Building, Maintaining and Improving an Imaging Physics Residency Program

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The number has doubled since 2013

<table>
<thead>
<tr>
<th>Imaging</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia University</td>
<td>2013</td>
</tr>
<tr>
<td>Cross Cancer Institute - University of Alberta*</td>
<td>2009</td>
</tr>
<tr>
<td>Emory University</td>
<td>2014</td>
</tr>
<tr>
<td>Henry Ford Health System**</td>
<td>2009</td>
</tr>
<tr>
<td>Mayo Clinic***</td>
<td>2010</td>
</tr>
<tr>
<td>Stony Brook University Medical Center</td>
<td>2009</td>
</tr>
<tr>
<td>University of Chicago</td>
<td>2014</td>
</tr>
<tr>
<td>University of Florida College of Medicine</td>
<td>2013</td>
</tr>
<tr>
<td>University of Texas M. D. Anderson Cancer Center*</td>
<td>2002</td>
</tr>
<tr>
<td>U Penn Medical Physics***</td>
<td>2010</td>
</tr>
<tr>
<td>West Physics***</td>
<td>2013</td>
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</table>

Background

- The accreditation process for advanced imaging devices (CT, MRI, US, NM, PET) has highlighted the role of qualified medical physicists (QMP) in radiology.
- Healthcare enterprise policies on QMP certification
- Issues with standardization in training have been raised.
Issues Identified by ABR Physics Trustees

- Candidates often showed extensive knowledge in narrow areas but lacked of knowledge in other areas (e.g., ultrasound, MRI).
- Candidates often showed an inability to relate medical physics activities to the broad clinical care of the patient.

RL Morin and JD Allison, ABR Physics Trustee Report, AAPM Newsletter, Jan & Feb 2013

Background

- ABR “2012 initiative” was announced in 2002: CAMPEP-accredited education program → Part I eligibility
- ABR “2014 initiative”: CAMPEP-accredited residency program → Part II eligibility
- The number of accredited imaging physics residency programs then was inadequate (6 in North American and none in nuclear medicine in 2011).

RSNA/AAPM/SNMMI recognize the shortage of imaging/nuclear medicine physics residency
Available Training Guides

- AAPM Report 90 (2006) (revision of No. 36) contains a broad outline of residency structures and training
- AAPM Report 133 (2008) describes educational pathways for residents and includes a model of academic/industry training
- AAPM Report 249 (2013) (revision of No. 90)
- IAEA TCS-47 (2010) and IAEA TCS-50 (2011) has very detailed descriptions of training modules
- CAMPEP Standards (updated 3-2015)

Starting a Residency Program

- Initial Assessment
  To determine if the necessary elements for training imaging physicists are present
  - Institutional support?
  - Clinical physics faculty?
  - Curriculum coverage?
  - Program goals and objectives?
  - What would the graduates be like?

S.W.O.T – Emory Program and U of Chicago Program

**Strength**
- Strong faculty with nationally recognized expertise
- New hospital facilities with expanding clinical imaging physics responsibility

**Weakness**
- Older equipment/not state-of-the-art
- Limited FTE in clinical imaging physics

**Opportunities**
- Local graduate university with CAMPEP program
- Strong CAMPEP PhD Program and Certificate Program
- Strong radiation therapy residency program

**Threats**
- Decrease in clinical volume, consolidation of equipment
- Limited long-term funding
Program Structure and Governance (CAMPEP Standards)

- The clinical facilities for training must be accredited
- A medical physics residency shall require at least 2 years of clinical training
- Remedial education shall be well-defined
- Steering committee
- Procedure for performance evaluation and progress review
- Program website available and updated at least annually
- A program may consist of a single institution or multiple affiliated institution (Hub-and-Spoke Model).

### Hub and Spoke Model - Leveraging areas of weakness

<table>
<thead>
<tr>
<th>Academic Partner</th>
<th>Industry Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty Practice as specialists - Modality specific - Experts in their research fields</td>
<td>Faculty practice as generalists - Broad knowledge base - Experts in equipment assessment</td>
</tr>
<tr>
<td>Experts in applied clinical medical physics</td>
<td>Experts in regulatory compliance and safety</td>
</tr>
<tr>
<td>Exposure to an academic hospital</td>
<td>Exposure to a large number of regional or satellite hospitals and clinics</td>
</tr>
<tr>
<td>Facilities include newer generation equipment</td>
<td>Facilities include a wide range of equipment generations, mobiles, analogue detectors, etc.</td>
</tr>
<tr>
<td>Support of a large administrative infrastructure and resources</td>
<td>Small staff, provider of efficient consulting services</td>
</tr>
<tr>
<td>Low percentage of board certified physicists</td>
<td>High percentage of board certified physicists</td>
</tr>
</tbody>
</table>
How to Implement – Emory Program

- Funding and Conflicts of Interest
  - Sharing training
  - Sharing financial resources
- Affiliation agreement
  - Describes standards of mentorship, training, technology transfer, liability, indemnification, communications/public acknowledgements, venue disputes, etc. between academic/industry partners
- Emory will submit single accreditation document to CAMPEP and be responsible for its administration and maintenance.

CAMPEP
Commission on Accreditation of Medical Physics Educational Programs, Inc.

http://www.campep.org/ResidencyStandards.pdf

Standards for Accreditation of Residency Educational Programs in Medical Physics

Revised March 2015

1. Program Goal and Objectives ......................... 2
2. Program Structure and Governance ............... 2
3. Program Director .................................... 3
4. Program Staff ........................................ 4
5. Institutional Support .................................. 4
6. Educational Environment ............................ 5
7. Scholarly Activities .................................. 5
8. Residency Curriculum ................................ 5
   a) Imaging Physics Residency Curriculum ........ 7
   b) Nuclear Medicine Physics Residency Curriculum 8
   c) Radiation Oncology Physics Residency Curriculum 10

Program Director and Program Staff
(CAMPEP Standards)

- The program director must be certified by an appropriate certifying agency in the field of the residency program
- The program director should have at least 5 years of full-time experience beyond clinical certification
- At least 2 certified physicists shall be engaged in the residency program and the ratio shall be at least 1:1.
Rotation schedule

1. Program Goal and Objectives ................................. 2
2. Program Structure and Governance ...................... 2
3. Program Director ............................................. 3
4. Program Staff ................................................. 4
5. Institutional Support ........................................... 4
6. Educational Environment ................................. 5
7. Scholarly Activities ........................................... 5
8. Residency Curriculum ........................................ 5
   a) Imaging Physics Residency Curriculum .............. 7
   b) Nuclear Medicine Physics Residency Curriculum .... 8
   c) Radiation Oncology Physics Residency Curriculum ... 10

Didactic education expectations

1. Ethics and Professionalism Curriculum ................. 6

Optional research opportunities

1. University of Chicago – Imaging Residency
   - 40 Clinical Faculty and 13 Physics Faculty Members
   - 3.5 FTE in Clinical Physics; 4 ABR certified physicists
   - Mitchell Hospital, a 395-bed adult hospital
     3 CT scanners; 3 RAD rooms; 1 R/F room; 1 Dental room; 4 Portable; 3 MRI scanners; 3 nuclear medicine scanners; 1 SPECT/CT; 4 ultrasound scanners
   - Comer Children's Hospital, a 155-bed pediatric hospital
     1 CT scanner; 3 RAD rooms; 2 R/F rooms; 1 MRI scanner; 3 ultrasound scanners
   - DCAM, a 525,000 square foot outpatient clinic and surgery facility
     2 CT scanners; 3 RAD rooms; 2 R/F room; 2 Portable; 1 MRI scanner; 3 nuclear medicine scanners; 1 PET/CT; 2 ultrasound scanners
   - Center of Care and Discovery, a 1.2 million square foot hospital
     4 CT scanners; 3 RAD rooms; 1 R/F room; 1 Dental room; 4 Portable; 3 MRI scanners; 3 nuclear medicine scanners; 1 SPECT/CT; 4 ultrasound scanners
   - Affiliation with Lurie Children's Hospital

Academic departments

- Department of Radiology
- Department of Medical Physics
- Department of Informatics
- Department of Imaging and Informatics
- Department of Surgery

Clinical sites

- Mitchell Hospital
- Comer Children's Hospital
- DCAM
- Center of Care and Discovery
- Lurie Children's Hospital

Research opportunities

- Basic and translational research
- Clinical research
- Industry collaborations
- International collaborations
### Overall Program: Univ of Chicago

<table>
<thead>
<tr>
<th>Rotation</th>
<th>Time Allotment (weeks)</th>
<th>Total Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hospital and Department Orientation and Safety Training &amp; Annual Oral Evaluation</td>
<td>1-4</td>
<td>4 weeks</td>
</tr>
<tr>
<td>2. Primary Rotations</td>
<td>5-93</td>
<td>88 weeks (6-20 weeks/rot.)</td>
</tr>
<tr>
<td>3. Attendance of Department Seminars and Journal Clubs</td>
<td>Minimum once per week</td>
<td></td>
</tr>
<tr>
<td>4. Clinical-oriented Research Project</td>
<td>Minimum one presentation at a national conference per year</td>
<td></td>
</tr>
<tr>
<td>5. Two national conferences</td>
<td>94-97</td>
<td>4 weeks</td>
</tr>
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### Overall Program: Emory Univ

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<tr>
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<th>Time Allotment (weeks)</th>
<th>Total Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Institution and Affiliate Orientation and Safety Training</td>
<td>0-4</td>
<td>4 weeks</td>
</tr>
<tr>
<td>2. Introduction to Medical Physics</td>
<td>0-8</td>
<td>8 weeks</td>
</tr>
<tr>
<td>3. Primary Rotations</td>
<td>9-99</td>
<td>90 weeks (10 weeks/rotation)</td>
</tr>
<tr>
<td>4. Attendance of Department Seminars</td>
<td>Evaluated throughout the program</td>
<td></td>
</tr>
<tr>
<td>5. Independent Research Project</td>
<td>Evaluated by the resident's program mentor</td>
<td></td>
</tr>
<tr>
<td>6. Advanced Topics in Clinical Imaging / Or Remediation</td>
<td>100-104</td>
<td>4 weeks</td>
</tr>
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Training Record and Assessment

Logbook of Activities and Progress
- Document tested equipment, seminars and journal clubs, clinical observations, safety trainings, teaching activities, shielding design and protection survey, assigned readings, research projects, time-away and monthly meeting notes.

Resident Progress Evaluation
- Self-directed study - evaluated by the rotation mentor.
- Annual written examination
- Annual oral examination by the entire panel of the rotation mentors
- End of Rotation Evaluation in the Second Year (Competency level checklist)

Continuing Education Activities
- Seminars, Journal Clubs and National Conferences.

Independent Research Project
- Minimum one abstract submission to a national conference per year

Recruitment
- Medical Physics Match and AAPM MP-RAP
  - https://natmatch.com/medphys/
  - http://www.aapm.org/CAP/
- Admission criteria
- Selection process
- Good practices in recruitment for diversity
  - Training the admission committee to recognize unconscious biases
  - Enlarge the candidate pool with outreach
  - Use rubric evaluation form instead of premature numerical ranking

CAMPEP Initial Accreditation

Accreditation Steps
- Prepare and submit a self-study using the CAMPEP template giving evidence of consistency with the CAMPEP standards
- The self-study is reviewed by the CAMPEP Residency Education Program Review Committee (REPRC). The program needs to respond to the questions and concerns raised by the reviewers.
- A site visit is conducted to validate the assessment for all first-time applicant programs. (For reaccreditation, a site visit is done at least once every ten years.)
CAMPEP Site Visit

- It requires 1.5 days.
- The purpose of the site visit:
  ◦ To meet and talk face to face with faculty/staff, residents, and administrative officials of the program.
  ◦ To observe the adequacy of facilities.
  ◦ To assess the aptitude and commitment of residents and faculty/staff.
  ◦ To observe the general educational and clinical environment at the institution.
  ◦ To examine selected areas identified in the self-study review and to obtain additional information required for evaluation.

http://www.campep.org/res.asp

CAMPEP Site Visit Agenda - Sample

- Meet with Program Director
- Meet with Program Faculty
- Meet with Residents
- Review Program Records
- Meet with Department Leaders
- Tour Training Facilities
- Preparation for Exit Interview
- Exit Interview with Program Director

CAMPEP Site Visit - Tips

- Respond thoroughly to the CAMPEP team’s review on your self-study prior to the site visit.
- Get everyone involved in preparation:
  (department leaders, steering committee, department faculty/staff, current residents, training facilities, affiliated sites).
  Does everyone read the full self-study?
  Do you do a mock site visit?
  Do you prepare a Q&A?
- Are all the records in order? and readily available?
- Make it easy on the site visit day:
  Have a designate person to escort the team?
  Have one conference room reserved for the day?
  Have boxed lunch ordered to the conference room?
CAMPEP Accreditation

Initial Accreditation:
- Initial period of 3 years.
- Annual report
- May be extended to 5 years

Provisional Accreditation:
- For a program that has not yet admitted its first resident.
- For a period until the first resident has completed the first year of study, at which time a full site visit will be conducted and accreditation will be extended for a full 5 years.

Accreditation Deferred:
- This action is for programs found to be non-compliant with CAMPEP standards for accreditation to allow an adequate period of time for the institution to implement planned or suggested improvements.

Accreditation Withheld:
- This action is for programs found to be non-compliant with CAMPEP standards for accreditation, nor does it appear that program changes could be achieved within a reasonable period of time to qualify for accreditation.

Improvement of the Program

Internal Periodic Reviews
- Rotation evaluations and program evaluations from residents
- Quarterly steering committee meetings
- Annual self-evaluation

External Periodic Reviews
- Program advisors: institutional and external

Questions?