Medical Physics Residencies - 101: The What's, Where's, and How's

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Xspect Inc.

Outline

- Autobiographical Sketch
- Medical Physics the what and the why
- Medical Physics Residency Programs
- Structural Example of a Residency Program
- CAMPEP
- ABR/CCPM
- Applying to a Residency Program
- Medical Physics Resources

About Me

- Former Laurentian University undergraduate and graduate student
- Graduated with B.Sc. (Hon.) Applied Physics in 2006
- Graduated with M.Sc. Physics in 2009
- Medical Physics Resident: 2010-2012
 - Baylor Health Care System
- Research Physicist: 2012-2014
 - Sunnybrook Health Sciences Centre
- Physicist: March 2014 present
 - Xspect Inc.

What is Medical Physics?

- Simply put: the application of physics to medicine.
- More formally: the applications of physical energy, concepts, and methods to the diagnosis and treatment of human disease
- Three main avenues:
 - Diagnostic physics
 - Nuclear Medicine
 - Radiotherapy

What do Medical Physicists do?

- Clinical Services and Consultations
 - Dx Imaging/Rad Therapy/NM Imaging
 - Equipment Performance
 - Shielding Considerations
 - Imaging Problems
 - Patient Consultations

What do Medical Physicists do?

- Research and Development
 - Radiobiology
 - Application of new high-energy machines for patient treatment
 - New techniques for accurate measurements of radiation
 - Digital Imaging Methods
- Teaching
 - Post-secondary appointments to medical physicists, resident physicians, medical students, and radiographic technologists

Medical Physics Residency Programs

- Objective
 - To educate and train medical physicists to a level of competency sufficient to practice the desired Medical Physics field (diagnostic imaging, therapy, nuclear medicine) independently.

 Prepare the resident for his/her board certification exam.

Diagnostic Physics Residency Structure

- Residency program broken into II modules over two years:
 - Radiography
 - Fluoroscopy
 - Digital Radiography
 - Magnetic Resonance Imaging
 - Computerized Tomography
 - Ultrasound
 - Mammography
 - Image Display, Processing, and Informatics
 - Image Quality
 - Shielding
 - Dose Estimates, Radiobiology, Dose Reduction, and Personnel Dosimetry

Module Completion Requirements

- Observe the testing of at least five units (or as needed)
- Independently test one unit under supervision
- Written test
- Oral test
- Remedial work (if needed)
- For one module, this would typically amount to about two to three months of work.

My Job Responsibilities

- Observation, supervised testing, and independent testing of imaging equipment.
- Assisting with teaching of Radiology residents, MRT's, and in-services to physicians.
- Occupational worker pregnancy consultations.
- Shielding considerations/calculations.
- Adult and Fetal Dose Calculations and Determination of Risk.

Diversity in Teaching

- I had observed multiple physicists performing the same tests for a specific modality.
- Both a very good thing and a challenge at the same time.
- I was able to take the "best of all worlds" and create my own way to test units.

Interaction With Technologists

- In-service presentations
 - Digital Mammography
 - CT Dose Reduction Initiative

- Annual Physics Testing
 - Operating the unit (e.g. CT, MR)
 - Discussion regarding if any test failed and how to correct it

A Typical Day's Work

- Ask other physicists what units I can help out with/observe testing.
- Finish testing units which have been assigned to me.
- Compiling the report after an inspection and then sending it to the site contact.
- STUDY STUDY STUDY!

A Take Home Point

- Coming from a background of a four year B.Sc. (Hon.) and a two and a half year M.Sc., I was very academically inclined.
- Needed to make the transition to gaining practical knowledge, while still having the didactic knowledge gained through courses.
- This transition is essential in order to portray yourself at a higher level of professionalism to other physicists, technologists, radiologists, etc.
- This takes time.

Another Take Home Point

- NEVER, be afraid to ask a question.
- There is no such thing as a stupid question. The only "stupid" thing about stupid questions is not asking them.
- One of, if not, the most effective ways to learn a new concept (or be reminded of one).

Commission on Accreditation of Medical Physics Educational Programs (CAMPEP)

 nonprofit organization whose objectives are the review and accreditation of educational programs in medical physics

 accreditation is to ensure program or institution has met a defined standard (provides a quality service or education)

CAMPEP Accredited Graduate Programs in Medical Physics

Entries Last Updated May 1, 2014

† Indicates institutions offering tracks within their degree program which are not CAMPEP compliant. Students graduating from these institutions who have completed the CAMPEP accredited program will be identified through an appropriate certificate awarded on completion of the program.

** Indicates Institutions offering a Professional Doctorate in Medical Physics (DMP), Therapy and Diagnostic Physics Tracks

| Institution | Initial Accreditation |
|---|-----------------------|
| Carleton University | 2010 |
| Cleveland State University | 2011 |
| Columbia University | 2009 |
| Duke University Medical Center | 2008 |
| East Carolina University | 2006 |
| Georgia Institute of Technology | 2010 |
| Louisiana State University | 2006 |
| McGill University | 1993 |
| Oklahoma State University | 2013 |
| Oregon State University † | 2011 |
| Purdue University/Indiana University † | 2012 |
| Ryerson University | 2013 |
| San Diego State University | 2010 |
| Seoul National University† | 2012 |
| SUNY Stony Brook University† | 2010 |
| University at Buffalo (SUNY) School of Med | 2009 |
| University of Alberta - Cross Cancer Institute | 2002 |
| University of Arizona | 2012 |
| University of British Columbia | 2004 |
| University of Calgary - Tom Baker Cancer Centre | 2005 |
| University of California - Los Angeles † | 1994 |
| University of Chicago | 2008 |
| University of Cincinnati | 2009 |
| University of Florida | 2001 |
| University of Florida University of Kentucky Medical Center | 1998 |
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| University of Manitoba - CancerCare Manitoba† | |
| University of Massachuesetts Lowell | 2012 |
| University of Miami | 2013 |
| University of Minnesota | 2013 |
| University of Missouri | 2011 |
| University of Nevada Las Vegas† | 2011 |
| University of New Mexico | 2009 |
| University of Oklahoma HSC | 2005 |
| University of Pennsylvania | 2011 |
| University of Texas HSC - Houston | 1989 |
| University of Texas HSC - San Antonio† | 1997 |
| University of Toledo Medical Center | 2009 |
| University of Victoria - BC Cancer Agency | 2009 |
| University of Wisconsin | 1988 |
| Vanderbilt University School of Medicine ** | 2010 |
| Virginia Commonwealth University | 2010 |
| Wayne State University† | 1988 |
| Western University† | 2010 |

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CAMPEP Accredited Graduate Program Typical Content

- As per AAPM report 197:
- Core topics (e.g. Radiobiology)
- Imaging Science (e.g. X-ray Imaging)
- Radiation Therapy (e.g. Treatment Planning)
- Imaging for Treatment Guidance and Monitoring (e.g. Portal Imaging)

Essentials and Guidelines for Clinical Medical Physics Residency Training Programs – AAPM Report 249

Patient Care and Procedural Skills

- Providing physicians with appropriate technical and dosimetric information
- Improving and maintaining image quality

Medical Physics Knowledge

- specification, acceptance testing, and quality assurance of imaging and therapeutic equipment
- applications of physics problem-solving skills to clinical medical physics problems

Practice-based Learning and Environment

- contributing to research and development projects in cooperation with radiologists, nuclear medicine physicians, radiation oncologists, etc.
- investigating and evaluating patient care practices

Interpersonal and Communication Skills

 demonstrating effective teaching of medical physics and radiation effects to trainees, technologists, etc.

Professionalism

- demonstrating a commitment to excellence and ongoing professional development
- respecting patient privacy and confidentiality

Systems-based Practice

- showing competence in information technology (IT) issues such as electronic media, software licensing, levels of access, and information security
- understanding policy development procedures and quality management systems

American Board of Radiology (ABR)

 Governing board in the U.S. to certify Medical Physicists and Radiologists

- For Medical Physicists, there are three sub-specialties for ABR certification:
 - Therapeutic Medical Physics
 - Diagnostic Medical Physics
 - Nuclear Medical Physics

ABR Process

- The ABR process is broken down into three parts.
- In Part I, a written general medical physics exam of basic topics (with some core physics) is given along with a written clinical exam (anatomy, physiology, and radiobiology).
- Part II is a specialty-specific exam. This is also written.
- Part III involves an oral examination in the specialty desired.
- For Parts II and III, if an individual is applying for more than one specialty, separate exams must be taken for each one.

Part I Requirements

 The candidate must have completed a CAMPEP-accredited residency program.

 This implies that one must enroll in a CAMPEP-accredited graduate program first.

Canadian College of Physicists in Medicine (CCPM) Exam

- Board Certification Exam for individuals whom are Canadian Citizens, whom have received schooling in Canada, or whom have a job in Canada.
- Four specialties:
 - Radiation Oncology Physics
 - Diagnostic Radiology Physics
 - Nuclear Medicine Physics
 - Magnetic Resonance Imaging Physics

Exam Requirements

- Master's or Doctoral degree in Medical Physics, Physics, or a related discipline.
- At least two years of patient-related experience in the sub-speciality being applied for.
- As of January 1, 2016, all applicants for certification in the Radiation Oncology Physics subspecialty must have graduated from either a CAMPEP accredited graduate or residency program.

CCPM Exam

- Written Exam:
 - Part I (general medical physics)
 - Part II (radiation or MR safety)
 - Part III (specific questions related to subspeciality)
 - Part IV (general questions related to subspeciality)
- Oral Exam:
 - Test practical knowledge learned through a residency or OTJ training.

American Association of Physicists in Medicine (AAPM)

- Largest organization of Medical Physicists.
- Purposes are to:
 - promote the application of physics to medicine and biology,
 - encourage interest and training in medical physics and related fields
- Annual and spring meetings
- www.aapm.org

AAPM Reports

 #249: Essentials and Guidelines for Clinical Medical Physics Residency Training Programs

#197:Academic Program
 Recommendations for Graduate Degrees in Medical Physics

Additional Reports on www.aapm.org

Canadian Organization of Medical Physicists (COMP)

- Analogous to the AAPM
- Objectives are:
 - Promote scientific knowledge
 - Further the exchange and publication of scientific or technical information
 - Promote and protect professional standards
 - Promote and encourage certification by the CCPM
 - Link to activities of other organizations with similar objectives
- www.medphys.ca

Applying to a Medical Physics Residency

- CAMPEP website
- AAPM website
- COMP website

 Where one applies to depends upon the certification board one wants to attain (ABR vs. CCPM) and also on the subspeciality.

Application Process

- Written Application
 - Education
 - Courses
 - Practical experience
- Phone Interview
 - A re-cap of your written application
 - If applying across borders, be prepared to have some basic knowledge on the work visa process
 - Possibility of being asked questions regarding a medical physics concept. Know your stuff!
 - Don't be nervous!

Radiological Society of North America (RSNA)

- Largest Radiology conference in the world.
- Purposes are to:
 - promote and develop the highest standards of radiology and related sciences through education and research
 - provide professionals with educational programs and materials of the highest quality, and to constantly improve the content and value of these educational activities
- Annual Meeting in Chicago
- www.rsna.org

Society of Nuclear Medicine and Molecular Imaging (SNMMI)

- Purpose is to:
 - promote the science, technology and practical application of nuclear medicine and molecular imaging
 - Annual and mid-winter meetings.

www.snmmi.org

Mailing Lists

 Diagnostic Imaging Medical Physicists List (DXIMGMEDPHYS)

 The American Medical Physics Mailing List (MedPhysUSA)

 The Global Medical Physics Mailing List (MedPhys)

Journals

- Medical Physics
 - http://www.medphys.org/
- Radiology
 - http://radiology.rsna.org/
- Radiographics
 - http://radiographics.rsna.org/
- Physics in Medicine and Biology
 - http://iopscience.iop.org/0031-9155

Questions?

Thank you for your time today.

• jeff@xspect.ca