



# ***SDAMPP Medical Physics Education and Training Report***

*Presented at the 2016 SDAMPP Annual Meeting by  
Jay Burmeister, PhD  
Chair, SDAMPP Trainee Affairs Committee*

## Introduction

The following report represents a summary of the presentation at the 2016 SDAMPP annual meeting entitled “The Current State of Medical Physics Education and Training”. The purpose of this presentation was to gather, present, and discuss data surrounding the current state, and effects of recent changes on, the education and training landscape in Medical Physics. The presentation was preceded by a pre-meeting survey which was emailed to all registrants for the SDAMPP annual meeting. Registration was not limited to SDAMPP members. In addition, real-time data was collected during several of the presentations given at the SDAMPP annual meeting using an app called Socrative. A number of questions of this type were asked during this presentation. The data from the pre-meeting survey are presented next, followed by a description of the presentation including the real-time survey results, and an associated discussion. Approximately 60-70 attendees were present at the meeting and at least a partial set of responses was collected from 61 separate attendees.

## Pre-Meeting Survey

Of the 71 registrants, 47 responded to the survey. The questions and associated responses are listed below. Appendix 1 contains all written answers and comments.

---

**Question 1: What is the most significant issue facing medical physics education and training right now?** (47 responses, complete responses presented in Appendix 1)

**Most common responses:**

Supply / demand (graduation rate, number of residency positions, clinical demand, etc.): 22

Recruitment of quality MP students and quality of training provided: 8

Changing education landscape, requirements, standards, degree types, etc.: 4

Narrow focus on clinical training: 4

Availability of research funding: 3

Funding of education and training in general: 3

---

**Question 2: Are you in favor of an active effort to reduce graduate program enrollment to approach (NOT necessarily to reach) equilibrium with residency spots and/or clinical demand?**

**Responses: 47**

Yes: 26 (55%)

No: 21 (45%)

---

**Question 3: Please select the choice that most appropriately reflects your primary role in medical physics education and training:**

**Responses: (47)**

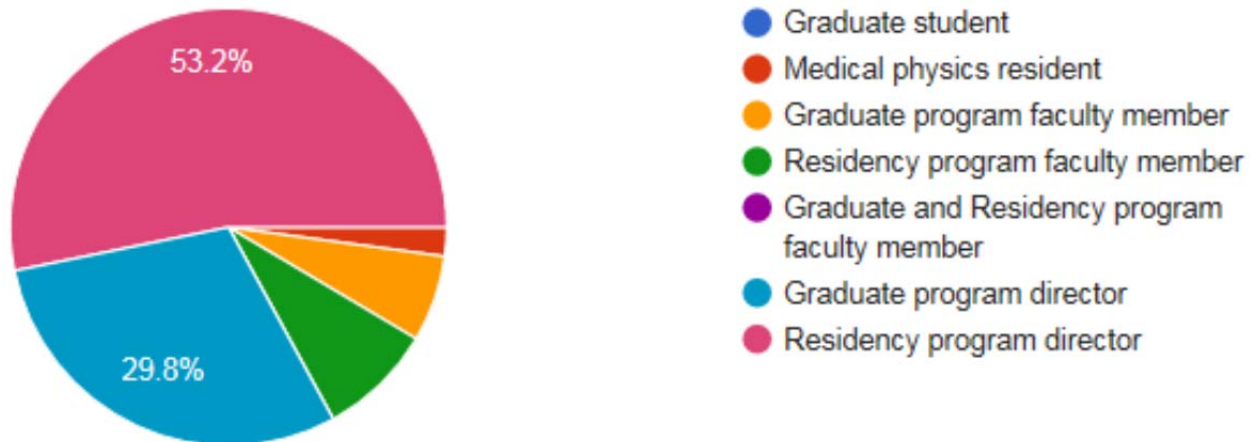
Residency Program Director: 25 (53%)

Graduate Program Director: 14 (30%)

Residency Program Faculty Member: 4 (9%)

Graduate Program Faculty Member: 3 (6%)

Medical Physics Resident: 1 (2%)



---

[Questions 4-6 were asked of Graduate Program Directors only.]

**Question 4: Are you currently actively reducing enrollment in your graduate program due to residency availability and/or clinical demand?**

**Responses: 14**

Yes: 3 (21%)

No: 11 (79%)

---

**Question 5: By what percentage do you feel that you could reduce enrollment in your graduate program without jeopardizing the program's viability?**

**Responses: 13**

0% (7)

20% (1)

25% (1)

50% (1)

Unknown (3)

---

**Question 6: What would be the jeopardizing factor(s)? (finances, course offerings, etc.) (12 responses)**

**Most Common Responses: (many responses contained multiple factors)**

Finances: 5

Critical mass of students / faculty, state or university requirements: 5

Course offerings: 3

None / unclear: 3

---

**Question 7: Do you believe that the disparity between available residency positions and medical physics graduates will have a negative effect on the medical physics graduate program applicant pool?**

**Responses: 47**

Yes: 25 (53%)

No: 22 (47%)

---

**Question 8: Do you see the MS degree as a viable medical physics education pathway in the future?**

**Responses: 47**

Yes: 31 (66%)

No: 16 (34%)

---

**Question 9: Do you see the DMP as an improvement in the MP education and training system?**

**Responses: 47**

Yes: 12 (26%)

No: 35 (75%)

---

**Question 10: What do you think is the right number of CAMPEP-accredited clinical training slots needed PER YEAR to meet clinical demand in Radiation Therapy (this includes both clinical residency and DMP spots)?**

**Responses: 43 (average numerical response = 131)**

80-100 (2)

120-129 (4)

130-139 (3)

140-149 (2)

>150 (5)

Qualitative response or one requiring data that we don't yet have (12)

Don't know (15)

---

**Question 11: What do you think is the right number of CAMPEP-accredited clinical training slots needed PER YEAR to meet clinical demand in Imaging (this includes both clinical residency and DMP spots)?**

**Responses: 39 (average numerical response = 33)**

10-20 (4)

21-30 (4)

31-40 (5)

41-50 (1)

>50 (2)

Qualitative response or one requiring data that we don't yet have (5)

Don't know (18)

---

## Discussion

The presentation began with a review of the data from questions 1-6 in the pre-meeting survey. From these survey results, the most significant issue facing medical physics education and training right now appears to be supply and demand for medical physics graduates, residency positions, and clinical positions. However, there were five other common answer themes listed in the data which represent significant professional issues, including the recent changes in the education and training infrastructure, recruitment of high quality students and the effective education of those students, the relatively narrow focus on clinical training, and funding for both medical physics research and medical physics education and training in general. While many respondents indicated that the mismatch between MP graduates and residency positions was the major issue facing MP today, only 55% of respondents were in favor of an active effort to reduce graduate program enrollment. This is due partly to the perception of whether the problem lies in the supply or the demand. Of the 22 respondents who felt that this mismatch was the major issue, 12 felt that the problem was the shortage of residency positions, 7 felt that the problem was the overabundance of graduates, and 3 did not specifically indicate which one was the problem. Based on this data therefore, only 7 of 47 respondents (15%) believe that the issue is specifically a problem of overabundance of MP graduates. Of the 17 respondents who identified themselves primarily as graduate program directors or faculty, 6 felt that this mismatch was the major issue and only 2 of these felt that the number of medical physics graduates was the problem. In comparison, of the 29 respondents who identified themselves primarily as residency program directors or faculty, 15 felt that this mismatch was the major issue and 5 of these felt that the number of medical physics graduates was the problem. Most graduate program directors indicated that they were not actively reducing enrollment in response to market influences, and most felt that they had little or no capacity to do so if they desired.

For a more in-depth evaluation of the state of supply and demand in the education training pipeline, we next evaluated data from the CAMPEP program directors survey from 2015 (the data collected and presented in 2016). The number of graduate programs accredited by CAMPEP has grown dramatically over the past decade. From 1988-2007, 15 programs achieved accreditation. From 2007-2010, the number of accredited programs doubled to 30, and then increased to 44 from 2010-2013. There are currently 50 accredited graduate programs. From the 2015 CAMPEP survey, there were 1161 total students enrolled in these programs and 332 graduates (202 MS, 99 PhD, 6 DMP, and 25 Certificate). One interesting statistic is that only 294 students matriculated in 2015, down 5% from an average of 308 over the prior three years (2012-2014). This could indicate that some programs are reducing their numbers of matriculating students in response to the overabundance of graduates and/or scarcity of employment opportunities (both clinical and in other areas). This decrease is actually larger when evaluated on a per program level since the number of accredited programs has increased over that time period. The number of matriculating students per accredited program can be calculated from previous CAMPEP survey data at  $311/40=7.8$  in 2012,  $289/44=6.6$  in 2013,  $324/46=7.0$  in 2014, and  $294/48=6.1$  in 2015. The number of matriculating students per accredited graduate program in 2015 (6.1) is therefore 14% lower than the average value from 2012-2014 (7.1).

The likelihood of residency placement for graduate students entering the match can be calculated using data from the MedPhys Match website (<https://www.natmatch.com/medphys/stats/2016stats.html>). For 2016, 106 spots were filled out of 331 match registrants, so approximately 32% of all registrants matched into a residency position. This can be compared to 108/402=27% in 2015. Since the number of applicants matched in each year was nearly the same, the major difference was the significant decrease (nearly 20%) in the number of registrants. One might have expected this number to increase in 2016 if unmatched 2015 applicants re-applied. There is currently no clear explanation for this decrease.

A number of recent publications have discussed whether the MS degree remains a viable pathway into clinical practice (1-6). While this is a very complicated question, two specific implicit aspects of the question are (1) does the MS degree provide suitable preparation for clinical training in medical physics, and (2) is it still reasonable to hope that you will be able to acquire a residency position with an MS degree? The answer to (1) is still 'yes', assuming that the program adheres to the recommendations of AAPM Report #197, which clearly spells out the recommended medical physics coursework. The answer to (2) is much more complicated. One way to begin to answer this question would be to evaluate current residency placement data for both MS and PhD holders from CAMPEP accredited graduate programs. The MedPhys Match statistics from 2015 are available online at <https://www.natmatch.com/medphys/aboutstats.html>. These statistics were further elucidated in the May/June 2015 AAPM newsletter ([http://www.aapm.org/pubs/protected\\_files/newsletter/4003-aapmnews.pdf](http://www.aapm.org/pubs/protected_files/newsletter/4003-aapmnews.pdf)). Using these data, one can calculate the percentage of applicants in several demographic categories who were able to successfully match into a residency position. For those with a CAMPEP-accredited MS degree, that percentage was 40/121 (33%) and for those with a CAMPEP-accredited PhD degree, it was 37/92 (40%). This difference is not as large as some might expect, however, it should be remembered that this percentage is based on the number of "applicants" who matched, not the percentage of "registrants" who matched. The disparity in the fraction of registrants who matched between CAMPEP-accredited MS and PhD holders may be larger.

This discussion initiated the first of the real-time Socratic questions:

---

**Socratic Question 1: If you were a graduate student interested in a purely clinical position, would you choose to complete a PhD in order to increase your chance of obtaining a clinical residency position?** (Further clarification was given before collecting responses that the decision to complete the PhD was assumed for this question to be ONLY to increase your chances of obtaining a residency position.)

**Responses: 49**

Yes: 32 (65%)

No: 17 (35%)

---

This response is intriguing given that more than half of these same respondents stated in the following question that this is a misuse of our medical physics research resources:

---

**Socratic Question 2: Do you feel that the completion of a PhD by a student who is interested in a purely clinical position is a misuse of our medical physics research resources?** (Again, a clarification was made that the PhD in question here was completed ONLY to provide a better chance of obtaining a residency position.)

**Responses: 52**

Yes: 29 (56%)

No: 23 (44%)

---

Disparities in graduate placement between institutions was discussed next, indicating first that residency placement likelihood is dependent more upon the institution one attends than which degree one pursues (see also: Loughery, B. and Burmeister, J. "Is the MS Degree Still a Viable Option for Clinical medical Physics Education and Training?", *Med. Phys.* **43**, 3745 (2016) <http://dx.doi.org/10.1118/1.4957475>.) Furthermore, we must be careful in utilizing these data since they tell us nothing about what fraction of an institution's graduates actually want to pursue a residency position. We may estimate this fraction for all CAMPEP-accredited programs from the CAMPEP survey. In 2015, 61% of all PhD graduates and 53% of all MS graduates from CAMPEP-accredited institutions entered a clinical or residency position. Moreover, 18% of the MS graduates either pursued another degree or are still seeking a position. If we assume that many of these graduates will ultimately enter a clinical position, we may estimate that roughly 2/3 of all graduates from CAMPEP-accredited programs will ultimately enter the clinical workforce. In summary, data were presented from the pre-meeting survey indicating that 65% of respondents continue to see the MS degree as a viable medical physics educational pathway in the future.

The next topic of discussion was whether PhD candidates who are ultimately interested in hybrid academic-clinical faculty positions may be dissuaded from the field due to the time commitments of a PhD and residency, and whether this clinical training in any way impedes their research progress. One such possibility is related to the logistics of the match process. Students need to make a decision to enter the match nearly a year in advance of their potential residency start date, and despite the best intentions of students and advisors, the research timescale is difficult to predict and to constrain within a strict schedule. This is exacerbated by the fact that the student may spend a great deal of time the following winter traveling for resident interviews. The question then becomes, "What should be done if a PhD student matches into a residency but is unable to complete his/her research prior to the start date of the residency?" This puts the PhD advisor and/or the residency program in a difficult situation. The third Socratic question asked SDAMPP members which was the most favorable solution to this problem:

---

**Socratic Question 3: A PhD student matches with a residency program but is not able to successfully defend the PhD by the residency start date. The best solution to this problem is:**

**(A) adjust the residency start date**

**(B) complete the PhD during the residency**

**(C) complete the PhD after completion of the residency program**

**(D) incorporate PhD completion as requirement in match system**

**Responses: 53**

(A) 17 (32%)

(B) 14 (26%)

(C) 2 (4%)

(D) 20 (38%)

---

Responses were split fairly evenly between postponing the residency start date, completing the PhD during the residency, or incorporating PhD completion as part of the match process. (It should be noted that the second response is only possible if the student already had a graduate degree, otherwise they would not be eligible for the residency position unless the program were to confer an MS degree based on the currently completed coursework and research.)

The next discussion question was whether the disparity between available residency positions and MP graduates will have a negative effect on the MP graduate program applicant pool. A survey was circulated to all match applicants and program directors in both 2015 and 2016. Three 2016 AAPM presentations were based on data from this survey (7-9). Results from this survey indicated that the vast majority of match applicants felt that the current residency placement rate is a problem for our profession, while less than half of residency program directors felt this way. In addition, approximately 30% of match applicants over the past two years suggested that they would not have pursued graduate education in Medical Physics if they had known their likelihood of getting into a residency program. It appears, therefore, that the answer to the question of whether the residency match disparity negatively impacts applicants is “yes” based on the responses of current residency match applicants. SDAMPP members were asked in the pre-meeting survey whether residency availability will negatively affect MP recruitment and greater than half of the respondents said that they did believe that the disparity between available residency positions and MP graduates will have a negative effect on the MP graduate program applicant pool. A 2016 AAPM presentation was based on this topic (10).

Another important current dynamic in the MP education and training landscape is the professional doctorate degree, or DMP. There are currently three CAMPEP-accredited DMP programs and seven other graduate programs are in the process of or considering the possibility of initiating a DMP program within their institution. According to the 2015 CAMPEP survey data, four programs are awaiting institutional approval and one is currently awaiting CAMPEP accreditation. A pre-meeting survey question asked, “Do you see the DMP as an improvement in the MP education and training system?” Interestingly, 35 out of 47 respondents answered “No”. To gain a better perspective on this sentiment, respondent comments were reviewed. Of the 35 comments, 30 of them (85%) shared two themes: (1) the cost of the program to the student and (2) the concern that the DMP is simply an MS + residency. Many of these comments stated explicitly that there is no perceived difference between a DMP and an MS + residency and that the DMP merely is a name change and a transfer of the funding burden from institution to student. Interestingly, none of the DMP programs currently accredited by CAMPEP are simply an MS degree plus 2 years of structured clinical training. The AAPM WGDMP is currently



gathering data on the composition of all DMP programs in existence or in creation. It will be important to share this data with the SDAMPP membership and the AAPM as a whole.

The next Socratic question asked the attendees what should constitute a DMP:

---

**Socratic Question 4: A DMP should consist of:**

- (A) MS + 2 years clinical training**
- (B) MS + additional didactic coursework + 2 years clinical training**
- (C) MS + additional research + 2 years clinical training**
- (D) MS + didactic coursework and research + 2 yrs clinical training**

**Responses: 54**

- (A) 10 (19%)
  - (B) 8 (15%)
  - (C) 18 (33%)
  - (D) 18 (33%)
- 

Only 19% of respondents to this question indicated that it should consist only of an MS plus 2 years of clinical training. Several other questions were then interactively asked in regard to the DMP. The first was whether the attendees feel that DMP students should be free to enter the MedPhys Match:

---

**Socratic Question 5: Do you feel that DMP students should be free to enter the MedPhys match?**

**Responses: 52**

- Yes: 25 (48%)
  - No: 27 (52%)
- 

On one hand, if an institution is not reliant on the clinical services performed by the DMP students in their clinical years, or on the tuition necessary to support the educational infrastructure, it seems reasonable that they would allow their students to enter the match and potentially obtain a paid residency position. In addition to the financial benefit, this is also advantageous to the student in that they get to see another clinical operation at a separate institution which may make them a more well-rounded trainee. On the other hand, the financial structure for such programs can be complicated and the program has invested significantly in preparing the student for their clinical training, thus it would be understandable that some institutions would not want their DMP students to leave prior to their clinical service years. Another issue surrounding DMP program implementation is whether and how former MS or PhD graduates of that program are able to obtain the DMP degree. While it wouldn't make sense not to allow them to pursue the degree, the question is whether it makes sense for them to complete the 2 year clinical training component. This is particularly true if they are already board certified, since the residency requirement that spawned these programs is specifically for board certification, and since board certification is a form of independent validation that they already have sufficient clinical training.

Socratic question number 6 asked what respondents think should be required of a former MS graduate in order to obtain the DMP:

---

**Socratic Question 6: A university with an existing MS program in medical physics establishes a DMP program. The pathway for former MS graduates of this program to complete the DMP should require:**

- (A) the clinical training component at that university**
- (B) the clinical training component from any CAMPEP program**
- (C) no clinical training component if graduate has >2 years clinical experience**
- (D) no clinical training component if graduate is board certified**

**Responses: 45**

- (A) 16 (36%)
  - (B) 11 (24%)
  - (C) 4 (9%)
  - (D) 14 (31%)
- 

Approximately 1/3 of respondents felt that such students should be required to complete the clinical training at that institution, while another 1/3 felt that they should not be required to complete the clinical training component as long as they are board certified. Evaluated another way, 60% of respondents felt that the MS graduate should be required to complete the 2 year clinical training component in some form, while 40% felt that it was not necessary provided they already had sufficient clinical training in practice.

Socratic questions 7 and 8 asked about the standardization of DMP composition and pathway for former MS graduates:

---

**Socratic Question 7: Should the composition of the DMP be standardized across institutions? (Y/N)**

**Responses: 49**

- Yes: 38 (78%)
  - No: 11 (22%)
- 

**Socratic Question 8: Should the DMP pathway for former MS graduates be standardized across institutions? (Y/N)**

**Responses: 50**

- Yes: 40 (80%)
  - No: 10 (20%)
-

Approximately 80% of respondents to both questions answered that these should be standardized across institutions. This standardization would clearly be helpful in establishing the composition and logistics of these programs, and hopefully also would help demonstrate and standardize the value of the DMP.

Socrative question number 9 asked attendees whether they would have entered a DMP program if they were currently an MS student at an institution which had just implemented a DMP program:

---

**Socrative Question 9: If you were a graduate student entering an MS program and a DMP program became available at your institution would you choose the DMP over the MS?**

**Responses: 50**

Yes: 29 (58%)

No: 21 (42%)

---

Interestingly, while approximately 75% of respondents did not feel that the DMP is an improvement in the MP education and training system, 60% of them would have chosen the DMP over an MS degree. Finally, Socrative question number 10 asked about perceptions regarding the cost of the DMP:

---

**Socrative Question 10: What is an appropriate cost for an entire DMP program?**

**(A) \$0 (clinical service should offset tuition)**

**(B) \$25k-50k**

**(C) \$50k-75k**

**(D) \$75k-100k**

**(E) >\$100k**

**Responses: 47**

(A) 7 (15%)

(B) 10 (21%)

(C) 7 (15%)

(D) 16 (34%)

(E) 7 (15%)

---

There was very large variability in the set of responses to this question, with 15% stating that clinical service should offset tuition and the DMP should not be a cost to the student, 21% stating that \$25k-\$50k is a reasonable cost, 15% stating that \$50k-\$75k is a reasonable cost, 34% stating that \$75k-\$100k is a reasonable cost, and 15% stating that >\$100k is appropriate.

The session concluded by returning again to the issue of supply and demand and how we proceed within medical physics education and training. Pre-meeting survey questions 9 and 10 asked respondents how

many therapy and imaging training positions (including both residency and DMP spots) we need each year. The average numerical responses were 132 and 33 for therapy and imaging, respectively. It is instructive to compare these values to our current numbers. The 2015 CAMPEP data (from the 2016 survey) indicated that 120 CAMPEP graduates entered a clinical residency program. Of the 106 positions obtained by MS and PhD graduates, 90 of them were in therapy and 16 in imaging. If the distribution of positions between therapy and imaging is the same for the 14 certificate program graduates who obtained a residency position and the handful of DMP students entering their clinical years (there were 6 DMP graduates in 2015), we can estimate approximately 105-110 spots in therapy and approximately 20 spots in imaging. Thus, we are relatively close to our own predictions of where we need to be, and based on our own (admittedly incomplete) assumptions, the residency shortage is on the way to being resolved. However, only about 1/3 of respondents actually gave a numerical answer, this is indicative of the fact that we have very limited data about our job market, making the uncertainty so great that even many of our education and training program directors are unwilling to take a guess at a numerical value for the number of clinical training spots we need. These results underscore the necessity for collecting additional and more accurate supply and demand data for the various aspects of our profession, including clinical, academic, industry, government, etc. Without this information, we will continue to be limited in that while we can continue to track statistics from our graduate and residency programs, we will remain unable to calibrate them against any meaningful benchmark.

#### References:

- 1) Hazle JD, Jordan DW, Orton CG. Future qualification as a qualified clinical medical physicist should be restricted to doctoral degree holders. *Med. Phys.*, 43(4), 1585-7 (2016).
- 2) Mills, MD. The meaning of the Master of Science Degree in Medical Physics. *J. Appl. Clin. Med. Phys.*, 15(1), 1-2 (2014).
- 3) Mills, MD. The meaning of the Master of Science Degree in Medical Physics, Part 2. *J. Appl. Clin. Med. Phys.*, 15(2), 1-3 (2014).
- 4) Mills, MD. The meaning of the Master of Science Degree in Medical Physics, Part 3. *J. Appl. Clin. Med. Phys.*, 15(3), 1-3 (2014).
- 5) Mills, MD. The meaning of the Master of Science Degree in Medical Physics, Part 4. *J. Appl. Clin. Med. Phys.*, 16(2), 1-3 (2015).
- 6) Beckham, WA and Jackson, EF. Letter to the Editor: Re: The meaning of the Master of Science Degree in Medical Physics, Part 4., *J. Appl. Clin. Med. Phys.*, 16(4), 334-335 (2015).
- 7) Hendrickson, K., Burmeister, J., Rodrigues, A., Juang, T., and Vimolchalao, S. "Ethics and Discriminatory Behavior in the MedPhys Match" *Med. Phys.* **43**, 3745 (2016).
- 8) Juang, T., Rodrigues, A., Vimolchalao, S., Burmeister, J., and Hendrickson, K.. "Making the Match: Selection Factors in the Medical Physics Residency Match" *Med. Phys.* **43**, 3361 (2016).
- 9) Rodrigues, A., Juang, T., Vimolchalao, S., Burmeister, J., and Hendrickson, K. "Improving the MedPhys Match and Interview Process: Results from an Independent Survey of Applicants and Programs" *Med. Phys.* **43**, 3361 (2016).
- 10) Loughery, B., Hendrickson, K., and Burmeister, J. "Will the Low Residency Placement Rate Scare Talented Candidates Away from Our Profession?" *Med. Phys.* **43**, 3363 (2016).