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ABSTRACT

This study investigated factors associated with medical students performance on the United States Medical Licensing Examination (USMLE) Step One examination. The USMLE Step One emphasizes basic mechanisms and principles that are typically covered in the first 2 years of medical school. The study examined the relationship among student performance on Step One, academic achievement in medical school, and the preparation method for Step One. It also examined students perceptions of the efficacy of the medical school curriculum in preparing for Step One and compared preparation course participants and nonparticipants on their perceptions of preparedness for Step One. The study was conducted at the University of Miami School of Medicine, Florida, and all students who participated in a commercial preparation course took the Kaplan course. One hundred medical students (68% of the sample) responded to the survey, and of these, 32 students said they were preparation course participants. Student records were available for 135 students. Of the 143 class members, 97% passed Step One on the first try. Academic achievement was an important factor related to Step One performance. The commercial test preparation course was well received by the students, but student performance was not enhanced by participating in the Kaplan course. Students thought the curriculum had prepared them well for Step One, but those who participated in a commercial preparation course thought it had been valuable. (SLD)

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STUDENT USMLE STEP ONE PREPARATION AND PERFORMANCE

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The United States Medical Licensing Examination (USMLE) is currently the sole examination pathway to initial licensure for allopathic physicians in the US. The three Steps of the USMLE have different foci and form a continuum. The USMLE Step One emphasizes basic mechanisms and principles[1], which are typically covered within the basic science and pre-clinical curriculum during the first two years of medical school. Over three fourths of US medical schools require medical students to pass the USMLE Step One for promotion and/or graduation[2]. Residency program directors also view USMLE Step One scores as nationally standardized, objective report of information in the student profile[3]. Many medical students take commercial preparation courses to help them prepare for Step One because of its importance to their careers. However, a 1998 survey on a random sample of Step One examinees in the US and Canada suggested that participation in such courses had little effect on their performance[4]. Two earlier studies concurred that commercial review courses had little or no impact on the medical board exam performances[5,6]. However, previous studies have suggested a strong correlation between student performance on Step One and academic achievement in medical school[4,7]. Other reported predictors for Step One performance included basic science pathways[8] and MCAT scores[4].

Objectives

This investigation explored factors associated with medical students' performance on the USMLE Step One. The three major objectives of this study were to:

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(1) examine the relationships between student performance on Step One, academic achievement in the medical school, and the preparation method for Step One;

(2) examine students' perception on the efficacy of the medical school curriculum in preparing them for Step One; and

(3) compare preparation course participants and non-participants on their perceptions of preparedness for Step One.

Perspectives

This study was conducted at the University of Miami School of Medicine (UMSM), a private school in the southeast with an enrollment of approximately 600 medical students for the 2000-01 academic year. Up until the 2001-02 academic year, the UMSM curriculum was a discipline-based model[7], consisting of two years of basic sciences, mechanisms of disease, and clinical skills, and two years of clinical clerkships.

All second-year medical students at the UMSM are required to pass Step One for promotion to the junior year. The UMSM students have approximately eight unscheduled weeks between the second and third years of medical school. Students must sit for the USMLE Step One prior to the beginning of the third year clinical clerkships. Several available commercial preparation courses for Step One are offered to students in May and June in the region. The preparation course of choice in 2000 was offered by Kaplan, which provided three weeks of full-day lecture format instruction. All of the students that participated in a preparation course took the Kaplan course that year.

Methods

A survey questionnaire was distributed to the junior medical students (N=148) in July 2000 after they took the USMLE Step One but before they received the Exam results. The gender makeup of the junior class included 71 (48%) male and 77 (52%) female. The questionnaire contained 43 multiple-choice questions including: (a) demographic data and the number of weeks they spent preparing for Step One; (b) factors

influencing their decision on preparation course participation; (c) assessment of the medical school curriculum; and (d) preparation methods for Step One.

Student academic records were obtained including Step One scores, UMSM course grades, UMSM weighted grade point averages (GPAs) for the first two years of medical school, class GPA quartile standing, as well as attendance status on preparation course participation.

The UMSM uses a numeric grading system, assigning course grades on a scale of 0-100. Weighted GPAs were calculated based on the individual course grades weighted by the number of credits.

Data Collection

One hundred medical students (68%) responded to the survey including 44 males and 56 females, among which 32 students claimed to be preparation course participants. Among the sample of 148 junior medical students of this study, 135 records of first year academic achievements (GPAs, quartiles & course grades) and 140 academic records for the second year were obtained from the medical school. The gaps for student records were due to multiple factors: dropouts, transfers and leaves of absence. Records from the school indicated that a total of 43 (29%) students participated in the preparation course for Step One. To compare with the targeted sample, the respondents had slightly higher percentages of females (56% vs. 52%) and preparation course participants (32% vs. 29%).

Descriptive and inferential statistical techniques were used to analyze the data. An α level of .05 was used in determining statistical significance for inferential statistical analyses.

Results

The 2000 USMLE Step One passing score was 179. Ninety-seven percent of UMSM juniors (n=143) passed the 2000 Step One on their first attempt. One student who failed initially soon dropped out of medical school due to other academic reasons. The other four students who failed initially passed Step One on their later attempts. Among these five juniors, two took the preparation course and three studied on their

own. The UMSM mean score for the 2000 USMLE Step One was 215 ± 21, which was very similar to the national average (215 ± 23).

Associations between the following factors and methods of preparation for Step One were evaluated: "personal learning habits", "advice from other students" "the need for an organized schedule" "deficiency of the curriculum", "reputation of the course", "confidence in your abilities", and "money". "Personal learning habits" and "advice from other students" were the two most important factors affecting all the participants (100%) and ncarly all the non-participants (97%) in their decision as to how to prepare for Step One. "The need for an organized schedule" was an important factor to all student participants but only to 59% (n=40) of he non-participants. "Money" was an important factor to 40% of the participants and 60% of the non-participants. Other factors included "deficiency of the curriculum", "confidence in your abilities", and "reputation of the course". Overall, there was a very low correlation (Spearman $\rho = .152, p > .05$) on the responses to the seven listed factors between the participants and non-participants (Table 1).

Table 1: Factors Influencing Students' Decision on Preparation Course Participation

Factor	*Participants*	*Non-participants*
Advice from other students	93.8%	88.1%
Money	39.7%	59.7%
Reputation of the course	96.9%	56.7%
Personal learning habits	100%	97.0%
Deficiency of the curriculum	85.4%	38.8%
Confidence in your abilities	71.0%	83.6%
The need for an organized schedule	100%	59.1%

Note: The numbers shown are the percentages of students who responded either "very important" or "important" to each listed factor

There was no significant difference in first-year GPAs between the prep course participants (85.79 ± 4.55) and non-participants (87.23 ± 4.35) ($t = 1.75$, $df = 132$, $p = .08$). Non-participants had a higher second-year GPA (87.78 ± 4.27) than participants (85.35 ± 4.58) ($t = 3.05$, $df = 138$, $p < .05$). Chi-square test results suggested that there was a significant relationship between the first year class quartile standing and

preparation course participation ($\chi^2 = 11.38$, $df = 3$, $p < .05$). A significant relationship was also found between the second year class quartile standing and preparation course participation ($\chi^2 = 9.846$, $df = 3$, $p < .05$). A greater proportion of students from the lowest quartile of the first and second year GPAs took preparation courses.

The Step One score correlated significantly with both the first-year GPAs (Pearson $r = .777$, $p < .01$) and the second-year GPA scores (Pearson $r = .798$, $p < .05$). The correlation coefficients between Step One score and the first-year courses in the medical school ranged from .283 (with Clinical Skills I course) to .621 (with Biochemistry and Molecular Biology course). The correlation coefficients between Step One score and the second-year courses in the medical school ranged from .422 (with Introduction to Psychiatry course) to .694 (with Mechanisms of Disease II Module).

Using a *t*-test, the difference on Step One mean scores between participants (206.00 ± 18.49) and non-participants (218.73 ± 21.36) was found statistically significant ($t = 3.42$, $df = 147$, $p < .05$). Non-participants had a significantly higher Step One mean score than participants. However, due to the significant difference in the second year GPA means between participants and non-participants, the pre-existing difference in GPAs should be adjusted for a meaningful comparison of the Step One scores between the two groups. By using an analysis of covariance (ANCOVA) with the second-year GPA as a covariate, the effect of preparation course participation was not statistically significant ($F = .14$, $p = 0.71$) (Table 2). This suggests that participation in the preparation course had no effect on student Step One performance after controlling for the effect of GPA.

Table 2: ANCOVA on Difference of Step One Performance between Preparation Course Participants and Non-participants:

	DF	*Mean Square*	*F-Value*	*P-Value*
Status of Prep Course Participation	1	26.71	.14	.71
2nd-year GPA (Covariate)	1	25980.71	131.60	<.001
Interaction (Participation x 2nd-year GPA)	1	43.03	.22	.64
Residual	134	197.42		

Overall, about 84% of the survey respondents perceived the first two years of the medical school curriculum to be helpful in preparing them for the USMLE Step One. Among the specific segments of the medical school curriculum, "pathology" (94.0%), "physiology" (89.9%), "anatomy/neuroanatomy/ embryology" (87.9%), and "microbiology/immunology" (84.5%) were thought to be most helpful; "behavioral sciences" (43.4%), "biochemistry/genetics" (46.5%), and "pharmacology" (57.6%) were thought to be least helpful (Table 3). There was a strong correlation between preparation course participants and non-participants on the perceptions of the medical school curriculum (Spearman $\rho = .882, p < .05$).

Table 3: Student Perceptions of the Medical School Curriculum and Preparation Course in Preparing Them for Step One:

Course Segment	*Medical School Curriculum*			*Prep Course*
	All Respondents	*Non-participants*	*Prep Course Participants*	
Pathology	94.0%	92.5%	96.9%	67.7%
Physiology Portion	89.9%	89.5%	90.7%	93.8%
Anatomy/Neuroanatomy/Embryology	87.9%	82.0%	90.0%	87.1%
Microbiology/Immunology	84.7%	85.0%	83.9%	93.5%
Pharmacology	57.6%	62.7%	46.9%	96.9%
Biochemistry/Genetics	46.5%	41.8%	56.3%	90.4%
Behavioral Sciences	43.4%	41.8%	46.9%	80.7%

Note: The numbers shown are the percentages respondents who perceived that the medical school curriculum or the preparation course "definitely" or "somewhat" prepared them well for Step One

Ninety-seven percent of preparation course participants perceived that the preparation course either "definitely" or "somewhat" helped them in preparing for the USMLE Step One. Over half (55%) of the participants would "definitely" recommend the preparation course to future students. About 27% of the participants would "somewhat" recommend the course. Only 18% would not recommend the course "at all". Most participants found the course materials (books, CD-ROMs) to be "definitely" (53%) or "somewhat" (41%) helpful. The live lectures were perceived to be "definitely" (69%) or "somewhat" (22%) helpful. Similarly, many participants believed that the course "definitely" (55%) or "somewhat" (27%) prepared them well with "test format/test-taking strategies". Approximately 28% of the participants felt that the

"amount of time in lecture" was "definitely" appropriate, and 53% of the participants thought it was "somewhat" appropriate.

Non-participants perceived that the self-study method was either "definitely" (84%) or "somewhat" (15%) an efficient use of their time. About 59% of non-participants reported that they studied alone, while 30.9% reported studying with another person, and 10.3% reported studying with a group.

In terms of specific segment of the preparation course, "pharmacology" (96.9%), "physiology" (93.8%), "microbiology/immunology" (93.5%), "biochemistry/genetics" (90.4%), "anatomy/neuroanatomy/ embryology" (87.1%), and "behavioral sciences" (80.7%) were thought to be very helpful. However, only 67.7% of the participants were in favor of the "pathology" segment (Table 3). There was a negative correlation between the perceived quality of the medical school curriculum and the perceived quality of corresponding segments of the preparation course (Spearman $\rho = -.316$).

Most non-participants felt that they were "definitely" or "somewhat" prepared for all portions of the USMLE Step One – "physiology" (100%), "behavioral sciences" (100%), "pathology" (100%), "microbiology/immunology" (99%), "biochemistry/genetics" (97%), "anatomy/neuroanatomy/embryology" (96%), and "pharmacology" (94%).

Discussions

The results of this study indicate that academic achievement during the first two years in medical school is an important factor related to student performance on the USMLE Step One, which concurs with previous findings[4,7]. This suggests that students' early academic performance in medical school can be used as a predictor for future USMLE Step One performance. Remedial studies or tutorials in the weak subject areas should be recommended and offered to those students with low GPAs.

Commercial preparation courses such as Kaplan's were well received by the participants in general. These courses served well for those of some students who needed an organized schedule. However, student

performance on Step One was not enhanced after participating in the preparation course. Kaplan's preparation course appeared to offer no advantage as a remedial course to the medical students. In addition, this study showed that self-study can be an equally effective method to prepare for Step One for those students who prefer to study alone or in pairs.

The medical students in this study felt the school curriculum prepared them well for Step One. Most students felt well prepared for Step One regardless of their preparation methods. Student expectations for the preparation course appeared to bc based on their coursework experiences in the medical school curriculum. There was an inverse relationship between the perceived course quality of the curriculum and the perceived quality of corresponding segments of the preparation course. For example, pathology was the most favored course within the UMSM curriculum according to the preparation course participants; however, it was the least favored segment in the preparation course. Pharmacology was the most favored segment of the preparation course according to participants; yet it was one of the least favored courses with the UMSM curriculum by the same group. It can be postulated that preparation course participants were looking for added value to complement the perceived weaknesses in the medical school curriculum.

The junior students at the University of Miami School of Medicine did well on the USMLE Step One in 2000. The vast majority of the junior students passed Step One on the first attempt, and the remainder passed it in later attempts. A few conclusions can be reached based on the findings of this study: (1) performance on Step One is related to academic performance in medical school and not the type of preparation methods; (2) students perceived value in whatever method of preparation they used; and (3) the strengths of the commercial preparation course were in areas of perceived curriculum weaknesses.

Generalization of the findings from this study to other medical schools or student groups may not be warranted due to its scope and study samples. More investigations on this subject will bring better understandings of the multiple factors that affect student performance on the USMLE Step One.

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