Building, Maintaining and Improving an Imaging Physics Residency Program

Jonathon A. Nye, PhD
Assistant Professor
Director, Medical Physics Imaging Program
Emory University School of Medicine
Department of Radiology and Imaging Sciences

Outline

1. Strategic planning
2. The diagnostic physics environment
3. Hub and spoke model
4. Maintenance and improvements

Strategic Planning

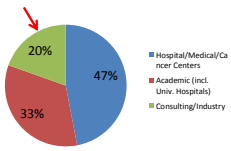
- Where are we?
- What do we have to work with?
- Where do we want to go?
- How to we get there?

S.W.O.T

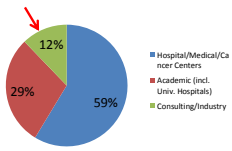
Strength	Weakness
• Strong faculty with nationally recognized expertise	• Older equipment/not state-of-the-art
Opportunities	**Threats**
• Local graduate university with CAMPEP program	• Decrease in clinical volume, consolidation of equipment

Diagnostic Physics Environment

Distribution (All DABRs)



Therapy Only (All DABRs)



*A larger proportion of diagnostic medical physicists serve in the consulting/industry sector compared to therapy physicists

Know your local environment

Regulatory Forces

- Federal
  - MQSA (1998) – Requires documented mammography QC
  - MIPPA (2008) – CMS tech. component tied to camera cert.
- States
  - MP licensure required in 4 states (NY, TX, CA, FL)
  - GA sets loose standards for oncology but not imaging physicists
- Accrediting bodies
  - ACR: prefers QMPs but has non-QMP pathways/grandfathering
  - IAC: must be QMP for CT but not NM or MRI
  - TJC: expected to adopt ACR requirements in 2014

AAPM/ABR advocate for agencies to demand certified physicists in their instrument accreditation process

http://rules.sos.state.ga.us/docs/290/5/22/04.pdf (accessed 10/14/13)
http://www.intersocietal.org/mri/standards/IACMRIStandards2013.pdf (accessed 10/14/13)
http://www.intersocietal.org/ct/standards/IACCTStandards2013.pdf (accessed 10/14/13)
http://www.intersocietal.org/nuclear/standards/IACNuclearPETStandards2012.pdf (accessed 10/14/13)

Regulatory Forces

- Medicare Improvements for Patients and Providers Act (MIPPA) of 2008
  - Sec. 135 IMAGING PROVISIONS
    - Beginning Jan. 1st, 2012 technical component of "Advanced Diagnostic Imaging (ADI) Services" will be paid only for accredited hospitals and clinics
    - ADI services include all CT, MRI and NM
    - Accr. can be conferred by TJC (?), IAC ($) or ACR ($$$)
  - At Emory: NM is IAC, MR/CT is ACR (Mammo is FDA)

http://www.gpo.gov/fdsys/pkg/PLAW-110publ275/pdf/PLAW-110publ275.pdf (accessed 10/15/13)

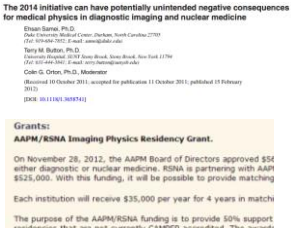
Financial Forces

- Unlike medical residencies, medical physics residencies are not subsidized by the federal government
- Major limitation in meeting ABR requirements is lack of funding for residency programs
- Academic
  - Funded by Department or Healthcare to provide instrument accreditation services (now required by MIPPA for MR,NM and CT)
- DMP pathway
  - Four year professional degree (2 yrs didactic for MS, 2yr of residency)
  - Reverses revenue stream, students pay tuition for residency
  - Terminal degree (professional doctorate)
- For-profit companies
  - Carry the resident for a duration that eventually produces net profit (~3yrs)*
  - Two currently approved (Upstate Medical Physics in NY, West Physics in GA)

Starkschall. 2008. JACMP 9(2) http://www.jacmp.org/index.php/jacmp/article/view/2876/1413 (accessed 10/14/13)
* Pizzutiello, RJ. *Diagnostic Physics Residency Upstate Medical Physics Thoughts on Hub and Spoke.* AAPM Hub and Spoke Workshop Feb. 15th, 2013 New Orleans, LA

Financial Forces

- RSNA/AAPM recognize residency funding problems (finally!)



The 2014 initiative can have potentially unintended negative consequences for medical physics in diagnostic imaging and nuclear medicine

Ehsan Samei, Ph.D.
Duke University Medical Center, Durham, North Carolina 27705
(Tel: 919-684-7932; E-mail: samei@duke.edu)

Terry M. Button, Ph.D.
University Hospital, SUNY Stony Brook, Stony Brook, New York 11794
(Tel: 631-444-3042; E-mail: terry.button@stonybrook.edu)

Colin G. Orton, Ph.D., Moderator

(Received 10 October 2011; accepted for publication 11 October 2011; published 15 February 2012)

[DOI: 10.1118/1.3659741]

Grants:

AAPM/RSNA Imaging Physics Residency Grant.

On November 28, 2012, the AAPM Board of Directors approved $5
either diagnostic or nuclear medicine. RSNA is partnering with AAPI
$525,000. With this funding, it will be possible to provide matching

Each institution will receive $35,000 per year for 4 years in matchi

The purpose of the AAPM/RSNA funding is to provide 50% support

RSNA, AAPM Help Fill Urgent Need for Medical Physics Residency Programs

December 01, 2011

As the date when medical physicists must comply with new board certification requirements quickly approaches, RSNA and the American Association of Physicists in Medicine (AAPM) are offering incentives to establish much-needed accredited diagnostic imaging medical physics residency training programs.

Beginning in 2014, the American Board of Radiology (ABR) will require medical physicists to complete an accredited two-year residency program in order to take board exams and achieve the Qualified Medical Physicist (QMP) designation

Herman Donaldson Seibert

S.W.O.T

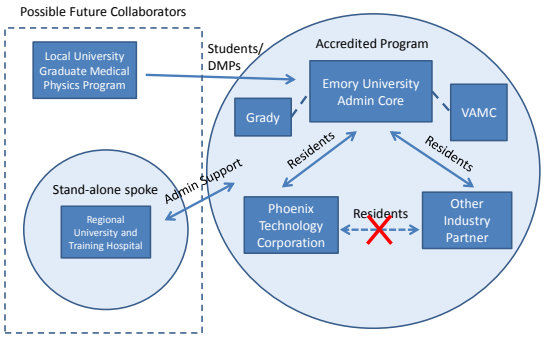
Strength	Weakness
• Favorable regulatory environment	• No certain long-term funding

Opportunities	Threats
• CAMPEP approves a variety of programs	• Regionally competing CAMPEP programs

What is a Hub and Spoke?

- Some possible examples
  - Smaller facilities (hospitals, clinics, cancer centers,…) form a consortium
  - Stand-alone programs access neighboring (unaffiliated) hospitals for specific resources
  - Partnership between separately accredited programs (therapy and diagnostic, DMP and residency programs)
  - Partnerships between academic hospitals and industry/private consulting

Hub and Spoke



Hub and Spoke Residency Model

- Academic/Industry partnership
  - Emory → Hub and administrative core
  - Phoenix Technology Corp → Industry training partner
- Each stakeholder will contribute training and financial resources residency program
- Training includes academic and industry experiences

14

Opportunities for Leveraging Different Skillsets

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

S.W.O.T

Strength	Weakness
• Favorable regulatory environment • Academic & consulting experience	• No certain long-term funding • Increasing administrative burden
Opportunities	**Threats**
• CAMPEP permits a variety of programs • Local MP Graduate Univ. & regional hospitals	• Regionally competing CAMPEP programs • Department's clinical mission changes

Possible Program Benefits

Academic Partner	Industry Partner
Mentorship	Academic colleagues, collaboration and reputation
Community and national service	Marketing advantage
Clinical support	Economical cost for training
Scholarly research activity	Larger community and regional impact
	Teaching opportunities for staff
	Minimization of administrative resources
	Recruiting tool

What to consider when implementing

- Affiliation agreement
  - Outline of admin. and training responsibilities
  - Formalizes training between hub and partners
- Conflict of Interest Policies
- Managing two or more competing partners
- Low faculty certification by ABR, ABMP, or ABSNM
- Non-MD residency job code needs to be created
- Insurance for training conducted outside Emory

Hurdles to Hub and Spoke Model

- Managing two or more competing Partners. Options include,
  - Partners do not share training in a given modality or
  - Each resident is assigned to rotate between academic and partner and do not cross between partners
- Affiliation agreement – precedent of academic/industry training exists at Emory (thank goodness!)
  - Residents will be non-MD category and employed by Emory
  - Residents fall under Emory SOM policies with specifics in the affiliation agreement
- Financial Conflicts of Interest
  - Financial model (fee-for-service or unrestricted gift?)
  - Industry gifts (i.e. use of equipment)
- Staff accreditation by ABR, ABSNM, or ABMP in their specialties will help strengthen the CAMPEP application

19

Affiliation Agreement

- Sets the rules and responsibilities of each party's participation in the MP residency
- Components
  1) Governance – Emory is the administrative core and is responsible for programs accreditation
  2) Responsibilities of the academic and industry affiliates
  3) Funding – Gifts to Emory residency education fund to cover portion of training/travel/other expenses
  4) Indemnification – defense against hurt and losses
  5) Resident placement – decided on by academic/industry faculty committee
  6) Insurance – Residents will be Emory employee and likely fall under their policies
  7) Name/Marketing – Need to comply with Emory COI rules
  8) Termination of Agreement/Renewal
  9) Changes to Agreement – agreed upon by both parties
  10) Effective Date and Signatures
  11) Venue/Jurisdiction – Venue for disputes
  12) Notices
  13) Intellectual property rights
  14) Information integrity/privacy
  15) Standards of training and education
  16) Non-compete agreement between residents and industry partners

20

S.W.O.T

Strength	Weakness
• Favorable regulatory environment • Academic & consulting experience • Leverage skillsets together	• No certain long-term funding • Implementation timeline • Institution COI issues

Opportunities	Threats
• CAMPEP permits a variety of programs • Local MP Graduate Univ. & regional hospitals • Spokes are vested in trainee	• Regionally competing CAMPEP programs • Department's clinical mission changes • Competing spokes • Partner drops out

Overall Program

Rotation	Time Allotment (weeks)	Total Duration
1. Institution and Affiliate Orientation and Safety Training	0 – 4	4 weeks
2. Introduction to Medical Physics	0 - 8	8 weeks
3. Primary Rotations General Radiography Fluoro/Interventional Radiography Mammography Computed Tomography Magnetic Resonance Imaging Nuclear Medicine Radiology Informatics Dosimetry and Radiation Safety Ultrasound	9 –99 AAPM Report no. 249 AAPM Report no. 90 IAEA TCS-47 (2010) IAEA TCS-50 (2011)	90 weeks (10 weeks/rotation)
4. Attendance of Department Seminars	Evaluated throughout the program	
5. Independent Research Project	Evaluated by the resident's program mentor	
6. Advanced Topics in Clinical Imaging /Or Remediation	100 - 104	4 weeks

Training Assessments

Introduction to Medical Physics

End of Rotation - Computer-based (ABR Part 2 style) examination

Primary Rotations

a. Self-directed study - evaluated by the rotation mentor.

b. Monitoring of training - Tracking of resident supervised and unsupervised instr. training

c. Presentation to faculty - communication of relevant topics from the primary rotation

d. Computer-based (ABR part 2 style) examination

e. End of Rotation Evaluation

i. Written evaluation: Submitted by the mentor

ii. Oral examination – Meet competency levels (ABR part 3 style)

Continuing Education Activities

a. Seminar summaries: Resident will submit two summaries per year

Independent Research Project

a. Evaluated for progress periodically during meetings between the resident and their program mentors (guidelines for PQI projects published by Frey et al., JACR 2007.)

b. The resident will submit their final research project to the Program Director..

c. Presentation of their research at the Research in Progress Seminar.

Advanced Topics in Clinical Imaging

a. A four weeks plan will be developed by the Program Director and program mentor.

23

Maintenance and Improvements

- Quality improvement projects
  - Residents and faculty are paired together
  - 2 to 3 year timeline
- Problem-based learning
  - Expose residents to a variety of clinical scenarios
    - Laboratory data, an equipment encounter, phantom data collection, case studies, computer simulations, paper-based clinical scenarios, journal articles
  - Each scenario consists of objectives, the clinical cue, and expected outcomes
  - The resident works independently or in small groups
  - Time consuming to create but creates efficiencies in training

Problem-based learning

- Some examples,
  - Dosimetry
    - Conceptus
    - Size specific dose in computed tomography
    - Nuclear medicine
  - Phantom development
    - MRI chemical shift QC
    - TG 111 methodology
  - Instrumentation
    - Building a Hall effect sensor
  - Curve fitting
    - Fitting analytical models to experimental data
    - Model selection
  - Shielding design
    - Computed tomography
    - Nuclear Medicine

Available Training Guides

- AAPM Report 90 (2006) and 249 (2013) 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
- IAEA TCS-47 (2010) and IAEA TCS-50 (2011) has very detailed descriptions of training modules

- 3 Areas of Training
  - Therapeutic, currently 56 centers
  - Imaging Physics, currently 10 centers (2 private)
  - Nuclear Medicine, currently 0 centers
    - Nuclear medicine is a rotation in all approved diagnostic programs

26

Residency Faculty and Collaborators

- Radiology
  - John N. Aarsvold, PhD
  - Hiroumi Kitajima, PhD
  - James Galt, PhD
  - John Malko, PhD
  - Ioannis Sechopoulus, PhD
  - Perry Sprawls, PhD
  - Xiangyang Tang, PhD
  - Deqiang Qui, PhD
- Radiology Exec. Comm.
  - John Votaw, PhD
  - Mark Mullins, MD, PhD
  - Carolyn Meltzer, MD
- EHSO
  - Stan Wilson, MS, RSO
  - Rebecca Neill, MS
- Phoenix Technology Corp.
  - Michael Cuddy, MS
  - Chris Bentley, MS
  - Chris Lease, MS
  - Sandra Paige, MS
  - Steven Palefsky, PhD

Thank you and
safe travels home!