The Necessity of Innovation in Medical Physics

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Disclosures

• Principal employer: University of Wisconsin
• AAPM President & Board Member
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• Scientific Advisory Board member – ViewRay

AAPM - Medical Physicists

• AAPM is a scientific and professional organization of over 8,000 physicists working in medicine.
• Most AAPM members work in clinical practice in radiation therapy.
Objective

• Is Innovation necessary to be successful as a Clinical Medical Physicist?

Diversity and Complexity of Today’s Clinical Medical Physics

• patient simulation
• treatment planning systems
• delivery systems
• daily image guidance

Diversity and Complexity of Today’s Clinical Medical Physics

• a multitude of recommendations from AAPM
  – 149 Task Group reports produced
  – 76 Task Groups currently active
  – 8 Miscellaneous reports produced
  – Multiple practice guidelines in development
Have we become so prescriptive that innovation is unnecessary?

• Has Clinical Medical Physics matured such that execution of prescribed activities encompasses our scope of work?

No

• Innovation by Clinical Medical Physicists has always been necessary for improved care.

Examples of QMPs being innovative

• use of the MLC
• creation of daily image guidance
• implementation of technologies into the clinical space, becoming mainstream
Why do Medical Physicists hold the stature we do in Medicine?

• …the ability to develop and implement technology into the clinic and enable our physician colleagues to practice medicine at a much higher level.

Are Clinical Medical Physicists Scientists?

• No
• … but do they need the scientific training?
• Absolutely, to fundamentally understand:
  – the problems they face
  – the technologies for solving those problems
  – the process of solving the problem

Innovative Medical Physicists changing Clinical Practice

• Rock Mackie (Pinnacle), Rock Mackie (Tomo), David Jaffery (CBCT IGRT), Andy Beavis (VIRTUAL), Ken Gall (Mevion), Jim Dempsey (ViewRay), Ben Nelms (QA software), Bill Simon (measurement tools)
Do Clinical Medical Physicists need to be Innovative?

http://www.businessweek.com/articles/2012-03-20/memo-to-ceos-stop-blathering-about-innovation-and-do-something

Implementation of Technology

Nomos Peacock for IMRT

http://mexicophys.org/med/51-2006/p427-4450

Figure 3. Photograph of the NOMOS Peacock aerial brachytherapy system. Courtesy NOMOS Corporation.

30 of 61 installs in 1st 5 years were non-academic centers.*

*Personal communications w/ Bruce Curran
Accuray Cyberknife

- Two of first five installs were at community based centers with single Medical Physicist.

The IMRT QA Problem

- Number of Plans
  - Failing Absolute Dose: 301
  - Passed: 172
  - Failed: 66
  - No Follow-up Measurement: 47
  - Passed with Special Delivery: 16

  2nd Re-Measurement
  - Passed: 17
  - Failed: 11
  - No Follow-up Measurement: 25
  - Passed with Special Delivery: 3

  3rd or More Re-Measurements
  - Passed: 2
  - Failed: 2
  - No Follow-up Measurement: 4

From Stephen Kry

- Only 3/301 failed cases were re-planned!
- Extreme majority treated as is...
How to write the acceptance testing procedure into the purchase agreement for this equipment? How to commission the new system to perform specific tasks?
Clinical Medical Physics in changing Healthcare Environment

- Do we really improve patient care?
- CMS Metrics: Clinical Quality Measures (CQMs)
  - how to apply them in medical physics.

Gather the data!

Is A better than B?

Quality Metrics
  - Identify
  - Capture
  - Analyze

Conclusions

- Innovation has been, is currently, and will be essential for the success of Clinical Medical Physics
- As is developing and nurturing critical thinking skills
- Healthcare economics will likely amplify these needs.