

# PROFESSIONAL CERTIFICATION PROGRAMS FOR MEDICAL PHYSICISTS

Andy Miller, MS, CHP  
VA Medical Center  
Nashville, TN

# Introduction

- \* Medical Physics
- \* Areas of Specialization in Medical Physics
- \* Certifying Organizations
- \* Requirements for Candidates
- \* Current Status of Certifications
- \* Re-certification Requirements

# Medical Physics


## American Association of Physicists in Medicine (AAPM)

- \* Founded in 1958
- \* Currently over 7,500 members

### Statements of the AAPM:

“We are generally known as ‘Medical Physicists’.”

“The responsibility of the medical physicist is to assure that the radiation prescribed in imaging and radiation therapy is delivered accurately and safely.”



“One of the primary goals of the AAPM is the identification and implementation of improvements in patient safety for the medical use of radiation in imaging and radiation therapy.”

(AAPM website 2013)

# “Qualified Medical Physicist” (as defined by AAPM)

1. M.S. or Ph.D. in physics, medical physics, biophysics, radiological physics, medical health physics, or equivalent disciplines from an accredited college or university, and
2. Certification in the specific subfields of medical physics with its associated medical health physics aspects by an appropriate national certifying body and abides by the certifying body’s requirements for continuing education.

# Areas of Specialization in Medical Physics

## (Subfields of Medical Physics)

(as recognized by the AAPM)

- \* Therapeutic Medical Physics
  - \* Certification by ABR, ABMP, or CCPM
- \* Diagnostic Medical Physics
  - \* Certification by ABR, ABMP, or CCPM
- \* Nuclear Medical Physics
  - \* Certification by ABR, ABMP, CCPM, or ABSNM
- \* Medical Health Physics
  - \* Certification by ABMP
  - \* Comprehensive Certification by ABHP plus a minimum of 3 years relevant experience in the subfield of medical health physics

# Certifying Organizations Medical Physics

- \* American Board of Radiology (ABR)
- \* American Board of Medical Physics (ABMP)
- \* Canadian College of Physicists in Medicine (CCPM)
- \* American Board of Science in Nuclear Medicine (ABSNM)
- \* American Board of Health Physics (ABHP)

# American Board of Radiology (ABR)

“We are guided by the principle that certification matters.”

“The mission of the American Board of Radiology is to serve patients, the public, and the medical profession by certifying that its diplomates have acquired, demonstrated, and maintained a requisite standard of knowledge, skill, understanding, and performance essential to the safe and competent practice of diagnostic radiology, radiation oncology, and medical physics.”

Medical Physics is one category of certification by the ABR.



# ABR Certification

ABR certification in Medical Physics “indicates that its holder has completed certain requirements which the Board considers to be at or above the minimum level of qualification to act in an advisory capacity to physicians regarding the physical aspects of radiation therapy, diagnostic radiology, and/or nuclear medicine.”

Certification is valid contingent on meeting the requirements of Maintenance of Certification (MOC)

# ABR Certification Examinations in Medical Physics

## Three-part Examination

- \* Part 1- Computer-based
  - \* General Exam
  - \* Clinical Exam
- \* Part 2 - Computer-based
  - \* Specific to an area of qualification
  - \* Diagnostic, therapeutic, or nuclear
- \* Part 3 - Oral boards
  - \* Specific to an area of qualification
  - \* Diagnostic, therapeutic, or nuclear

# Requirements for Candidates for ABR Certification in Medical Physics

- \* Part 1 candidate must be enrolled in or graduated from a CAMPEP-accredited program.
- \* There are specific time limits to complete each part following date of approval to take the exam.
- \* Part 2 can be taken only after passing Part 1 (General and Clinical).
- \* 2014 Initiative: Candidate must have completed a CAMPEP-accredited **residency** program before being eligible to take the Part 2 exam in medical physics.

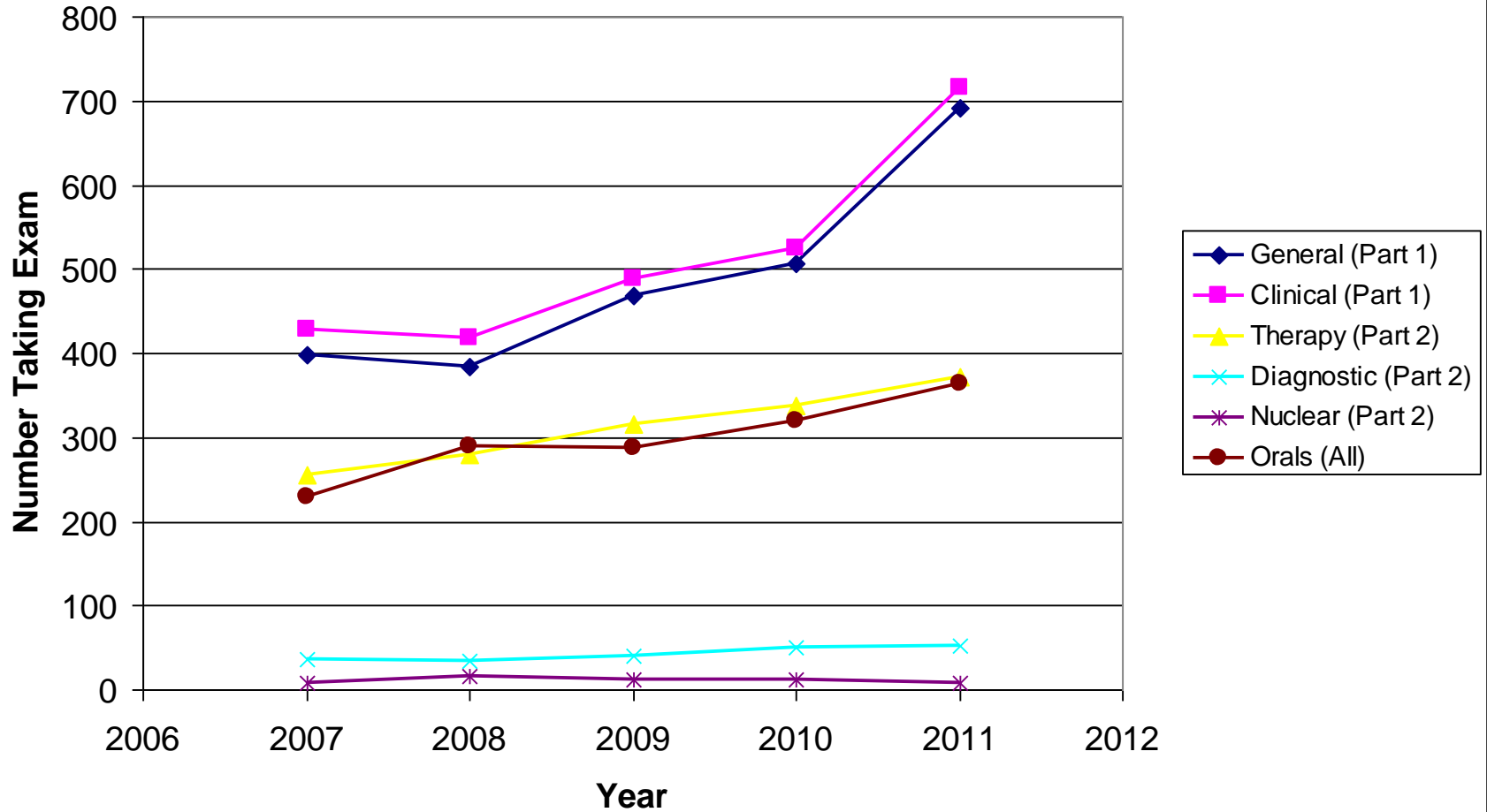
# Commission on Accreditation of Medical Physics Educational Programs (CAMPEP)

- \* Described by David Hintenlang (U of F) earlier today

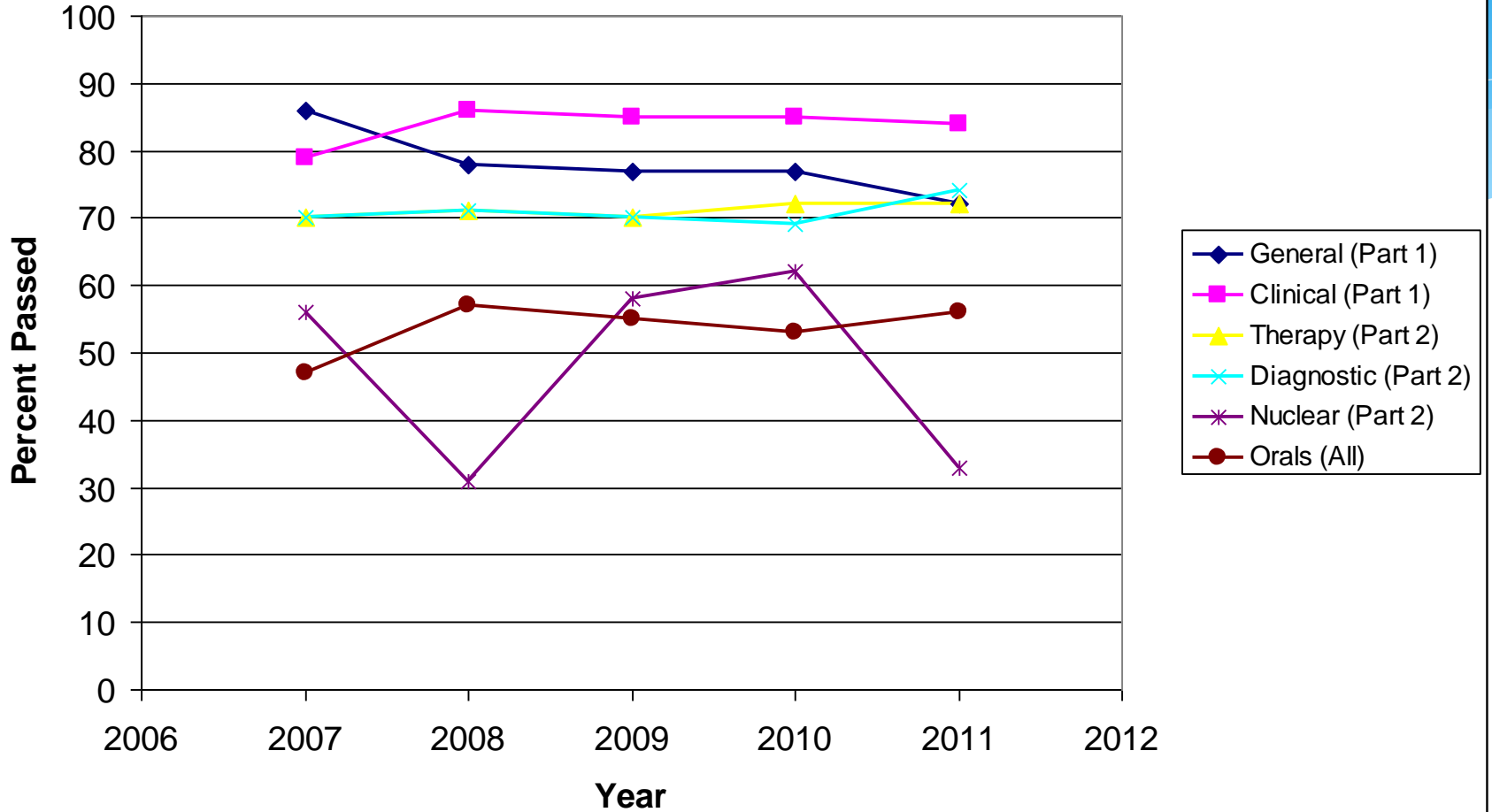
# ABR Certification Examinations in Medical Physics

- \* Computer-based exams
  - \* Given in fall at a third party testing center throughout US
  - \* No references
  - \* No paper – write on a laminated sheet and turn in at the end of exam
  - \* An emulated version of the TI-30XS calculator is used on the examination interface
- \* Oral exams
  - \* Held in Louisville in June
  - \* 5 examiners, 5 questions per examiner, 25 minutes each
  - \* Question on screen – discussions with each examiner
  - \* Pass, Conditional Pass, Fail

## ABR Certification Candidates



# ABR Certification Statistics



# ABR Sample Questions

## General – Part 1

Reduced contrast in a therapy verification image compared with a simulator radiographic image is primarily a result of which process?

- A. An increased number of pair productions
- B. An increased number of Compton interactions
- C. An increased number of photoelectric interactions
- D. A decreased number of photoelectric interactions
- E. A decreased number of Compton interactions



# ABR Sample Questions

## Clinical – Part 1

For a patient suspected of having kidney stones, what is the most appropriate examination?

- A. CT
- B. MRI
- C. Abdominal radiography
- D. Endoscopic retrograde cholangiopancreatography
- E. Hysterosalpingogram

# ABR Sample Questions

## Therapeutic Medical Physics – Part 2

Simple Question: According to TG-59, an ionization chamber reading is corrected to compensate for the temperature and pressure dependence of which of the following?

- A. Air volume in the ionization chamber
- B. Mass of air in the ionization chamber
- C. Mass stopping power ratio for electrons in the ionization chamber
- D. Mass stopping power ratio for electrons of the phantom material
- E. Density of air in the monitor chamber

# ABR Sample Questions

## Therapeutic Medical Physics – Part 2

Complex Question: The isocenter of a 10-MV oblique photon beam is at 12-cm depth, of which 6 cm is muscle tissue and 6 cm is lung tissue. What is the difference in the dose calculated at isocenter without lung density correction and the dose actually delivered at the same point?

- A. 20% higher
- B. 10% higher
- C. 5% higher
- D. 10% lower
- E. 20% lower

# ABR Sample Questions

## Diagnostic Medical Physics – Part 2

Simple Question: For a photo-timed radiograph, an increase in which of the following factors will increase patient skin dose?

- A. Milliampere
- B. Kilovolt peak
- C. Patient thickness
- D. Focal spot size
- E. Source-to-image distance

# ABR Sample Questions

## Diagnostic Medical Physics – Part 2

Complex Question: A 5-MHz ultrasound beam is incident on a blood vessel at an angle of 45 degrees. If the blood is moving toward the transducer, and the mean velocity is 30 cm/s, what is the mean frequency shift in kHz of the reflected beam?

- A. 0.7 kHz
- B. 1.4 kHz
- C. 2.8 kHz
- D. 5.6 kHz
- E. 11.2 kHz

# ABR Sample Questions

## Nuclear Medical Physics – Part 2

Simple Question: A spatial resolution measurement of a SPECT system is performed using line sources of Tc-99m according to the NEMA protocol. If the spatial resolution (FWHM) is 10.5 mm in the center of the phantom, what is the peripheral tangential spatial resolution (FWHM) in mm at 7.5 cm from the center of the phantom?

- A. 8 mm
- B. 12 mm
- C. 14 mm
- D. 16 mm

# ABR Sample Questions

## Nuclear Medical Physics – Part 2

Complex Question: A generator is eluted and yields 300 mCi of Tc-99m. What is the maximum acceptable number of microcuries of Mo-99 allowable at the time of elution in order for clinical studies to be done up to 6 hours after elution?

- A. 5.6
- B. 12
- C. 24
- D. 30
- E. 45

# American Board of Medical Physics (ABMP)

- \* Established in 1987
- \* Sponsored by:
  - \* AAPM
  - \* AAHP
  - \* American College of Medical Physics (over 450 members, chartered in 1982, associated with AAPM)
  - \* International Society for Magnetic Resonance in Medicine (over 5,000 members)
- \* Certificates currently awarded in:
  - \* Medical Health Physics (41 Diplomates)
  - \* Magnetic Resonance Imaging Physics (39 Diplomates)
- \* Other certifications discontinued in 2001



# ABMP Agreement with ABR

- \* Effective in 2001
- \* ABMP discontinued awarding new certification in:
  - \* Radiation Therapy Physics (312 Diplomates)
  - \* Diagnostic Imaging Physics (77 Diplomates)
  - \* Nuclear Medicine Physics (8 Diplomates)
  - \* Hyperthermia Physics (2 Diplomates)
- \* ABMP Diplomates in Radiation Therapy Physics and Diagnostic Imaging Physics who enrolled in ABR program prior to 12/31/2006 were issued a Letter of Certification Equivalence (LoCE) from ABR (with specific ABR requirements to maintain the LoCE).

# ABMP Certification in Medical Health Physics

- \* Tests the candidate's experience and practical knowledge of current radiation protection standards and practices for ionizing and nonionizing radiation.
- \* Currently 41 Diplomates in Medical Health Physics
- \* Three part certification process
  - \* Part 1 General Medical Physics
  - \* Part 2 Medical Health Physics
  - \* Part 3 Oral exam
- \* Recertification every 5 years
- \* Continuing Education: 125 MPCEC's every 5 years [reduced from current 150 CE requirement] (effective 1/1/2014)

# ABMP Example Questions

## Part 1

Match the property (1-4) with the appropriate particle (A-E):

- A. Proton
- B. Neutron
- C. Electron
- D. Neutrino
- E. Pion

1. Has the greatest mass
2. Has rest mass of 140 MeV
3. Has no charge and rest mass of 939 MeV
4. Electron capture reduces the number of these in the nucleus.

# ABMP Example Questions

## Part 2

In calculating the room shielding for a high energy linac (25 MV) treatment room/ the entrance door to the room requires appropriate materials and thickness to shield against:

- (1) fast neutrons.
- (2) thermal neutrons.
- (3) high energy x-rays.
- (4) high energy gamma rays.

- A. (1) 1 (2) 1 and (3) only are correct.
- B. (1) and (3) only are correct.
- C. (2) and (4) only are correct.
- D. (4) only is correct.
- E. All are correct.

# Canadian College of Physicists in Medicine (CCPM)

- \* Established in 1979
- \* To recognize proven competence in physics applied to medicine
- \* Certification offered in 4 distinct sub-specialties:
  - \* Radiation Oncology Physics (323 currently certified)
  - \* Diagnostic Radiological Physics (25 currently certified)
  - \* Nuclear Medicine Physics (17 currently certified)
  - \* Magnetic Resonance Imaging (10 currently certified)
- \* Written examination and oral examination
- \* “Fellow” classification is also offered
- \* CCPM certified medical physicists also belong to the Canadian Organization of Medical Physicists (COMP)
- \* Re-certification required every 5 years

# Mammography Certification in Canada

- \* Canadian Association of Radiologists (CAR) accredits mammography facilities in Canada.
- \* CCPM accredits persons who are qualified to perform the physics component of mammography certification.
- \* Medical Physicists who conduct surveys of mammography facilities and provide oversight of the facility QA program “must be accredited in Medical Physics of Mammography by the CCPM or its equivalent, or any relevant provincial/territorial license.”  
(There are currently 28 certified mammography physicists in Canada.)

# American Board of Science in Nuclear Medicine (ABSNM)

- \* Founded in 1976
- \* Sponsored by:
  - \* Society of Nuclear Medicine (SNM)
  - \* American College of Nuclear Physicians
  - \* American College of Nuclear Medicine
- \* Primary objective: To certify scientists practicing in nuclear medicine
- \* Specialty Areas:
  - \* Nuclear Medicine Physics and Instrumentation
  - \* Radiopharmaceutical Science
  - \* Radiation Protection
  - \* Molecular Imaging

# ABSNM (cont'd.)

- \* Detailed education and experience requirements for each specialty area
- \* Two-part written examination:
  - \* General Nuclear Medicine Science Examination
  - \* Specialty Examination
- \* Administrative services for the ABSNM provided by SNM
- \* Currently 223 Diplomates of the ABSNM



# ABSNM Certificate

“A certificate granted by this Board does not of itself confer, or purport to confer, any degree of legal qualifications, privileges or license to practice Nuclear Medicine.”

(ABSNM website 2013)

# USEPA Federal Guidance Report No. 14 (2012)

## “Radiation Protection Guidance for Diagnostic and Interventional X-ray Procedures”

- \* Replaces FGR No. 9 (1976)
- \* Prepared by the Medical Work Group of the ISCORS Federal Guidance Subcommittee
- \* Provides guidance for Federal facilities
- \* Defines several terms, including:
  - \* Health Physicist
  - \* Medical Physicist
  - \* Medical Health Physicist
  - \* Qualified Physicist (includes statements re: certifications, continuing education, and experience)
  - \* Qualified Medical Physicist (includes statements re: certifications, continuing education, and experience)

# NCRP 147, 151

## Qualified Expert

### \* NCRP 147 1.5 General Concepts

- \* The term “qualified expert” used in this Report is defined as a medical physicist or medical health physicist who is competent to design radiation shielding for medical x-ray imaging facilities. The qualified expert is a person who is certified by the American Board of Radiology, American Board of Medical Physics, American Board of Health Physics, or Canadian College of Physicists in Medicine.
- \* Radiation shielding *shall* be designed by a qualified expert to ensure that the required degree of protection is achieved.

### \* NCRP 151 1.10 General Concepts

- \* The term qualified expert used in this Report is defined as a medical physicist or a health physicist who is competent to design radiation shielding in radiotherapy facilities, and who is certified by the American Board of Radiology, American Board of Medical Physics, American Board of Health Physics, or Canadian College of Physicists in Medicine.
- \* Radiation shielding *shall* be designed by a qualified expert to ensure that the required degree of protection is achieved.

# Conclusions and Acknowledgements

- \* John Frazier and Steve King were instrumental in the development of this presentation
- \* <http://www.theabr.org/ic-rp-landing>
- \* <http://www.abmpexam.com/>
- \* <http://www.ccpm.ca/>
- \* <http://www.snm.org/absnm/>