Physical activity training in US medical schools: Preparing future physicians to engage in primary prevention

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Abstract

**Background:** Medical professionals serve as influential sources of information and guidance for their patients. Medical school may be an opportune time to provide future physicians with training in physical activity (PA) so that it can be more effectively addressed in clinical practice.

**Methods:** To assess the inclusion and amount of PA training in US medical school curricula, we attempted to conduct structured interviews with the program directors of the 171 accredited US medical education programs in the spring of 2013. **Results:** Seventy-four schools (allopathic, \(n = 64\); osteopathic, \(n = 10\)) completed the structured interviews. Fifty-eight programs (78.4\%) reported having PA training included as part of their curriculum. Thirty-five (61.4\%) and 25 (43.9\%) programs included instruction on national aerobic and strength training guidelines, respectively. Thirty-one programs (56.4\%) felt that they offered a sufficient level of PA-related training for their students to successfully counsel their patients in the future. Over the 4 years of medical school, an average of 8.1 (\(\pm 9.8\)) h of mandatory PA training was offered.

**Conclusion:** Though many medical schools report providing some level of PA content, the time dedicated for this training is still low in comparison to other topics, such as nutrition education, which are featured more prominently. New and innovative ideas are needed for the integration of more, higher quality PA training for our next generation of medical practitioners.

Introduction

Engaging in regular physical activity (PA) reduces the risk of chronic disease, enhances mental health and improves quality of life [1]. Yet in the past two decades, physical inactivity has continued to rise in the US [2,3]. In 2013, only 20.8\% of adults met the national recommendations for both aerobic activity and strength training [4]. This low level may be partially attributed to a lack of attention PA receives by healthcare providers, who serve as influential sources of health information and guidance for their patients [5,6]. Healthcare providers are in a unique position to provide guidance, educate patients on the benefits of PA and motivate individuals and families to make healthier choices [7]. However, less than one-third of patients who had seen a physician in the past year were advised to begin or continue engaging in PA [8] and among those who were physically inactive, only 44.9\% had been told by a healthcare professional to become more active [9]. One of the major barriers to PA counseling by physicians is a lack of knowledge and skill [10], as nearly 90\% of physicians indicate that additional training in exercise counseling would be beneficial [11].

Medical school presents an opportune time to educate future physicians on the basics of PA as part of an integrated approach to disease prevention [7]. On average, medical students are more active than the general population [12] and enter medical school believing that PA counseling is an important part of their work [13]. However, upon completing medical school, students report being ill-prepared to discuss and provide guidance on PA to their patients [14] and are unable to identify national PA guidelines [15]. This may stem from the level of PA instruction being offered in medical school. In an assessment of US medical schools conducted in 2002, only 12.7\% of programs reported including PA instruction in their curricula [16]. A recent analysis of US medical education curricula posted online found that a majority of programs did not require their students to take any courses in

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**History**

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PA [17]. Without the appropriate training, physicians will likely remain ill-prepared and unable to effectively play a significant role in helping their patients engage in recommended levels of PA.

There is a pressing need to identify how PA training is currently being included in US medical schools in order to inform future efforts to improve medical education. Given that the study by Cardinal et al. [17] focused exclusively on evaluating curricula posted online, a comprehensive assessment of PA training beyond what may be posted online, has not been conducted in more than a decade in US. Therefore, the objective of this study was to engage US medical school program directors in structured interviews to determine the level and timing of PA training being provided to their medical students, as well as barriers to the integration of this training in their curriculum.

Materials and methods

For this study, we reviewed the websites of the 137 allopathic schools, registered with Association of American Medical Colleges, and the 34 osteopathic schools, registered with American Association of Colleges of Osteopathic Medicine, in the spring of 2014 to identify two points of contact for each program; the program leader who most likely oversaw the medical curricula, such as the program director or the curriculum coordinator, and their administrative assistant. We then attempted to schedule an appointment to conduct a structured interview with the main point of contact at each medical school. This study was reviewed by the University of Miami Human Subjects Research Office and assigned a determination of non-human subjects research.

Interview development and administration

We developed a structured interview, based on items used in previous studies [16,18], to elicit information on the level of PA training in each school’s medical education curriculum. The interview script was vetted by a panel of PA experts and medical school administrators for clarity and completeness. The interview included questions to determine if the medical school included public health (such as an MPH program), if the institution felt it was their responsibility to provide PA instruction for their students, whether the students themselves desired PA training, and the barriers for implementing PA training in their curriculum. Respondents were also asked to describe the amount of time dedicated for PA instruction over each of the 4 years of the medical program and if this training was considered required, elective or parallel (activities available to students outside of formal medical training). See online Supplementary file 1 for a copy of the interview script.

Emails were sent to the identified program leaders and administrative assistants at all 171 US medical schools requesting an appointment to conduct the interview via a phone conversation. If we did not receive an initial response, a second round of follow-up emails and phone calls were placed. We then replicated this process with other individuals in the medical education program until the interview was completed or representatives at each school were contacted a minimum of five times. An emphasis was given to conducting the interview via a phone conversation in order to allow for more in-depth discussion. If a phone interview was not feasible, they were given the option of completing the interview questions online or emailing an electronic document back to the research team.

When a phone appointment was confirmed, we sent a description of the study and an electronic version of the interview script in advance of the scheduled appointment. The interview took 15–30 min to complete depending on the level of detail of the responses. During the interviews, research team members took detailed notes of responses (interviews were not audio recorded) and probed to receive as comprehensive response as possible. Responses to close-ended questions were directly entered into a database, while open-ended responses where coded by a minimum of two research team members prior to analysis.

Statistical analysis

Frequencies and proportions were reported for each interview item. Mean values for the number of hours of PA training (required, elective and parallel) were computed for each year, a cumulative total for all 4 years, and the mean number of hours of required PA instruction. The number of times a response was mentioned in open-ended questions, such as specific classes in which PA training was offered, the main stakeholders responsible for integrating PA training into the curriculum and barriers faced integrating PA training into their curriculum, was recorded. For the open-ended questions, multiple responses for each question were permitted. Duplicate mentions from the same program director (i.e. mentioning the same barrier at different times) were not counted.

Chi square tests were used to identify differences in the type of medical program (allopathic vs. osteopathic) and whether: a) they felt it was the responsibility of the institution to provide PA training, b) their students wanted PA training and c) if they provided instruction on national recommendations for aerobic and strength training. Similar analyses were conducted examining whether programs with a public health program differed across these same outcomes. We also examined whether there were differences in the number of programs offering PA training based on if they felt that: 1) it was their responsibility to provide PA instruction for their students and 2) their students’ desired PA training. Finally, independent t-tests were conducted to determine if the number of hours of PA instruction differed between: 1) allopathic and osteopathic medical programs and 2) programs that had a public health program. Analyses were conducted using Statistical Analytic Software (SAS) version 9.3 (SAS Institute, Inc., Cary, NC, USA) with an alpha set a priori at p < 0.05.

Results

Our research team conducted structured interviews with program leaders from 74 medical education programs (43.3% of all programs); 40 through phone interviews (54.1%), 22 through an online version of the interview questions (29.7%), 11 through the completion of an electronic
document of the interview questions (14.9%) and 1 in-person interview (1.4%). Ten programs (5.8%) declined participation in the study. The remaining schools did not respond to our repeated interview requests.

Of the completed interviews, 64 and 10 were completed with allopathic and osteopathic medical education programs, respectively. Responses from the programs that completed the interview process are presented in Table 1. In brief, 53 of these programs had a public health program (71.6%), 70 felt that it was the responsibility of the institution to provide training in PA (94.6%) and 51 felt that their students were interested in learning about PA (68.9%). There were no significant differences between the type of medical education program (allopathic vs osteopathic) and whether they: had a public health program ($p = 0.08$), felt it was the responsibility of the institution to educate students on PA ($p = 0.66$), believed that their students desired training in PA ($p = 0.94$) or offered specific training in PA ($p = 0.89$). Similarly, there were no significant differences in whether programs: felt it was the responsibility of the institution to educate students on PA ($p = 0.93$), believed that their students desired training in PA ($p = 0.12$) or whether they offered specific training in PA ($p = 0.67$) between medical schools that had a public health program and those that did not.

Fifty-eight schools reported including PA training (78.4%) in their curriculum. Of these schools, 35 (61.4%) and 25 (43.9%) included instruction on national aerobic and strength training guidelines, respectively, with only 24 programs (32.4%) providing instruction on both [1]. Thirty-one programs (56.4%) felt that they taught a sufficient level of PA for their students to successfully counsel their patients in the future. Of the 16 programs that did not offer PA training, only one (of 14) allopathic and one (of two) osteopathic program reported future plans to add PA training to their curriculum. Medical education programs were significantly more likely to include PA training in their curriculum if they felt it was their responsibility to provide this training ($p < 0.0001$), as well as if they felt that their students desired training in PA ($p < 0.0001$). There were no significant differences between the types of medical education program (allopathic vs. osteopathic) on whether they taught the national PA guidelines for aerobic activity ($p = 0.95$) or strength training ($p = 0.71$).

Table 2 presents the number of programs that offered PA training as part of their curriculum during each year of medical education and the average number of hours per year that PA training was provided. PA training was required by the greatest number of programs during the first year of medical school with this number decreasing over the subsequent 3 years. Schools reported requiring a mean total of 8.1 h over the 4 years of their medical education programs. Students were exposed to the greatest amount of PA training (required, elective and parallel) during their first (5.4 h) and third (5.9 h) years. Strategies for providing PA training through parallel experiences included health breaks for students (i.e. a 1-h period each day with no classes), involvement in community projects, wellness programs, student affairs lectures on personal wellness, interest groups and students clubs and luncheon events.

During the initial years of medical school, where the greatest amount of required PA training occurred, more instruction was included in pre-clinical training modules (basic anatomy, physiology, pathophysiology) and organ system base blocks (cardiovascular, endocrinology, gastrointestinal physiology). PA training was also included in the early phases of the

Table 1. Overview of physical activity training in undergraduate medical education programs.

|                                    | n     | Total       | Allopathic programs | Osteopathic programs |
|------------------------------------|-------|-------------|---------------------|----------------------|
| Provide public health training     | 74    | 53 (71.6%)  | 49/64 (76.6%)       | 5/10 (50.0%)         |
| Responsibility of the institution provide PA | 74    | 70 (94.6%)  | 60/64 (93.8%)       | 10/10 (100.0%)       |
| Student interest in PA             | 74    | 51 (68.9%)  | 44/64 (68.8%)       | 7/10 (70.0%)         |
| Inclusion of PA training           | 74    | 58 (78.4%)  | 50/64 (78.1%)       | 8/10 (80%)           |
| Inclusion of PA guidelines         | 57\* | 35 (61.4%)  | 30/49 (61.2%)       | 5/8 (62.5%)          |
| Inclusion of strength training guidelines | 56\* | 25 (43.9%)  | 21/49 (42.9%)       | 4/8 (50.0%)          |
| Sufficient level of PA training    | 55\* | 31 (56.4%)  | 27/47 (57.4%)       | 4/8 (50.0%)          |
| Plans to increase level of PA training | 55\* | 23 (41.8%)  | 19/47 (40.4%)       | 4/8 (50.0%)          |

\*One program that included PA training in their curriculum did not provide further responses.
\*Two additional programs did not complete these questions.
\*No significant differences were observed between allopathic and osteopathic programs.

Abbreviation: PA = Physical activity.
curriculum in doctoring and patient care modules, introduction to clinical medicine and clinical skills training. Program leaders reported that PA training was also included as a part of elective modules that focused on public health issues, preventive medicine, obesity, and in some modules that focused directly on exercise physiology. During clinical training, PA training was included in sports medicine, geriatric care, ambulatory medicine and complementary medicine. Finally, 10 program directors reported that their students received PA training during different clerkships, such as family and sports medicine. The most mentioned type of PA training was education on the health benefits of PA (30 mentions), skills in PA counseling [18], PA recommendations and guidelines [13], exercise physiology [12], basic exercise knowledge (i.e. intensity, frequency) [8], obesity prevention and weight management [7] and safety screening (i.e. treadmill testing) and injury prevention [5].

Table 3 presents information on the major stakeholders involved with implementing PA training in medical education curricula. The most commonly mentioned stakeholder was the individual course leaders/directors (22 mentions), followed by medical school faculty [19], medical education leadership [20] and the curriculum/planning committee [11]. Barriers to including PA training in the medical curriculum are also listed in Table 3. The most commonly mentioned barrier was time/room in the curriculum (30 mentions), the applicability of PA training to licensing and certification [6], lack of opportunities to provide applied learning experiences [6] and competing interests [5]. Program directors also discussed resistance to changing the curriculum, particularly when it came to changing the opinions and habits of more veteran faculty. Fifteen program directors did not report experiencing any barriers including PA training.

**Discussion**

The purpose of this study was to identify the level of PA training currently included in US medical school curricula. A majority of the program leaders (95%) felt it was the responsibility of their institution to provide PA training with 78% reporting the inclusion of PA instruction in their curriculum. However, a lower proportion of programs reported including essential tools for PA counseling, such as education on the national recommendations for aerobic activity (61%) and strength training (44%). Our findings suggest an increasing trend in the level of PA training being offered to US medical students since the last study in 2002 when only 13% of US medical schools reported offering this instruction [16]. However, the level of training reported in this study remains lower than levels reported by programs in other countries [18] and in other disciplines, such as nutrition education [20]. We found that a similar proportion of US medical schools provided instruction on national PA guidelines for aerobic activity (61%) as had been reported by programs in the UK [18]. Yet, only 41% of the programs taught recommendations for strength training [1], providing a possible explanation for the low levels of participation in this activity [21].

Despite the higher level of PA training reported previously [16], levels of PA counseling remain low with only one in three US adults receiving advice from their healthcare provider [8]. This lack of concordance between the increased level of PA training in medical schools and a lack of physician counseling in real-world settings may be due to several reasons. To begin with, only slightly more than one-half (56%) of the program leaders felt that their curriculum provided students with a sufficient level of training in PA. This is consistent with previous reports that future physicians are being ill prepared and are only moderately confident in providing PA counseling to their patients [13,19]. Similarly, medical education leaders have acknowledged that their students are not being adequately prepared to provide PA counseling [22]. The improvements observed in PA counseling by physicians, an increase of 9.8% from 2000 to 2010 [23], may also indicate a lag between the time that they received PA training in medical school and when they were able to implement it into practice.

**Time dedicated to PA training**

Medical schools reported providing an average of 17.7 h of PA content over the 4 years of undergraduate medical education, greater than the 11 h of PA training reported in 2002 [16]. Of the nearly 18 h of PA training reported in this study, an average of only 8.1 h of these were required components of the curriculum with the remainder of the hours coming through elective classes or parallel opportunities. While this level of required instruction is greater than that reported by medical programs in the UK (4.2 h) [18], this represents a low level of training compared with other national standards.

**Table 3. Key stakeholders and barriers faced in including physical activity training as a part of medical education curricula.**

| Key stakeholders (n) | Barriers to implementing physical activity training (n) |
|---------------------|--------------------------------------------------------|
| Course leaders/directors | 22 | Time/room in curriculum | 30 |
| Medical school faculty | 21 | Applicability to licensing and certification | 6 |
| Medical education leadership | 19 | Lack of applied learning | 6 |
| Curriculum (planning) committee | 11 | Activities competing interests | 5 |
| Other faculty | 8 | Lack of teaching expertise | 3 |
| Clerkship leaders | 6 | Difficulty monitoring curriculum offered | 3 |
| Students | 5 | Difficulty changing curriculum | 1 |
| Student affairs | 3 | Resources | 1 |
| Student organizations | 2 | Student interest | 1 |
| Medical departments | 2 | None | 15 |

*Number of times key stakeholders or barriers were mentioned.*
Barriers to implementation & future plans for adding PA training

Despite the low number of schools reporting that they provide sufficient PA instruction for their students, only 42% had plans to increase their level of training and only 45.8% of programs that do not offer PA training planned on adding it to their curriculum. Interventions to increase PA counseling in medical education have been shown to be effective, yet there have been relatively few efforts to increase this instruction [25]. Our results indicate that if a program believes that it is their responsibility to provide training in PA, and they believe that their students desire this training, they are much more likely to include it in the curriculum. In addition to medical education leadership, other key stakeholders who should be included in modifying the curriculum are the individual course leaders and medical school faculty. Our respondents felt that the key barriers to implementing PA instruction into their curriculum were: a) time, b) applicability to licensing and certification and c) a lack of teaching expertise. Despite these obstacles, 20% (n = 15) reported not having any barriers stopping them from providing PA training to their students.

A limitation of this study is the relatively low response rate (43%) to our interview requests. This response rate may be the result of self-selection bias and lead to an over-estimation of the level of PA offered in medical education curriculums. Program directors who completed the interview may have a higher level of PA training in their curriculum compared with those who did not participate. Investigators conducting a similar study in nutrition education that received a high response rate were able to directly contact nutrition educators within each program [20], an option that was not possible for us given the lack of exercise specialists employed in medical education programs. Additionally, the uncertainty of program directors regarding the specific details of their curriculum may have also led to overreporting in our study (i.e. a social desirability bias). These limitations are somewhat supported by the fact that our findings (78.4% of programs reported offering PA training) are higher than the level of PA training listed on the US medical education program websites (48.3%) by Cardinal et al. [17].

Recommendations

While there is increasing pressure on medical programs to teach a wide variety of preventive practices [26], it is imperative that innovative solutions be developed to provide medical students training in PA. Similar to recent recommendations for the training of medical students in the clinical management of obesity [27], medical education programs should develop a series of competencies that are implemented as part of a comprehensive curriculum that provide students with a solid foundation in exercise physiology, basic principles of how brief PA counseling can be applied to the clinic setting and greater training in behavioral medicine, particularly as it relates to PA. It is also imperative that students are provided with opportunities to apply their PA training, and that there are suitable residency programs, subspecialty fellowships and continuing education opportunities available for ongoing training [7]. PA training should be provided as part of a transformative, longitudinal approach that promotes interdependence between practitioners, nutritionists, registered clinical exercise physiologists, obesity experts, psychologists and behavioral specialists, all working as part of an interdisciplinary team [28].

These recommendations are being realized in several US medical education programs. The University of South Carolina Greenville School of Medicine has made it a priority to integrate PA into all 4 years of their curriculum and to provide their students with applied experiences in the community setting [29]. Other programs, such as at the University of Michigan and the University of California San Francisco, have revised their curriculum to provide greater flexibility in teaching multidisciplinary topics, including nutrition and obesity management [27]. This demonstrates how a medical education program, supported by strong administrative leadership and the desires of its medical student body, can be modified to include new topics that will improve patient health and wellness, such as PA training.

These examples demonstrate how a topic, such as PA can, and should be, seamlessly integrated longitudinally throughout the entire medical education curriculum. An entire course of section does not need to be dedicated to PA training; instead, the inclusion of PA can be infused into each pre-clinical module and the different rotations and clerkships. Further, and perhaps most importantly, the inclusion of questions on PA on medical board exams will raise the importance and increase the level of PA training that medical
students receive. We must continue to advocate for further expansion of training in PA across the medical education process to provide our future health care practitioners with the knowledge, confidence, and skills necessary to effectively counsel and engage their patients in conversations about leading healthier, more active lifestyles.

At the same time, it may also be important to consider the role of the physician in providing PA counseling. While several large studies have demonstrated moderate increases in short-term PA levels [30], the long-term impact of physician counseling remains uncertain [31]. Given the time constraints limiting patient–provider interactions regarding preventive strategies in the clinic setting [32,33], the role of the physician and their healthcare team may not be to provide in-depth counseling, but to engage patients in a discussion on the benefits of being active, conduct an assessment of current PA levels [34], deliver a brief PA prescription [35] and refer the patient to existing resources for ongoing support and guidance [36,37], similar to referring patients to a dietician. Therefore, the goal of medical education may not need to focus on training future physicians how to provide PA counseling, but to provide them with the confidence to engage their patients in meaningful discussions on leading healthy, active lives and connect them to extended members of the healthcare team [38].

Conclusion

In conclusion, our results provide a current snapshot of the level of PA training provided to students in US medical schools. Our results indicate a greater level of PA training in medical education programs than what has been offered in the past; however, this training is still less than ideal and lags behind related instruction in nutrition and obesity treatment and management. Further efforts are needed to broaden awareness for increasing PA training with medical students, faculty members and medical education leaders to better prepare our future physicians to effectively engage their patients in PA counseling as part of a comprehensive, preventive medicine approach.

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Declaration of interest

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Supplementary material available online

Interview script