**Focus on Medical Physics**

**Medical Physics and ABR Certification**

2016;9(1):20-25

By Geoffrey S. Ibbott, PhD, and G. Donald Frey, PhD

The American Association of Physicists in Medicine (AAPM) estimates that there are 6,800 practicing medical physicists in the U.S. Membership in the AAPM is open to scientists and others who have an interest in the field, and who practice in settings that involve medical physics work. Membership is not restricted to those with degrees or certification in medical physics, and as a result, there is a wide variation in educational background, clinical experience, qualifications, and career goals among AAPM members. There are others who identify themselves as medical physicists but who are not members of the AAPM. All this makes it somewhat difficult to characterize the profession, but this article is an attempt to do so.

According to the AAPM, the majority (75 percent) of medical physicists work fully or primarily in radiation therapy. (See Figure 1. Source, AAPM Annual Professional Survey). Only 70 percent report that they are certified by the ABR, the American Board of Medical Physics, the Canadian College of Physicists in Medicine, or another board. Approximately the same number (69 percent) say that they work primarily in clinical activities, with 22 percent working in research and 9 percent who are primarily administrators.

![Figure 1: Distribution of medical physicist specialization, according to the AAPM](image-url)
We tend to think of medical physics as a profession, where a profession is distinguished from an occupation by having the following characteristics:

- Standardized education
- Accreditation of educational programs
- Certification of practitioners
- Professional standards
- Licensure

In the case of medical physics, the following descriptions apply:

- The AAPM has described a standardized educational path as beginning with a thorough preparation in undergraduate physics, followed by graduate education leading to a master’s or doctoral degree and including medical physics coursework. The academic training must be followed by practical experience through a residency traineeship or a postdoctoral fellowship.
- Medical physics educational programs are accredited by the Commission on Accreditation of Medical Physics Education Programs (CAMPEP). CAMPEP accredits graduate educational programs leading to a degree, so-called “certificate” programs intended to provide medical physics education to people who already hold a graduate degree in another field, and residency programs.
- The RSNA offered certification of medical physicists beginning in 1934, and this responsibility was transferred to the ABR after World War II. The ABR certification program is the most widely recognized and respected certification program for medical physicists. The ABR is one of only two boards of the American Board of Medical Specialties (ABMS) that certifies nonphysicians; the American Board of Medical Genetics is the other.
- The AAPM has developed professional standards, including a Code of Ethics. Membership requires applicants to attest that they will uphold the Code of Ethics.
- Only four states offer licensure of medical physicists: New York, Florida, Texas, and Hawaii. Several other states maintain registries of qualified medical physicists, but these registries do not carry the legal force of licensure.

Until recently, the pathways that brought people into the profession were extremely varied. In the early years, physicists were recruited from classical university physics positions and were enticed by supplements to their salaries from clinical revenue. Most were trained on the job, and many had to teach themselves. Beginning in the 1960s, specialized graduate medical physics training programs were developed, but still, many medical physicists received only formal classical physics education, combined with clinical training in postdoctoral fellowships or more informal positions. Consequently, the quality and level of training and experience that many medical physics trainees received varied from intensive to almost nothing.

More recently, the need to standardize the training of medical physicists led to the development of CAMPEP. CAMPEP developed curriculum standards and an accreditation process, and today, most medical physics graduate programs are accredited.
Even more recently, CAMPEP published standards for medical physics residencies, and now approximately 100 residents complete their training in accredited residency programs each year. Most programs now participate in a residency match, modeled after diagnostic radiology and radiation oncology match programs. Today, however, there is a large imbalance between the output of graduate programs and the capacity of residency programs; therefore, in 2015, of 402 graduates who registered for the match, 122 withdrew. Of the remaining 280, only 108 (39 percent) matched. This imbalance is expected to worsen in coming years as graduates who didn’t match in 2015 attempt again in 2016.

The introduction of educational standards and the development of CAMPEP has enabled the ABR to rely on compliance with these standards, rather than have to impose its own standards on candidates for certification. As a result, the requirements for ABR certification in medical physics now include the following:

- A BS or graduate degree in physics, or coursework equivalent to an undergraduate minor in classical physics
- A graduate degree from a CAMPEP-accredited medical physics program
- Two years of clinical training in a CAMPEP-accredited residency program

Several alternatives to the above exist:

- Candidates who registered for the ABR Part 1 exam prior to 2013 are permitted to obtain 36 months of on-the-job training as an alternative to completing a residency.
- Candidates with graduate degrees in classical physics can complete the necessary minimum medical physics coursework in a CAMPEP-accredited graduate program without enrolling as degree students. They may then be admitted to a residency program.
- A few universities have developed programs that combine two years of graduate coursework with a two-year residency, culminating in a professional doctoral degree (called Doctor of Medical Physics – DMP).
- Medical physicists who were trained in a foreign country, worked there for at least a year, and received recognition as qualified to practice in that country can enter a “structured mentorship” in the U.S. This is a supervised program of at least 36 months’ duration that embodies the elements of a residency program.

Certification in Medical Physics

Certification in medical physics comprises a sequence of three exams. The exams are designed to test “book” knowledge obtained in a graduate program, clinical training obtained in a residency or through on-the-job experience, and the ability of the candidate to communicate his or her knowledge about clinical situations.

Part 1 Exam

The Part 1 exam is a computerized exam administered at testing centers run by Pearson VUE, a commercial testing company. Pearson VUE operates at least one testing center in each major
city, and in many cases, several testing centers are available. The exam consists of multiple-choice questions, each with a single correct answer.

To qualify to take the Part 1 exam, candidates must either:

- be enrolled in, or have completed, a CAMPEP-accredited educational program, or
- have completed a structured mentorship (applies to international medical physicists only).

The Part 1 exam has two subparts: a general medical physics exam and a clinical exam that tests knowledge of anatomy, physiology, and radiation biology. Candidates who fail the general medical physics exam must retake both exams in a subsequent year, but candidates who fail only the clinical exam may retake only the clinical exam. Candidates have five years from the date of original registration and admission to Part 1 to pass both subparts of the Part 1 exam. Failure to do so requires completing another year of education in a CAMPEP-accredited program and reregistration for Part 1. (See Figure 2.)

![Figure 2: The ABR physics exams and allowable time between steps in the certification process.](image)

**Part 2 Exam**

The Part 2 exam is also a computerized exam administered at Pearson VUE centers. It consists of 80 multiple-choice questions, of which 53 are “simple” questions: the answer requires either a single calculation or one item of knowledge. The remaining 27 items are “complex” and generally require multiple steps or multiple calculations. Each complex item has three times the value of a simple item. Unique Part 2 exams are administered for each of the three medical
physics certificates: therapeutic medical physics, diagnostic medical physics, and nuclear medical physics.

To qualify for the Part 2 exam, candidates must have passed the Part 1 exam no more than 10 years earlier. In addition, candidates must have completed a CAMPEP-accredited residency, 36 months of supervised clinical experience (candidates who registered before 2013), or a structured mentorship (international candidates only). Candidates who meet the residency training requirement become “board eligible” immediately. Consequently, it is possible to become board eligible before passing the Part 1 exam. Candidates in either of the other pathways must register for the Part 2 exam and be approved before becoming board eligible.

**Oral Exam**

Once a candidate successfully completes the Part 2 exam, he or she is automatically registered for the next administration of the oral exam. The oral exam is held each year in May or June in Louisville, Kentucky, and consists of five 30-minute sessions, each with a single examiner. The five examiners each ask one question from each of five categories. The categories are different for the three medical physics specializations.

Once a candidate is board eligible, he or she must become certified within six years. Failure to do so requires the candidate to complete an additional year of clinical training in a CAMPEP-accredited training program, and then register and be re-approved for the Part 2 exam (see Figure 2).

**Related Boards and Organizations**

In 1991, the American Board of Medical Physics (ABMP) was formed, and for about 10 years, it competed with the ABR for certification of medical physicists. In 2001, an agreement was reached, which called for the ABMP to discontinue certifying in fields that competed with the ABR. The ABR recognized ABMP diplomates by offering them a Letter of Certification Equivalency (LoCE) and the opportunity to enroll in ABR Maintenance of Certification (MOC). ABMP diplomates who received a LoCE and completed a 10-year cycle of ABR MOC could receive an ABR certificate. This program ended in 2015. Approximately 80 ABMP diplomates have chosen this route; others have chosen to maintain their ABMP certificates. The ABMP continues to certify candidates in MRI physics and medical health physics.

Several other boards also certify in fields related to medical physics. The American Board of Science in Nuclear Medicine (ABSNM) awards approximately the same number of certificates in nuclear medicine physics each year as does the ABR. The admission requirements are less demanding because completion of a residency program is not required, but the ABSNM does have an MOC program.

A relatively new organization, the International Medical Physics Certification Board (IMPCB), was formed to provide guidance and support to medical physics organizations for the establishment of national medical physics certification boards, and to conduct board examinations for medical physicists in countries that have not yet established certification...
boards. Near the end of 2015, the IMPCB accredited national medical physics certification boards in Korea and Hong Kong.

In addition to regular meetings with the AAPM and with CAMPEP, the ABR physics trustees, the ABR physics governor, and the ABR associate executive director (AED) for medical physics meet with the Society of Directors of Academic Medical Physics Programs (SDAMPP) and the ACR’s Medical Physics Commission. A Memorandum of Understanding was drawn up in August 2012, clarifying the roles of the four organizations most involved with education and training: ABR, AAPM, CAMPEP, and SDAMPP. (See Figure 3.)

![Figure 3: The relationships among the ABR, AAPM, SDAMPP, and CAMPEP.](image)

**Status and Future Developments**

A recent challenge for the medical physics trustees, governor, and AED has been the large number of candidates seeking certification. Many of these candidates entered the certification pathway prior to the 2012 requirement for a CAMPEP-accredited education and the 2014 requirement for a CAMPEP-accredited residency. A large number of them are still making their way through the exam sequence, so the May 2016 oral exam will again bring many candidates to Louisville.

However, the 2012 and 2014 requirements have resulted in a reduced number of candidates for the Part 1 exam, and the limited number of residencies will control the number of new candidates entering the pathway in future years. The effect of a standardized education is now being seen in improved passing rates on all the exams, for candidates who received a CAMPEP-accredited graduate education and completed a CAMPEP-accredited clinical residency.