Characterization, Samuel G. Armato III, PhD

Texture Characterization, Maryellen L. Giger, PhD

#### **RC221 Advances in CT: Technologies, Applications, Operations-Special Purpose CT**

Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.

Breast CT applications, John M. Boone, PhD

MSK CT applications, Wojciech Zbijewski, PhD

Interventional CT applications, Tobias Struffert

#### **RC321 Advances in CT: Technologies, Applications, Operations-Spectral CT**

Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.

Data Acquisition and Rendition Methods, Cynthia H. McCollough, PhD  
Applications, Sebastian T. Schindera, MD  
Future Prospects - Photon Counting, Taly G. Schmidt, PhD

**RC421 Advances in CT: Technologies, Applications, Operations-Functional CT**

Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.  
Contrast Administration for Cardiovascular Imaging and Beyond, Dominik Fleischmann, MD  
Perfusion Techniques and Applications - Stroke and Cancer, Ting-Yim Lee, MSc, PhD  
Perfusion Techniques and Applications - Cardiac, Aaron So, PhD

**RC521 Advances in CT: Technologies, Applications, Operations-CT Performance**

Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.  
Image Quality Characterization, Guang-Hong Chen, PhD  
Performance Evaluation, Yakun Zhang, PhD  
Performance Evaluation, Ehsan Samei, PhD  
Performance Optimization, Justin Solomon, PhD  
Performance Optimization, Ehsan Samei, PhD

**RC621 Advances in CT: Technologies, Applications, Operations-CT Practice**

Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.  
Practice management, Tim Szczykutowicz, PhD  
Practice optimization, Mannudeep K. Kalra, MD  
Practice monitoring, Joshua Wilson, PhD  
Practice monitoring, Ehsan Samei, PhD

**RC721 Advances in CT: Technologies, Applications, Operations-CT Systems**

Coordinators: Ehsan Samei, Ph.D. and Lifeng Yu, Ph.D.  
MDCT systems and acquisitions, Lifeng Yu, PhD  
Cone-beam systems and acquisitions, Jeffrey H. Siewerdsen, PhD  
Statistical and iterative reconstruction, Frederic Noo, PhD

**TRACK 22**

Director: Kristy Brock

**RC122 Anatomical MR Imaging for Radiotherapy Planning and Guidance**

State of the Art in Anatomical MR imaging, Aradhana M Venkatesan  
Clinical need for Anatomical MR imaging in Radiation Therapy, Cynthia Ménard  
Technical Challenges in the Integration of Anatomical MR Imaging into Radiotherapy, Carri Glide-Hurst

**RC222 Functional MR Imaging for Tumor Targeting in Radiotherapy**

State of the Art in Functional MR imaging for Tumor Targeting, Jason Stafford  
Clinical need for Functional MR imaging for Tumor Targeting in Radiation Therapy,  
Technical Challenges in the Integration of Functional MR Imaging for Tumor Targeting into Radiotherapy

**RC322 Functional MR Imaging for Normal Tissue Response Assessment in Radiotherapy**

State of the Art in Functional MR imaging for Normal Tissue Assessment,  
Clinical need for Functional MR imaging for Normal Tissue Assessment in Radiation Therapy , Clifton David Fuller

Technical Challenges in the Integration of Functional MR Imaging for Normal Tissue Assessment into Radiotherapy

**RC422 Dual Energy CT for Radiotherapy Applications**

State of the Art in Dual Energy CT Technology , Kruse, Jon J., Ph.D.

Clinical Need for Dual Energy CT in Proton Radiotherapy, Jessica Miller, Ph.D.

Technical Challenges in the Integration of Dual Energy CT into Radiotherapy Treatment Planning , Kruse, Jon J., Ph.D.

**RC522 Advanced PET Imaging for Radiotherapy Planning and Response Assessment**

State of the Art in PET Imaging , Paul Kinahan

Clinical Need for PET imaging in Radiotherapy

Technical Challenges in the Integration of PET imaging into Radiotherapy Treatment Planning, Steven Bowen

**RC622 Advances in CBCT Acquisition and Reconstruction in Radiotherapy**

State of the Art in Advanced CBCT Acquisition and Reconstruction

Clinical Need for advanced CBCT imaging in Radiotherapy, Tianyu Zhao

Technical Challenges in the Integration of CBCT imaging into Radiotherapy , Doug Moseley

**RC722 Machine Learning for Radiotherapy Applications**

Deep Learning for Image Segmentation, Analysis and Reconstruction, Jonas Teuwen

Machine Learning tumor classification, Jayashree Kalpahy-Cramer

Machine Learning for Automated treatment planning, Laurence Court

**TRACK 23**

**RC123 ACR Accreditation Updates I**

Coordinator: James M. Kofler, PhD

ACR CT Accreditation Update, Chad Dillion, PhD

ACR MRI Accreditation Update, Donna Reeve, PhD

ACR Nuclear Medicine and PET Accreditation Update, Beth Harkness

ACR Accreditation Updates II, James M. Kofler, PhD

**RC223A ACR Breast X-Ray Imaging Accreditation Update, Eric Berns**

Coordinator: James M. Kofler, PhD

ACR US Accreditation Update, Zhengfeng Lu, Ph.D.

ACR Accreditation: Preparing for a Site Visit, Heidi Edmonson, PhD

**RC323 Evolving Perspectives on Ultrasound Safety**

Coordinator: J. Brian Fowlkes, PhD

Ultrasound Safety: Understanding the Potential Bioeffects, J. Brian Fowlkes, PhD

Ultrasound Safety: What the clinician should know, Jacques S. Abramowicz, MD  
Ultrasound safety-What you should know about therapeutic ultrasound, Ken Bader, PhD

**RC423 Making Patients and Staff Safer in Interventional Procedures**

Coordinators: William F. Sensakovic, PhD and Thaddeus A Wilson, Ph.D.  
Patient Doses (in lab) and patient dose management, Steve Balter, PhD  
Staff Protection- Cataract and potential cancers, Madan Rehani, PhD  
Dose tracking and audits- Institution-wide program, Pei-Jan Lin PhD

**RC523 Optimization and Technology in Interventional Radiology**

Coordinators: William F. Sensakovic, PhD and Thaddeus A Wilson, Ph.D.  
Dose Optimization in the Interventional Suite, Robert G. Dixon, PhD  
Using Ultrasound in Place of CT and Fluoroscopy in the Interventional Suite, Patrick Warren, MD  
Advances in Interventional Use of CT, Chuck Mistretta, PhD

**RC623 Advanced Ultrasound Technology and Applications**

Coordinators: William F. Sensakovic, PhD and Thaddeus A Wilson, Ph.D.  
Contrast Agents, Peter Burns, PhD  
Strain Imaging, Steve McAleavey, PhD  
Practical Clinical Advice on the use of Contrast and Strain Imaging, Richard Barr, PhD

**RC723 Diagnostic Imaging: Contrast Makes all the Difference**

Coordinator: Charles E. Willis, PhD  
Diagnostic Imaging: Contrast Makes all the Difference: 1, Andrew D. A. Maidment, PhD  
Diagnostic Imaging: Contrast Makes all the Difference: 2, J. Anthony Seibert, PhD  
Diagnostic Imaging: Contrast Makes all the Difference: 3, Robert L. Dixon, PhD

**RC823 CT radiation dose reduction: techniques and clinical implementation**

Coordinator: Lifeng Yu, PhD  
Overview of technology for radiation dose reduction, Joseph W. Stayman, PhD  
Dose optimization strategy and clinical implementation in adult CT, Lifeng Yu, PhD  
Dose reduction and protocol optimization in pediatric CT, Robert D. MacDougall

**TRACK 25**

**RC125 Medical Physics 3.0: Re-envisioning Medical Physics in the Era of Value-based and Precision Healthcare**

Coordinators: Todd Pawlicki, PhD and Ehsan Samei, PhD  
Medical Physics 3.0: Re-envisioning Medical Physics in the Era of Value-based and Precision Healthcare, Todd Pawlicki, PhD  
Medical Physics 3.0: Re-envisioning Medical Physics in the Era of Value-based and Precision Healthcare, Ehsan Samei, PhD

**RC225 Mini-course: Image Interpretation Science -- Clinical Foundations of Medical Image Perception: Why Study Radiologists**

Coordinators: Elizabeth Krupinski and Ehsan Samei, PhD  
Clinical Relevance of Perceptual Issues in Radiology, Francine L. Jacobson, MD, MPH  
A Short History of Image Perception in Radiology, Elizabeth A. Krupinski, PhD

**RC325 Mini-course: Image Interpretation Science -- Radiologic Expertise:  
Incorporating Perception into Training**

Coordinators: Elizabeth Krupinski and Ehsan Samei, PhD  
On the Development of Expertise in Image Interpretation, Elizabeth A. Krupinski, PhD  
Using Expert Interpretation Strategies to Teach Trainees, William Auffermann, MD, PhD  
Formal Assessment of Practicing Radiologists, Alastair G. Gale, PhD

**RC425 Mini-course: Image Interpretation Science -- Computational Perception**

Coordinators: Elizabeth Krupinski and Ehsan Samei, PhD  
AI in Clinical Radiology, Maryellen L. Giger, PhD  
Intersection of Imaging Informatics and Perception, Katherine P. Andriole, PhD  
Radiologist Interpretation in the Era of AI, Curt Langlotz

**RC525 Mini-course: Image Interpretation Science -- Perception in the Clinic**

Coordinators: Elizabeth Krupinski and Ehsan Samei, PhD  
Impact of Fatigue on Radiologists' Performance, Elizabeth A. Krupinski, PhD  
Perception of Volumetric Image Data, Geoffrey D. Rubin, MD  
Role of Image Quality in Visual and Computational Perception, Justin B. Solomon, PhD  
Role of Image Quality in Visual and Computational Perception, Ehsan Samei, PhD

**RC625 Mini-course: Radiation safety for patients and staff -- Emerging advances in  
patient radiation protection**

Coordinator: Madan M. Rehani, PhD  
Emerging concepts of integration of image quality, radiation dose, and artificial intelligence, Ehsan Samei, PhD  
Practical aspects of integration of clinical image quality and patient dose optimization, Madan M. Rehani, PhD

**RC725 Mini-course: Radiation safety for patients and staff -- Practice tools and  
approaches for radiation safety**

Coordinator: Madan M. Rehani, PhD  
Decision support systems as effective tools, James A. Brink, MD  
Safety in CT of children, Donald P. Frush, MD  
Safety in nuclear medical procedures, Andrew J. Einstein, MD, PhD  
Safety in interventional fluoroscopic procedures, Donald Miller, PhD