Cross-sectional study of nutrition knowledge and attitudes of medical students at three points in their medical training at 11 southeastern medical schools

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ABSTRACT Eleven southeastern medical schools cooperated to evaluate nutrition knowledge and attitudes of medical students. This study complements previous reports of an examination of entering freshmen and seniors. Average knowledge scores for 165 students tested after basic sciences (preclinical) training in this study were 67 ± 7% compared with 53 ± 6% for freshmen and 69 ± 8% for seniors. The upperclassmen's scores were higher than the freshmen's (p < 0.001) and varied with the amount of required nutrition teaching. Only 13% of preclinical students perceived nutrition as important to their careers compared with 74% of entering and 59% of graduating students, suggesting that preclinical teaching reduces their sense of relevance of nutrition to medicine. These findings suggest that nutrition knowledge can be increased through preclinical coursework and that the knowledge level can be maintained through the clinical years. However, the positive attitude of freshmen toward nutrition is lost after preclinical training and is only partially regained after the clinical years. Am J Clin Nutr 1988;48:1–6.

KEY WORDS Nutrition education, medical education, nutrition teaching

Introduction

The Southeastern Regional Medical-Nutrition Education Network (SERMEN) was developed in 1984 as a collaborative effort to enhance nutrition education in southeastern medical schools. The eleven participating medical schools from Alabama, Florida, Georgia, and South Carolina represent a mix of state and private institutions that are health science centers or university based. Nutrition training in these schools ranges from no formally required coursework to a combination of comprehensive required and elective courses. It is thought that nutrition plays an important role in the American health care system. Consequently, quality medical training programs should prepare health professionals to educate the general public about nutrition issues and to manage the nutritional needs of patients (1). However, there is relatively little information available on knowledge levels of physicians about nutrition or on the effectiveness of medical-nutrition training programs. The results of previous SERMEN studies indicated that there is significant variation in nutrition knowledge among senior medical students (2). The same group generally reports dissatisfaction with both the quantity and quality of their nutrition education. A subsequent study of entering freshman medical students at SERMEN schools showed that their level of nutrition knowledge varied.

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when they matriculated was comparable among the schools; therefore, it was thought that differences in medical training programs explained the variability in nutrition knowledge of graduating students (3).

This study extends the previous findings and provides a description of both knowledge levels and attitudes of students at entry, at the midpoint, and near the completion of medical school. The purpose of the study was to measure nutrition knowledge and students' attitudes toward the importance of nutrition training and to relate any differences found among the schools and the three levels of training to the number of required hours of nutrition instruction.

**Methodology**

*Overall design of the study*

A nutrition examination was administered in the SERMEN medical schools to undergraduate medical student volunteers at three different levels of training: entry, end of year two, and middle of year four. Portions of the results of the testing at the entry and senior levels have been reported previously (2, 3). The number of required hours of nutrition instruction was used to quantify instruction.

*Development of the examination*

The development of the examination and procedures used for its administration were reported previously (2). In brief, the nutrition faculty representatives of the 11 SERMEN schools rated the importance of 41 nutrition-topic categories to the practice of medicine. The seven topics unanimously selected as of major importance guided the selection of objective test items from the University of Alabama at Birmingham’s Nutrition Test-Item Bank (4). These topics are nutritional assessment and support (hospital malnutrition); nutrition in surgery, trauma, and infection; obesity; major minerals; nutrition and diseases of the gastrointestinal tract; nutrition in cell growth, infancy, and adolescence; and pregnancy and lactation. Initially, 388 items were reviewed and 90 were selected and approved by the SERMEN representatives for inclusion in the examination. Items were selected on the basis of both content and statistical-performance considerations. The items represented a variety of formats (multiple choice, matching, true/false, case study) and emphasize basic and clinical sciences. Additional survey items were included to determine student interest in nutrition and to obtain demographic information.

Results of two survey items relating to student interest in nutrition were of particular interest in this report:

1) If nutrition-related electives were offered in your medical curriculum, how likely would you be to take one? a) unlikely b) possibly c) certainly d) not certain

2) How important do you think a good background in nutrition will be to your career goals? a) totally unimportant b) of little importance c) fairly important d) very important e) of major importance

In the first question option a was considered a negative response; option c was considered a positive response. Options b and d were not tallied as either a yes or no response. In the second question options a and b were coded as indicative of a negative response; options d and e were considered indicative of a positive response. Option c was not tallied as either a yes or no response.

*Data collection*

The examination was administered on a volunteer basis under the honor code in either proctored or take-home settings. The following numbers and groups of students within SERMEN schools were examined (some of the data on entering freshmen and seniors were reported previously) (2, 3): 1) 421 freshman students within the first 3 mo of medical school (before any class work with emphasis on nutrition) from 8 schools; 2) 165 students at the midpoint of medical school at the end of their sophomore year (referred to as midpoint or preclinical students) from 5 medical schools; and 3) 236 students in the middle of their senior year from 10 medical schools. These are not cohorts but three separate study groups. One new medical school (school code 11) was only beginning its third year at the time the examination was administered to senior students and, thus, the seniors at that school were represented by their third-year students. The results of the senior student data were analyzed with and without these students to be certain that the results were not significantly biased by including them. Four SERMEN schools participated at all three levels of testing. The period within which all students were tested was 17 mo (1983–1985).

**TABLE 1**

| Medical student background and interest in nutrition according to level of training |
|-----------------------------------|-------------------|-------------------|-------------------|
|                                   | Entry             | Midpoint          | Completion         |
|                                   | (n = 421)         | (n = 165)         | (n = 236)         |
| **Background**                   |                   |                   |                   |
| Undergraduate degree             | 97%               | 99%               | 100%              |
| Graduate degree                  | 11%               | 10%               | 17%               |
| Premed-allied health experience  | 28%               | 25%               | 24%               |
| Intended medical practice (private; academic)* | 62%; 10% | 58%; 13% | 62%; 19% |
| Premed nutrition course(s)       | 10%               | 19%               | 15%               |
| Nutrition degree                 | 1%                | 2%                | 2%                |
| **Interest in nutrition**        |                   |                   |                   |
| Desire nutrition elective (Yes; No)* | 62%; 1% | 24%; 15% | 34%; 7% |
| Nutrition important to career (Yes; No)* | 74%; 3% | 13%; 39% | 59%; 10% |

* Figures did not add up to 100% when students indicated uncertainty.
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TABLE 2

Relationship between changes in knowledge scores and amount of required nutrition instruction

<table>
<thead>
<tr>
<th>School code</th>
<th>Entry to midpoint level</th>
<th>Midpoint to senior level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proportional score changes</td>
<td>Amount of nutrition instruction</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>h</td>
</tr>
<tr>
<td>01</td>
<td>+44</td>
<td>58*</td>
</tr>
<tr>
<td>11</td>
<td>+34</td>
<td>19</td>
</tr>
<tr>
<td>08</td>
<td>+22</td>
<td>11</td>
</tr>
<tr>
<td>02</td>
<td>+19</td>
<td>11</td>
</tr>
</tbody>
</table>

* Separately identifiable coursework in nutrition.
† Basic science concepts in nutrition and other sciences all introduced through small group tutorial sessions such that number of hours of nutrition teaching were not clearly identifiable.

Data analysis

All examination results were scored and analyzed at the University of Alabama School of Medicine's Office of Educational Development with the automated Test Analysis Program developed at the University of Alabama at Birmingham. Item analysis of the results from the first test administration revealed six statistically defective items. On subsequent administrations, the six items appeared on the exam but did not count in the total knowledge score. Reliability of the exam was 0.71. Means and standard deviations were calculated from the knowledge-exam scores. Frequencies were tabulated and proportions of students selecting each response alternative were calculated for each survey item. The knowledge data were first evaluated by comparing the mean overall (total) score of students at each separate school and for all schools combined at each level of training. Mean scores for each school and all schools combined were then compared at each level of training for the seven nutrition subtopics covered by the examination.

Results

Students' background and interest in nutrition

The responses of students to the survey questions are given in Table 1. Their characteristics in terms of premedical training are remarkably similar. On the other hand, there are notable differences in their stated likelihood of taking a nutrition elective. The entry students indicated the greatest interest, the preclinical sophomore (midpoint) students had the least interest, and the graduating students had intermediate interest in an elective. The same general pattern pertains to their perceptions of the importance of nutrition to their own medical career goals. With the exception of students at school 01, there was a dramatic drop in the perceived importance of nutrition by the preclinical students examined in five of the SERMEN schools (Fig 1). Of the 29 preclinical students at school 01, 20 (69%) indicated nutrition was important and only one (3%) felt it was unimportant to a career in medicine. By contrast, the results from the 136 sophomores at the remaining four schools revealed that only one student felt that nutrition was important and 63 of the 136 (46%) felt that it was of little or no importance.

Students' knowledge in nutrition

The average knowledge scores at each level of training are shown in Figure 2 for four individual schools and overall. (The freshman and senior scores were reported previously [2, 3].) The score (x ± SD) for all entering freshmen tested was 53 ± 6%, which was significantly lower than that of the preclinical students (67 ± 7%, p < 0.001) and of the seniors (69 ± 8%, p < 0.001). By contrast, the difference between the preclinical and senior student scores was not significant (p = 0.10). (The results were essentially unchanged when the data were analyzed without the results of the students at school 11 who were tested in their third year.) These three statistical comparisons were made by independent t tests. Analysis of variance revealed no significant differences among schools at the freshman level but highly significant mean knowledge differences at the preclinical and senior levels. Table 2 shows the relationship between identified hours of nutrition required in the curriculum and the differences in mean knowledge scores across levels of training among the four schools that reported data on all three levels of training.

Percentage changes in knowledge scores on each of the seven subtopics covered by the examination are given in Figure 3. Compared with the freshmen, the child-growth subscores (covering cell growth, infancy, and adolescence) rose the least among the sophomores (up 17%) and showed the sharpest rise among the seniors (up 42%). The major-minerals subscores improved the most, with sophomores having a 58% higher score and seniors a 74% higher score than freshmen. The obesity subscores were 35% higher among the sophomores but fell considerably among the seniors to a level only 26% above the freshmen.

Student participation

The proportion of students who volunteered to take the examination varied in the different schools. At the entering-freshman level among the eight participating schools the average participation rate was 50% (range, 20–85%). At the end of the sophomore year among the
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![Graph 1: Percentage of medical students indicating that nutrition is important to their careers.](image1)

**FIG 1.** Percentage of medical students indicating that nutrition is important to their careers. Dashed lines indicate schools that tested students at all three levels of training, cross-sectionally. Isolated closed circles are data points for the other schools.

five participating schools the average participation rate was 33% (range, 4–100%). At the senior level among the ten participating schools an average of 28% of the students participated (range, 12–53%). Because of the possibility that the voluntary participation rate could significantly affect knowledge scores and attitudes because of self-selection, we compared the scores and responses to the attitudes questions of the students in instances in which the participation rates were extremely low and high (ie, 4% (4/96) and 100% (100/100), both for sophomore groups). The knowledge scores were identical (66 ± 6% in each group), the desire to take an elective was similar (0% and 13%, respectively), and the perceived importance of nutrition to their careers was similar (0% and 1%, respectively).

![Graph 2: Nutrition knowledge scores of SERMEN students.](image2)

**FIG 2.** Nutrition knowledge scores of SERMEN students. Dashed lines indicate schools that tested students at all three levels of training, cross-sectionally. Closed squares represent Mean ± SD for all students tested at each level.

Discussion

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The relative lack of interest among preclinical students in taking a nutrition elective may relate to their perception of nutrition as unimportant. This negative attitude was not shared by preclinical students at one of the five schools (school 01) despite the fact that all five schools had required nutrition coursework in the first 2 y and four of the five had physician role models. School 01 has a separately identifiable 58-h required freshman course in nutrition which is conducted by a physician. Heavy emphasis is placed on clinical application of nutrition principles. It is possible that this accounted for the greater proportion of students at school 01 that recognized the importance of nutrition.

The results of this study do not necessarily indicate that the differences in nutrition knowledge or attitudes of the students at the three levels of training are a direct result of the education programs of these SERMEN schools because the data were collected in a cross-sectional fashion. Furthermore, the proportion of students volunteering to take the examination varied in the different schools so that the results may not accurately reflect the class as a whole. On the other hand, the knowledge scores and attitudes toward nutrition were similar in two groups of students at schools in which there were low (4%) and high (100%) rates of participation in the study. Because the data were all collected over a relatively short time (17 mo), they represent samples of the three classes in which the background nutrition training environment was similar. The student samples were comparable in their premedical training and certain other measured characteristics making it less likely that the observed differences reflected a biased composition of the groups.

In summary, the findings of this study reveal that medical students' perceptions about the importance of nutrition to their careers vary significantly with their level of training, being lowest at the end of their sophomore year. This is accompanied by a loss of interest in taking nutrition electives. The implications are several: 1) greater efforts should be made during the early years of training to take advantage of and support the initial positive attitude of the students, 2) elective coursework in nutrition...
may be best provided early in training, and 3) curricula for the clinical years should include nutrition teaching. Nutrition knowledge of entering freshmen is consistent and homogeneous among various SERMEN schools. The higher knowledge scores found in subsequent years is variable among schools and is apparently related to the amount of required coursework in nutrition. It appears that the timing of nutrition in the medical school curriculum may not be critical in that senior students seem to have high knowledge levels regardless of whether nutrition instruction occurs in the basic sciences years or the clinical years. It will be important to extend and confirm the findings from this cross-sectional study by way of the ongoing prospective cohort study of students among SERMEN schools who are being followed throughout their 4 y of medical school.

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