Graduating Medical Students' Exercise Prescription Competence as Perceived by Deans and Directors of Medical Education in the United States: Implications for *Healthy People 2010*

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SYNOPSIS

Objectives. This study examined perceptions of deans and directors of medical education at 128 allopathic schools of medicine in the US about the importance of physical activity and exercise topics, and their perceptions about the competence of graduating medical students to perform six fundamental skills related to exercise prescription. *Healthy People 2010* recommends that clinicians counsel all patients about regular physical activity. However, in previous studies physicians identified lack of training as a barrier to physical activity counseling, and they questioned their own ability to advise patients properly.

Methods. Using the 17-item *Exercise and Physical Activity Competence Questionnaire*, data were collected from 72 of 128 medical schools, for a response rate of 56%.

Results. While 58% of respondents indicated their typical graduate was competent in conducting a patient evaluation for the purpose of approving that patient to begin an exercise program, only 10% said their students could design an exercise prescription. Only 6% of respondents reported that their school provided a core course addressing the *American College of Sports Medicine Guidelines for Exercise Testing and Prescription*.

Conclusions. Findings suggest a need for more undergraduate medical training in physical activity and exercise prescription.

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Evidence suggests that regular moderate physical activity enhances health and reduces the risk of premature death and the development of various chronic diseases.[1–22] The Surgeon General,[23] the American College of Sports Medicine (ACSM),[24] and the American Heart Association (AHA),[25] recommend that adults accumulate at least 30 minutes of moderate-intensity physical activity each day. However, most US adults and too many children and adolescents are "either sedentary or less physically active than recommended."[26] According to the 1997 Behavior Risk Factor Survey, only 15% of US adults met the recommended amount of physical activity, while 40% engaged in no leisure time physical activity at all.[23,26]

In response to the sedentary lifestyle of Americans, *Healthy People 2010* establishes comprehensive preventive medicine objectives, including 15 related to physical activity, fitness, and counseling.[27] For example, Objective 22-1 seeks to reduce the proportion of adults who engage in no leisure-time physical activity, and Objective 22-2 seeks to increase the proportion of adults who engage in such activity on a regular basis, preferably daily for at least 30 minutes per session. Furthermore, *Healthy People 2010* includes objectives to increase the number of physicians who regularly counsel their patients about physical activity.[27] These objectives establish physical inactivity as a public health priority and underscore the importance of the physician's role in promoting lifelong physical activity among adults.

The Surgeon General, ACSM, and AHA recommend that men age 40 and older, women age 50 and older, and people with or at risk for chronic health problems such as heart disease and diabetes consult a physician before starting a vigorous physical activity program.[23–25] Advertisements of commercial health and fitness products, services, and programs also customarily advocate physician consultation prior to participation. In practice, however, few physicians actually include physical activity in their history taking or provide physical activity recommendations for their patients.[28–31] When physicians are asked about their ability to provide physical activity counseling and exercise prescriptions, they cite insufficient time, lack of reimbursement, and inadequate training in physical activity counseling.[32–34]

Several initiatives have sought to educate physicians and to facilitate physician-based physical activity counseling in the clinical setting.[35–37] Objective 1-7 of *Healthy People 2010* encourages medical schools to include core competencies in health promotion as part of their basic curricula.[27] Graber et al. found that academic deans endorse increased emphasis on health promotion in the undergraduate medical curriculum.[38] However, no study has specifically addressed the perceptions and attitudes of medical education deans about topics related to exercise and physical activity within the medical school curriculum.

This investigation of deans and directors of medical education was designed to determine their perceptions about the importance of physical activity and exercise topics, as well as their perceptions about the competence of graduating medical students to perform six fundamental skills related to exercise prescription. Deans and directors of medical education were selected for the study because of their knowledge of their schools' curricula, their position to influence curriculum changes, and their familiarity with medical student performance. While deans and directors of medical education are not solely responsible for medical school curricula, they understand current trends in medical education and the challenges encountered in creating a comprehensive program to prepare physicians for the changing medical care environment of the future.

METHODS

Instrumentation

Data were collected using the *Exercise and Physical Activity Competence Questionnaire* (EPACQ), an instrument designed exclusively for this investigation. To secure a viable response rate and to protect respondent anonymity, a decision was made to remove items that solicited information about the respondent and the school. To further ensure anonymity, the questionnaire was not coded to track respondents and schools. While these measures promoted anonymity, they also raised barriers to follow-up. The investigators decided to accept a potentially more modest response rate than to engage in unreasonable and excessive follow-up measures that could offend potential respondents.

The EPACQ included 17 items arranged in three parts. Part A, *Competence of Medical School Students*, contained six statements with a six-point, Likert-type scale response option ranging from 1 = not competent to 6 = very competent. Respondents rated the competence of a typical medical student graduating from their school on six essential skills related to patient exercise prescription (Table 1). These items/skills were drawn from *ACSM Guidelines for Exercise Testing and Prescription*, and they correspond to the tasks necessary for basic physical activity screening and physical activity prescription for non-pregnant healthy adults.[24] Part B, *Importance of Prescribing Patient Exercise and Physical Activity,* contained six statements with a six-point, Likert-type scale response option ranging from 1 = not

Table 1. Exercise and physical activity competence of typical graduating medical school students as perceived by deans and directors of medical education

Question: On a scale from 1 to 6 (1 = not competent to 6 = very competent), please rate the competence of the typical medical student graduating from your school on each of the following skills:

Scale

Not Competent 1 2 3 4 5 6 Very Competent

Skills	*N*	*Mean*	*SD*	*Minimally competent (%)*	*Moderately competent (%)*	*Highly competent (%)*
1. Conducting a physical examination on a non-pregnant healthy adult to approve that person to begin an exercise program	69	4.64	0.95	4.35	37.68	57.97
2. Determining the maximum heart rate for a non-pregnant healthy adult	70	4.46	1.15	7.14	41.43	51.43
3. Determining the daily caloric and nutritional needs of a non-pregnant healthy adult	71	4.25	1.04	5.63	47.89	46.48
4. Determining the body mass index for a non-pregnant healthy adult	71	4.23	1.16	8.45	47.89	43.66
5. Calculating the aerobic training heart rate range for a non-pregnant healthy adult	70	3.77	1.29	20.00	47.19	32.86
6. Designing an exercise prescription including frequency, duration, and intensity for a non-pregnant adult	70	3.30	1.03	22.86	67.14	10.00

SD = standard deviation

important to 6 = very important. Respondents indicated the importance they place on students being able to perform the same six skills presented in the competence scale (Table 2). Part C, *Curriculum in Medical School,* contained five forced-choice items addressing how topics related to health promotion and to exercise testing and prescription were offered in core and elective courses (Table 4). Finally, respondents were asked if they believed their medical school's curriculum dedicated sufficient time to topics on exercise and physical activity.

Items for the two scales were drawn from the *ACSM Guidelines for Exercise Testing and Prescription*, thereby supporting the scale's content validity.[24] Content validity also was assessed by a panel of experts and changes to the initial version of the instrument were made based on the experts' responses. Internal consistency reliability for Part A (competence) measured by Cronbach's alpha was 0.83, with discrimination indices between 0.53 and 0.71. Internal consistency reliability for Part B (importance) was 0.86, with discrimination indices between 0.56 and 0.82.

Procedures

This investigation used a cross-sectional survey research design. The authors attempted to mail to and receive a completed questionnaire from every dean and director of medical education at all 128 allopathic schools of medicine in the United States. Survey packets including a cover letter, questionnaire, and postage-paid return envelopes were mailed to every identified dean or director. Four weeks later a complete second mailing was conducted. No other follow-up contacts were made. Respondents were instructed to mark their responses directly on the questionnaire. Data from completed questionnaires returned between January 1 and May 5, 2000, were analyzed.

Data were collected from 72 participants, for a response rate of 56%. Based on visual inspection of postmarks on return envelopes, the schools that par-

Table 2. Importance of medical students being able to evaluate and prescribe exercise and physical activity for patients as reported by deans and directors of medical education

Question: On a scale from 1 to 6 (1 = *not important* to 6 = *very important*), please indicate how important it is for the typical medical student graduating from your school to be able to correctly perform the following skills:

Scale

Not important 1 2 3 4 5 Very important 6

Skills	*N*	*Mean*	*SD*	*Minimally important (%)*	*Moderately important (%)*	*Highly important (%)*
1. Determining the daily caloric and nutritional needs of a non-pregnant healthy adult	72	4.82	1.01	4.17	25.00	70.83
2. Conducting a physical examination on a non-pregnant healthy adult to approve that person to begin an exercise program	72	4.69	1.06	5.56	30.56	63.89
3. Determining the body mass index for a non-pregnant healthy adult	72	4.51	1.10	4.17	37.50	58.33
4. Determining the maximum heart rate for a non-pregnant healthy adult	72	4.42	1.04	4.17	44.44	51.39
5. Designing an exercise prescription including frequency, duration, and intensity for a non-pregnant adult	72	4.15	1.16	8.33	44.44	47.22
6. Calculating the aerobic training heart rate range for a non-pregnant healthy adult	72	4.14	1.17	8.33	50.00	41.67

SD = standard deviation

ticipated generally were evenly distributed geographically across the Northeast, Midwest, and Southern regions of the US. Proportionately fewer schools located in the West participated in the survey.

RESULTS

Competence

Given that higher mean scores suggest higher competence, the deans and directors of medical education who responded to the survey believe their graduating medical students were most competent in conducting physical examinations on non-pregnant healthy adults before starting an exercise program (mean = 4.64; standard deviation (SD) = 0.95) and least competent in designing an exercise prescription (mean = 3.30; SD = 1.03). The overall mean for the six competencies was 4.12 (SD = 0.82). With a scale midpoint of 3.5, this value indicates a moderate expectation of competence as viewed by the respondents. Table 1 provides a list of the overall ranking for the six scale items.

The six response options from the questionnaire were recoded to create three new values. Responses 1 and 2 were scored and assigned the value *minimally competent*; responses 3 and 4 were scored and assigned the value *moderately competent*; responses 5 and 6 were scored and assigned the value *highly competent*. Accordingly, respondents rated their graduating medical students as *highly competent* in conducting patient evaluation (58%), determining maximum heart rate (51%), determining daily caloric and nutritional needs (46%), determining body mass index (44%), calculating the aerobic training heart rate range (33%), and designing an exercise prescription (10%).

Importance

For a typical graduate correctly performing the six skills associated with prescribing patient exercise, respondents cited determining daily caloric and nutritional needs as most important (mean = 4.82, SD = 1.01) and calculating aerobic training heart rate range as least important (mean = 4.15, SD = 1.16).

The overall mean for the six competencies was 4.46 (SD = 0.84). With a scale midpoint of 3.5, this value indicates that respondents consider exercise prescription competencies as important. Table 2 provides a list of the overall ranking for the six scale items.

Again the original six response options were recoded to create three new values. In this analysis, responses 1 to 2 were scored and assigned the value *minimally important*; responses 3 and 4 were scored and assigned the value *moderately important*; responses 5 and 6 were scored and assigned the value *highly important*. Of the six skills, determining daily caloric and nutritional needs (71%) ranked as most important, followed by conducting a physical evaluation (64%), determining body mass index (58%), determining maximum heart rate (51%), designing an exercise prescription (47%), and calculating the aerobic training heart rate (42%).

Respondents' perceptions about their graduating medical students' competence on the six skills related positively and significantly to respondents' perceptions about the importance of the six skills (Table 3). The correlation between the *competence* overall mean of 4.12 (SD = 0.82) and the *importance* overall mean of 4.46 (SD = 0.84) was positive and statistically significant ($r = 0.71$, $p = 0.0001$). Moreover, a paired *t*-test revealed a statistically significant difference between the *competence* overall mean and the *importance* overall mean ($t = 4.29$, $p = 0.0001$).

Paired *t*-tests were conducted to determine if respondents' perceptions about their graduating medical school students' competence differed significantly from respondents' general perceptions about the importance of the six skills. Specifically, respondents' perceptions of importance were significantly greater compared to respondents' perceptions about their students competence on calculating the aerobic training heart rate range for a non-pregnant healthy adult ($t = 2.82$, $p = 0.0062$); determining the body mass index for a non-pregnant healthy adult ($t = 2.08$, $p = 0.0408$); determining the daily caloric and nutritional needs of a non-pregnant healthy adult ($t = 6.38$, $p = 0.0001$); and designing an exercise prescription ($t = 4.78$, $p = 0.0001$).

Table 3. Pearson correlations between competence mean score and importance mean score on exercise prescription skills.

Skills		*Not Important* 1	2	3	4	5	*Very Important* 6
1. Conducting a physical examination on a non-pregnant healthy adult to approve that person to begin an exercise program	Competence	0.53 (*n* = 69)					
2. Determining the maximum heart rate for a non-pregnant healthy adult	Competence		0.70 (*n* = 70)				
3. Calculating the aerobic training heart rate range for a non-pregnant healthy adult	Competence			0.69 (*n* = 70)			
4. Determining the body mass index for a non-pregnant healthy adult	Competence				0.54 (*n* = 71)		
5. Determining the daily caloric and nutritional needs of a non-pregnant healthy adult	Competence					0.55 (*n* - 71)	
6. Designing an exercise prescription including frequency, duration, and intensity for a non-pregnant adult	Competence						0.52 (*n* = 70)

NOTES: All Pearson correlations significant ($p < .0001$)

Curriculum delivery

When asked to describe how topics related to health promotion were offered to medical students, only 23% of respondents indicated that such topics were the primary focus of at least one core course. 51% indicated that such topics were addressed, but not as the primary focus of any core course. For elective coursework, 31% of respondents indicated that topics related to health promotion were the focus of at least one elective course, and 39% said such topics were the primary focus of two or more elective courses (Table 4).

For the *ACSM Medicine Guidelines for Exercise Testing and Prescription*, 6% of respondents reported that this topic was the primary focus of two more core courses, but almost half (46%) of respondents were not sure if topics related to the ACSM guidelines were offered or addressed in any core course.[24] Moreover, 49% were not sure if such topics were even offered in any elective course.

Nevertheless, 44% of respondents believed their medical school's curriculum dedicates sufficient curricular time to topics on exercise and physical activity; 27% believed they did not do so, and 29% were not sure. ANOVA was used to determine if respondents' perceptions about the importance of their graduates correctly performing the six skills associated with exercise prescription, and respondents' perceptions about their graduates' level of competence differed significantly from their perceptions about the amount of curricular time dedicated to topics on exercise and physical activity. No significant differences occurred, suggesting respondents' perceptions about the amount of curricular time dedicated to exercise and physical activity topics were independent of their perceptions about importance and competence.

DISCUSSION

In addition to the typical limitations of survey research, six specific limitations apply to this study. First, an unsolicited comment offered by one respondent reminded the investigators that deans and directors of medical education routinely receive requests to participate in studies related to curricula. If respondents perceived a survey as an annoyance, then the respondent may offer negative or reactive responses. Such reactions could explain the moderate response rate for this study. However, the results represent the professional judgment of 72 individuals with considerable influence in medical education. Second, though the survey packets were personally addressed to every identified dean and director of medical education at all

Table 4. How topics related to health promotion and the *American College of Sports Medicine Guidelines for Exercise Testing and Prescription* are delivered at medical schools in the United States as reported by deans and directors of medical education (*N* = 72)

Type of delivery	*Disease prevention and health promotion (%)*	*Exercise testing and prescription (%)*
1. How are topics related to disease prevention and health promotion offered to medical students at your school?		
Topics are the primary focus of at least one core course.	22.5	0.0
Topics are the primary focus of two or more core courses.	25.4	5.7
Topics are addressed, but are not the primary focus of any core course.	50.7	40.0
Topics are not offered in any core course.	0.0	8.6
Not sure if topics are offered in any core course.	1.4	45.7
2. How are topics related to the American College of Sports Medicine Guidelines for Exercise Testing and Prescription offered to medical students at your school?		
Topics are the primary focus of at least one elective course.	30.9	11.6
Topics are the primary focus of two or more elective courses.	39.4	4.4
Topics are addressed, but are not the primary focus of any elective course.	21.1	26.1
Topics are not offered in any elective course.	2.8	8.7
Not sure if topics are offered in elective course.	5.6	49.3

128 allopathic schools of medicine in the US, no assurance about who completed the questionnaire can be made. In retrospect, adding a question such as, "Are you the dean or director of medical education at your school?" might provide some assurance that the questionnaire was completed by the intended participants. Third, respondents may not have fully understood all items. For example, did they accurately differentiate between ranges for maximum heart rate and for aerobic training heart rate? Fourth, regarding the competence scale, respondents were asked to make a professional judgment about the typical medical student graduating from their school. Fifth, 49% of respondents were "not sure" if certain topics such as the *ACSM Guidelines* were addressed or offered in their curricula. Because all deans may not require their faculty to provide detailed syllabi of courses, such topics actually may be addressed but not represented in core competencies. Likewise, some respondents may not be familiar with the *ACSM Guidelines*. Furthermore, a common misconception suggests that medical schools cover the *ACSM Guidelines for Exercise Testing and Prescription* in sports medicine courses, though such courses often focus on orthopedics and rehabilitation rather than prevention. Sixth, the questionnaire was designed to be brief and easy to complete. Thus, the list of competencies was limited, and detailed demographic differences among medical schools were not explored. Despite these limitations, the findings expand our understanding about the emphasis placed on exercise and physical activity in the undergraduate medical curricula in the United States.

This investigation assessed deans' and directors' perceptions about the importance of graduating medical students' ability to evaluate and prescribe exercise for patients, and about their competence in performing six fundamental skills related to exercise prescription. Findings suggest that graduating medical students may lack sufficient training in exercise prescription, though deans and directors of medical education generally view such competence as important. Findings also suggest that some medical schools may not dedicate sufficient curricular time for training in exercise prescription.

Part A explored the extent to which deans and directors of medical education perceive their typical graduate as competent to perform six basic skills related to exercise prescription. Many respondents believed that their graduating students were *highly competent* in conducting a physical examination for approving a person to begin an exercise program (58%), determining maximum heart rate (51%), or determining caloric/nutritional needs (46%). Yet, only 10% of respondents felt their typical graduate could successfully design an exercise prescription that includes frequency, intensity, and duration of physical activity.

Unless future physicians receive postgraduate training about physical activity, effective exercise prescription, and counseling skills, physicians in primary care settings may not make an appreciable impact on achieving the *Healthy People 2010* objectives. Likewise, if physicians lack competence, or feel uncomfortable with their ability to provide individualized prescriptions and counseling in this area, or both, their efforts may not succeed. For instance, the general advice to "get some exercise" will not prove nearly as effective, in terms of patient participation and the possibility of achieving maximum benefits, as would an individualized exercise prescription that addresses frequency, intensity, and duration of exercise, as well as providing special instructions, contraindications, and proper progression.

Part B explored the extent to which deans and directors of medical education perceive topics related to exercise prescription as important. In terms of importance, the ability to calculate caloric and nutritional needs of a patient ranked as the number one skill. This finding may reflect the tertiary care setting prevalent at many medical schools, where teaching emphasizes treatment of patients who require intravenous fluids and parenteral nutrition. Skills ranked as important by the fewest respondents included the ability to calculate aerobic training heart rate range (42%) and the ability to design an exercise prescription (47%). These responses prove more difficult to interpret, but again they may reflect the tertiary care setting or a belief that such topics should be covered during postgraduate education.

Part C explored how curriculum topics related to health promotion and the *ACSM Guidelines* were offered to medical students. Slightly less than half (44%) of respondents indicated sufficient time was dedicated in their medical school's curriculum to topics related to exercise and physical activity. While this response may indicate a need for additional curricular time devoted to exercise and physical activity, the finding also may indicate that some respondents are not genuinely interested in including more content in this area. Rubin et al. suggested that the health promoting beliefs and practices of physicians become fairly well fixed by the time physicians graduate from medical school.[39] Therefore, topics related to health promotion should be offered during medical school to prepare future physicians for a more health-directed clinical environment consistent with the goals of *Healthy People 2010*.

Integrating a brief course on physical activity and

health with an emphasis on exercise prescription into existing medical school curricula will prove difficult. Faced with competing content interests, a saturated curriculum, funding issues, and time constraints, medical educators must provide a thorough and comprehensive education that includes both core medical competencies and exercise prescription training.

Because a lack of sufficient knowledge exists about the technical expertise of current medical students and practicing physicians, the findings from this study also offer some research implications. Additional research should focus on examining medical students' perceptions of their own competence and the level of importance they assign to physical activity and exercise prescription. Moreover, adequacy of their own technical preparation should be examined as well. The investigators suggest a national study of fourth-year medical students. Parallel or congruent studies involving third-year residents and practicing physicians also should be considered. Data from such studies will help gauge the level of technical preparation of physicians to meet the challenges of promoting and prescribing physical activity at the individual and community levels.

CONCLUSIONS

By all measures, physical inactivity and sedentary lifestyles create a significant public health burden for the United States. *Healthy People 2010* emphasizes the importance of regular participation in moderate physical activity as an essential component of a healthy lifestyle. Increasing physical activity among US adults will require a multifaceted public health approach, including primary-based prevention such as risk assessment and clinician counseling. Physicians can play an important role in achieving the *Healthy People 2010* objectives related to physical activity. However, they need a firm understanding about the concepts of physical activity and health and the ability to perform the clinical skills related to exercise prescription. Thus, while physicians in primary care settings need to examine their role in promoting physical activity, medical schools need to critically review their curricula to ensure that they adequately prepare physicians for this important challenge.

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