Student- and Faculty-Reported Importance of Science Prerequisites for Osteopathic Medical School: A Survey-Based Study

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Context: The relevance of current standard medical school science prerequisites is being reexamined.

Objectives: (1) To identify which science prerequisites are perceived to best prepare osteopathic medical students for their basic science and osteopathic manipulative medicine (OMM) coursework and (2) to determine whether science prerequisites for osteopathic medical school should be modified.

Methods: Preclinical osteopathic medical students and their basic science and OMM faculty from 3 colleges of osteopathic medicine were surveyed about the importance of specific science concepts, laboratories, and research techniques to medical school coursework. Participants chose responses on a 5-point scale, with 1 indicating "strongly disagree" or "not important" and 5 indicating "strongly agree" or "extremely important." Participants were also surveryed on possible prerequisite modifications.

Results: Student responses (N=264) to the general statement regarding prerequisites were "neutral" for basic science coursework and "disagree" for OMM coursework, with mean (standard deviation [SD]) scores of 3.37 (1.1) and 2.68 (1.2), respectively. Faculty responses (N=49) were similar, with mean (SD) scores of 3.18 (1.1) for basic science coursework and 2.67 (1.2) for OMM coursework. Student mean (SD) scores were highest for general biology for basic science coursework (3.93 [1.1]) and physics for OMM coursework (2.5 [1.1]). Student mean (SD) scores were lowest for physics for basic science coursework (1.79 [1.2]) and organic chemistry for OMM coursework (1.2 [0.7]). Both basic science and OMM faculty rated general biology highest in importance (mean [SD] scores, 3.73 [0.9] and 4.22 [1.0], respectively). Students and faculty rated biochemistry high in importance for basic science coursework (mean [SD] scores of 3.66 [1.2] and 3.32 [1.2], respectively). For basic science coursework, students and faculty rated most laboratories as "important," with the highest mean (SD) ratings for general anatomy (students, 3.66 [1.5]; faculty, 3.72 [1.1]) and physiology (students, 3.56 [1.7]; faculty, 3.61 [1.1]). For their OMM coursework, students rated only general anatomy and physiology laboratories as "important" (mean [SD] scores, 3.22 [1.8] and 2.61 [1.6], respectively), whereas OMM faculty rated all laboratories as "important" (mean scores, >3). Both student and faculty respondents rated research techniques higher in importance for basic science coursework than for OMM coursework. For prerequisite modifications, all respondents indicated "no change" for biology and "reduce content" for organic chemistry and physics. All respondents favored adding physiology and biochemistry as prerequisites.

Conclusion: General biology and laboratory were the only standard prerequisites rated as "important." Research techniques were rated as "important" for basic science coursework only. Physiology and biochemistry were identified as possible additions to prerequisites. It may be necessary for colleges of osteopathic medicine to modify science prerequisites to reflect information that is pertinent to their curricula.

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The current standard medical school science prerequisites of general biology, general chemistry, organic chemistry, physics, and their corresponding laboratories were established in response to the 1910 publication of *Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching*.[1] These prerequisites have remained basically unchanged over the past century.

In the past decade, however, several articles[2-10] have been published on the possible need to reexamine prerequisite requirements for medical school admission. Entering medical students have widely varied science backgrounds, challenging preclinical faculty to present material that can be understood by all students and often allowing less time for medically relevant topics.[6]

In 2009, an analysis of prerequisite scientific competencies for premedical science education was published by the Scientific Foundations for Future Physicians (SFFP) Committee,[11] and in 2010, the fifth comprehensive review of the Medical College Admission Test (MR5)[12] was performed to guide the next version of the test. Both reports indicated that more pertinent prerequisite knowledge is needed to replace topics that are now deemed less relevant to the foundations of medicine. Many medical school educators have suggested that students need prior exposure to more advanced topics like anatomy, biochemistry, cell biology, molecular biology, and genetics.[2-8,10]

In the present study, we designed a survey for students and faculty at osteopathic medical schools to address the following primary and secondary objectives: (1) to identify which science prerequisites are perceived to best prepare osteopathic medical students for their basic science and OMM preclinical studies, and (2) to determine whether science prerequisites for osteopathic medical school should be modified. In addition, we compared student responses with faculty responses, as well as our overall findings with those of the MR5. To our knowledge, no surveys have been previously published on science prerequisites for osteopathic medical schools comparing the opinions of students with their basic science and OMM educators.

Methods

Participants

Participants of the present survey-based study included full-time preclinical basic science and OMM faculty and students in the 2013 and 2014 graduating classes at the following colleges of osteopathic medicine: Touro University California, College of Osteopathic Medicine in Vallejo (TUCOM), the Touro University Nevada College of Osteopathic Medicine in Henderson (TUNCOM), and the Touro College of Osteopathic Medicine in New York, New York (TouroCOM). This study was approved by the institutional review boards at all 3 participating campuses.

Survey Development Process

Two separate versions of the survey were designed: 1 for students and 1 for faculty. Items for the survey were selected to be parallel with topics included in the MR5 survey. The surveys were constructed using a multistage process. The preliminary stage of the survey development process included a "think aloud" review with 2 TouroCOM students (class of 2012) for input on content and clarity of the survey questions. This stage also included a pilot test by 5 basic science and OMM content experts (unaffiliated with the Touro system), who also reviewed the survey for question content and clarity. After review of the feedback, we modified some questions to remove any ambiguity in wording.

Survey Design

The survey was divided into the following 5 sections:

1. **Background information.** Students were asked to provide information including medical school, graduating class, undergraduate major, additional degrees or certifications held, and whether they

completed their medical school prerequisites as a postbaccalaureate. Faculty were asked to provide information including area of expertise and years of teaching experience.

2. **General statements.** Using a 5-point Likert scale (with 1 indicating "strongly disagree" and 5 indicating "strongly agree"), participants were asked to indicate their overall agreement with whether science prerequisites sufficiently prepared students for their medical school coursework.

3. **Importance of science concepts.** Using a 5-point rating scale (with 1 indicating "not important," 3 indicating "important," and 5 indicating "extremely important"), participants were asked to rate the importance of knowing concepts in the following science disciplines before enrolling in medical school coursework: general biology, general chemistry, organic chemistry, physics, biochemistry, molecular biology, and genetics. For each science discipline, participants answered questions on 3 to 5 specific concepts. Participants were also able to select the response "unable to rate" for these questions.

4. **Importance of research techniques.** Using a 5-point rating scale (with 1 indicating "not important," 3 indicating "important," and 5 indicating "extremely important"), participants were asked to rate the importance of laboratory courses in the following science disciplines in preparing students for medical school coursework: general biology, general chemistry, organic chemistry, physics, biochemistry, molecular biology, general anatomy, microbiology, and physiology.

5. **Modification of standard prerequisites and other sciences.** Participants were asked to select from the following responses on how they believed science courses should be modified as prerequisites for medical school: 1, eliminate; 2, reduce content; 3, no change; and 4, add. Science courses listed in this question included biochemistry, biology, biology laboratory, general chemistry, general chemistry laboratory, genetics, immunology, microbiology, molecular biology, organic chemistry, organic chemistry laboratory, physics, physics laboratory, and physiology.

For sections 2 through 4, students were asked to consider each question separately for basic science and OMM coursework. Faculty were asked to respond to questions as they related to their area of expertise (ie, basic science or OMM). Participants had the option of adding qualitative comments in addition to selecting responses on the rating scales.

Data Collection

A link to the online survey (Survey Monkey) was distributed via e-mail in October 2011. Reminders were sent at 4-week intervals during the survey period. The survey period extended for 8 months and was closed in May 2012. Participation was anonymous and voluntary, with an option to withdraw at any time.

Statistical Analysis

Data analyses were conducted using SPSS software (version 18.0, SPSS Inc). Cronbach α was calculated for each discipline, and descriptive statistics were reviewed for data integrity, outliers, and general assumptions. Student *t* tests were used to compare responses to all survey questions. Analysis of variance (ANOVA) was used to test differences in student responses by class, campus, and undergraduate major. A *P* value of less than .05 was considered statistically significant.

Although student and faculty responses were compared, statistical analysis was not performed because of differences in the survey wording. Similarly, because of the small OMM faculty sample size, statistical analysis could not be performed to compare basic science and OMM faculty responses. A comparison of our results with those of the MR5 report was performed.

Results

A total of 797 students and 76 faculty members were invited to participate in the survey. Of those, 264 students and 49 faculty members completed the survey, for response rates of 33% and 64%, respectively. Cronbach α ranged from 0.82 to 0.98 for all disciplines, indicating adequate internal consistency of scale scores.

Survey Results

Background Information

STUDENT RESPONDENTS

Of 264 students, 103 (39%) were from TUCOM, 67 (25%) were from TUNCOM, and 94 (36%) were from TouroCOM. Of all students, 94 (36%) were in the graduating class of 2013 and 170 (64%) were in the graduating class of 2014. Of 261 students who reported their ages, 105 (40%) were aged 20 to 25 years; 144 (55%), 26 to 35 years; 9 (4%), 36 to 45 years; and 3 (1%), 46 years or older. Of the 251 students who reported their race/ethnicity, 2 (1%) were American Indian/Alaskan Native, 75 (30%) were Asian, 4 (2%) were black/African American; 149 (59%) were Caucasian, 5 (2%) were Hispanic/Latin, 2 (1%) were Pacific Islander, and 14 (5%) were "other."

Of 264 students, 187 (71%) indicated that their undergraduate major was in biological sciences, 11 (4%) indicated that it was in physical sciences, and 66 (25%) indicated that it was a nonscience major. Seventy-seven students reported having an advanced degree. Of those, 45 (58%) had an MA or MS degree in a science field, 15 (20%) had an MPH degree, 7 (9%) had a nonscience MA degree, 7 (9%) had an MBA degree, 2 (3%) held a DC degree, and 1 (1%) had a PhD degree.

Eighty-three students reported having additional certifications: 45 (54%) in emergency medical technician/first responder, 13 (16%) in phlebotomy, 6 (7%) in massage therapy, 4 (5%) in nursing, 4 (5%) in teaching, 3 (4%) in medical technology, and 3 (4%) in respiratory therapy. The remaining 5 (6%) certifications were for physical therapists, medical assistants, and registered dieticians.

FACULTY RESPONDENTS

Of 48 faculty respondents, 25 (52%) had less than 6 years teaching experience, 10 (21%) had 6 to 10 years, and 13 (27%) had more than 10 years. Forty of 49 faculty respondents (82%) were basic science faculty and 9 (18%) were OMM faculty. Primary disciplines were as follows: anatomy, 10 (21%); OMM, 9 (19%); pathology, 5 (10%); biochemistry, 4 (8%); microbiology, 4 (8%); pharmacology, 4 (8%); physiology, 4 (8%); other, 3 (6%); histology, 2 (4%); immunology, 2 (4%); genetics, 1 (2%); and molecular biology, 1 (2%).

Because of the small sample size, school location was not included in the faculty survey to eliminate respondent identification.

General Statements

STUDENTS

Student responses to the general statement regarding prerequisites were "neutral" for basic science coursework and "disagree" for OMM coursework, with mean (standard deviation [SD]) scores of 3.37 (1.1) and 2.68 (1.2), respectively. No statistically significant differences were found between the mean student responses for basic science and OMM coursework within a specific campus. The ANOVA analyses showed significant differences ($P<.05$) between TUCOM and TUNCOM for basic science coursework and TUCOM and TouroCOM and TUNCOM and TouroCOM for OMM coursework. This finding may reflect variations in faculty presentation and expertise based on OMM objectives.

FACULTY

Basic science and OMM faculty responses to the general statement regarding prerequisites were similar to students' responses, with mean (SD) scores of 3.18 (1.1) for basic science coursework and 2.67 (1.2) for OMM coursework.

Importance of Science Concepts

STUDENT

Respondents' mean scores for the importance of science topics are listed in *Table 1*. For each prerequisite discipline, *t* tests indicated significant differences between student basic science vs student OMM mean scores ($P<.001$). Students rated general biology concepts highest in importance for basic science coursework among all disciplines. General chemistry concepts were rated higher for basic science coursework than for OMM coursework. Students gave general biology the highest rating among the 4 standard science prerequisites for basic science coursework. For OMM coursework, mean (SD) scores from students for general biology overall were 2.3 (1.2), or "somewhat important." Students rated the biology subtopic of general anatomy/embryology higher in importance for basic science coursework than for OMM coursework, with mean (SD) scores of 3.85 (1.2) and 3.45 (1.5), respectively. Mean (SD) overall scores for organic chemistry and physics were 1.2 (0.7) and 2.5 (1.1) (ie, "not important" and "somewhat important") for OMM coursework. The ANOVA analyses showed significant differences between campus locations for physics only ($P<.05$).

Student mean scores for all molecular biology concepts ranged from 3.67 to 3.87 (ie, between "important" and "very important") for basic science coursework and from 1.33 to 1.46 (ie, between "not important" to "somewhat important") for OMM coursework. All biochemistry concepts were rated high in importance for basic science coursework (mean [SD] overall score, 3.66 [1.2] and low in importance for OMM coursework (mean

Table 1.
Student- and Faculty-Reported Importance of Basic Science Courses, Laboratory Courses, and Research Techniques as Prerequisites for Osteopathic Medical School Basic Science and OMM Courses

	Rating, mean (SD)[a]			
	Student (N=264)		Faculty[b]	
Topic Area	Basic Science	OMM	Basic Science (N=40)	OMM (N=9)
Basic Science Courses				
General biology	3.93 (1.1)	2.30 (1.2)	3.73 (0.9)	4.22 (1.0)
General chemistry	2.85 (1.2)	1.30 (0.7)	2.85 (1.2)	3.20 (1.6)
Organic chemistry	2.46 (1.3)	1.20 (0.7)	2.39 (1.2	3.27 (1.4)
Physics	1.79 (1.2)	2.50 (1.1)	2.33 (1.2)	3.27 (1.2)
Molecular biology	3.73 (1.1)	1.39 (0.8)	3.32 (1.1)	3.31 (1.4)
Biochemistry	3.66 (1.2)	1.50 (0.9)	3.32 (1.2)	4.17 (0.8)
Genetics	3.29 (1.2)	1.33 (0.8)	2.82 (1.1)	2.69 (0.9)
Laboratory Courses				
Standard prerequisite	2.77 (1.3)	1.83 (1.0)	2.90 (1.1)	3.55 (1.4)
Nonstandard prerequisite	3.31 (1.6)	1.97 (1.2)	3.31 (1.1)	4.23 (1.0)
Research Techniques	2.15 (1.2)	1.14 (0.5)	2.60 (1.2)	1.87 (1.4)

[a] Respondents rated importance of topic areas on a 5-point rating scale with 1 indicating "not important," 3 indicating "important," and 5 indicating "extremely important."
[b] Faculty were asked to rate topic areas as they related to their area of expertise (ie, basic science or osteopathic manipulative medicine [OMM]).

Abbreviation: SD, standard deviation.

[SD] overall score, 1.5 [0.9]). Genetics concepts were rated "important" for basic science coursework and "not important" for OMM coursework (mean [SD] scores of 3.29 [1.2] and 1.33 [0.8], respectively).

Comparison of the responses of students who had science undergraduate majors with those who had nonscience undergraduate majors showed no statistically significant difference for the overall statement and modification questions. This analysis was not performed on responses to questions on the science disciplines.

Of the standard prerequisite laboratories, general biology and general chemistry were rated highest for basic science coursework (mean [SD] scores, 3.51 [1.3] and 2.72 [1.3], respectively), whereas general biology and physics were rated highest for OMM coursework (mean [SD] scores, 1.97 [1.2] and 2.08 [1.3], respectively). For nonstandard prerequisite science disciplines, students rated all laboratories as "important" for their basic science coursework, with general anatomy and physiology rated as most important (mean [SD] scores, 3.66 [1.5] and 3.56 [1.7], respectively). These laboratories also received high ratings for OMM coursework (mean [SD] scores, 3.22 [1.8] and 2.61 [1.6], respectively). The remainder of the laboratories were rated as "not important" (mean scores <1.35) for OMM coursework.

FACULTY

Both basic science and OMM faculty rated general biology concepts highest among the science disciplines, consistent with ratings from students. The biology subtopics of human physiology and general anatomy/embryology received the highest ratings among OMM faculty, with mean (SD) scores of 4.78 (0.4) and 4.78 (0.6), respectively. Basic science faculty rated physiology highest, with a mean (SD) score of 4.03 (0.9). Of note, general chemistry, organic chemistry, and physics were given higher overall ratings by OMM faculty than by basic science faculty. Regarding physics, OMM faculty gave high ratings to the subtopics of basic concepts (mean [SD] score, 3.78 [1.0]), basic waves (mean [SD] score, 3.22 [1.4]), and mechanics (mean [SD] score, 3.78 [1.4]), whereas basic science faculty rated only basic physics as "important" (mean [SD] score, 3.03 [1.4]).

Both basic science and OMM faculty rated molecular biology concepts as important for understanding their coursework, with the highest ratings going to DNA and RNA structures for basic science faculty (mean [SD] score, 3.51 [1.1]) and cell signaling for OMM faculty (mean [SD] score, 3.56 [1.4]). The biochemistry concepts were rated as "important" by all faculty.

Mean [SD] overall scores for genetics concepts were 2.82 (1.1) for basic science faculty and 2.69 (0.9) for OMM faculty. For all laboratories, OMM faculty ratings were higher than basic science faculty ratings.

Importance of Research Techniques

For research techniques, student ratings for basic science coursework were higher overall than those of the basic science faculty, with microscopy rated the highest in both groups (mean [SD] scores, 3.03 [1.3] and 2.79 [1.3], respectively). For OMM, both student and faculty respondents rated these research techniques as "not important" (mean [SD] scores, 1.14 [0.5] and 1.87 [1.4], respectively).

Modification of Standard Prerequisites and Other Sciences

Student- and faculty-recommended modifications of prerequisites are listed in *Table 2*. Overall, both student and faculty respondents indicated that general biology and general biology laboratory should not be changed, whereas general physics and general physics laboratory should undergo content reduction. Student and OMM faculty indicated that general chemistry, organic chemistry, and their respective laboratories should undergo content reduction. Overall, student and faculty respondents recommended the addition of physiology and biochemistry as prerequisites. Students also indicated that immunology and microbiology should be added as prerequisites. Although anatomy was not listed as an option

under modification choices, 24 of 43 students (56%) and 4 of 7 faculty members (57%) who added qualitative comments indicated that anatomy should be added as a prerequisite.

Comparison of Results With MR5 Results

A comparison of our findings with the MR5 findings is summarized in *Table 3*. For both studies, the ranking of importance of concepts was similar, with physics being ranked as slightly more important in the MR5 study than in the present study and organic chemistry being rated as slightly more important in the present study than in the MR5 study. In addition, a similarity was seen in mean scores for research techniques in the present study compared with those in the MR5 study (mean [SD] scores of 2.60 [1.10-1.31] and 2.59 [0.84-1.41], respectively).

Discussion

In a 2012 survey,[13] 89% of physicians indicated that their basic science education was valuable to their clinical practice. These findings suggest that it is incumbent on our COMs to ensure that our students are prepared with the appropriate science knowledge so that they can grasp basic science principles and connect them with clinical knowledge. In our study, despite a strong agreement between basic science faculty and students, there was a disassociation between what OMM faculty perceived as

Table 2.
Student- and Faculty-Recommended Modifications of Standard and Nonstandard Prerequisite Science Courses for Osteopathic Medical School

	Rating, mean (SD)[a]		
		Faculty[b]	
Course	Student (N=264)	Basic Science (N=40)	OMM (N=9)
Standard Prerequisite			
General biology	3.10 (0.4)	3.17 (0.4)	3.57 (0.5)
General biology laboratory	2.98 (0.6)	2.78 (0.6)	3.00 (0)
General chemistry	2.77 (0.6)	3.06 (0.4)	2.86 (0.4)
General chemistry laboratory	2.63 (0.7)	2.65 (0.6)	2.86 (0.4)
Organic chemistry	2.45 (0.7)	3.00 (0.4)	2.75 (0.7)
Organic chemistry laboratory	2.26 (0.8)	2.44 (0.8)	2.38 (0.5)
Physics	2.42 (0.8)	2.82 (0.4)	2.29 (0.8)
Physics laboratory	2.23 (0.9)	2.29 (0.9)	2.43 (1.1)
Nonstandard Prerequisite			
Biochemistry	3.55 (0.6)	3.53 (0.5)	3.71 (0.5)
Genetics	3.37 (0.7)	3.30 (0.7)	3.29 (0.8)
Immunology	3.57 (0.6)	3.33 (0.6)	3.29 (0.5)
Microbiology	3.56 (0.6)	3.26 (0.7)	3.43 (0.5)
Molecular biology	3.29 (0.6)	3.22 (0.6)	3.50 (0.6)
Physiology	3.73 (0.5)	3.53 (0.5)	3.71 (0.5)

[a] Modification ratings were as follows: 1, eliminate; 2, reduce content; 3, no change; and 4, add.
[b] Faculty responses broken down by faculty members' area of expertise (ie, basic science or osteopathic manipulative medicine [OMM]).

Abbreviation: SD, standard deviation.

important compared with that of their students. For example, with the exception of anatomy and physiology, the students rated standard prerequisite science concepts as low importance for their OMM coursework, whereas faculty rated them as important.

The low mean student rating in the subtopics of bioenergetics and metabolism for OMM coursework indicates a disconnect between these biochemistry concepts and muscle-related OMM topics. Despite the medical application of the research technique of microscopy to histology and pathology, its low rating by both students and faculty for OMM coursework indicates that OMM faculty may not be incorporating basic science concepts sufficiently into their curriculum. The OMM faculty assigned higher ratings to laboratories than students and basic science faculty; this finding may reflect that the hands-on approach of OMM faculty is "laboratory-like."

Many of the competencies and related learning objectives put forth in the SFFP report[11] for entering medical students are parallel to the concepts included in our study. For example, SFFP competency E3 states, "Demonstrate knowledge of basic physical properties and their applications to the understanding of living systems." One of the learning objectives for this competency is "Explain the interrelationships among work, energy, force, and acceleration." Although the SFFP identified these physical science principles as important, the OMM students in our study gave a lower rating to physics concepts than their OMM faculty. The ANOVA analyses showed significant differences ($P<.05$) between locations for physics, suggesting that a student's rating for physics may have been influenced by the OMM presentation at a specific school.

The questions on research techniques in our survey relate to SFFP competency E2, which states, "Demonstrate understanding of the process of scientific inquiry, and explain how scientific knowledge is discovered and validated." Whether participating in a research project or reading journal articles, our future physicians need to understand research techniques to appreciate and understand the latest in clinical research. This understanding should enable them to connect their basic science with

Table 3.
Comparison of Osteopathic Medical School Prerequisite Study Findings With MR5[12] Study Findings

	Score, mean (SD range)[a]	
Concept	**Prerequisite Study (N=40)**	**MR5 Study (N=89-130)[b]**
Standard Prerequisite		
General biology	3.73 (0.92-1.19)	3.12 (0.83-1.33)
General chemistry	2.85 (1.13-1.27)	2.96 (0.90-1.14)
Organic chemistry	2.39 (1.13-1.22)	2.70 (0.69-1.13)
General physics	2.33 (1.00-1.37)	2.91 (0.81-1.20)
Nonstandard Prerequisite		
Biochemistry	3.32 (1.10-1.23)	3.34 (0.91-1.23)
Cellular/molecular biology	3.32 (1.04-1.24)	3.07 (0.63-1.41)
Research methods/techniques	2.60 (1.10-1.31)	2.59 (0.84-1.41)

[a] Scores reflect faculty responses only. Scores were assigned on a 5-point rating scale, with 1 indicating "not important" and 5 indicating "extremely important."
[b] N varied among concepts.

Abbreviations: MR5, fifth comprehensive review of the Medical College Admission Test; SD, standard deviation.

clinical knowledge,[14] increase their understanding and use of evidence-based medicine,[15] and lead to more osteopathic medical research.

Our results concur with much of the literature from the past decade that suggests entering students should have a strong basis in biochemistry, cell biology, genetics, molecular biology, and physiology.[2,3,5,6,16,17] These findings are reflected in recent prerequisite changes for many medical school admissions criteria. Approximately 80% of allopathic medical schools either require or highly recommend biochemistry,[18] with close to 14% of osteopathic medical schools requiring this course for admissions.[19]

The similarity of our findings with the MR5 results,[12] which included participants from allopathic medical schools only, suggests parallel responses between allopathic and osteopathic medical school faculty. Of note, unlike the MR5 survey, our study included medical students' opinions on prerequisites that directly pertain to their medical education. Nonetheless, even with differences in the samples, the ratings were comparable in both studies.

Our study had some limitations. First, because our research used a survey for data collection, the results are based on participants' perceptions and should not be viewed as objective information. As with other survey-based studies on educational topics,[20,21] the findings of the present study may be used to direct future research. Second, whereas the number of concepts listed in the MR5 survey was extensive, 3 to 5 key concepts from each discipline were chosen for our survey that we perceived as most important for medical education. Third, although we analyzed students' responses according to their undergraduate majors, we did not analyze responses according to their medical school performances. A previous study on this topic, however, showed no correlation.[22] Fourth, because of the small number of OMM faculty in the current study, statistical analysis between basic science and OMM faculty responses was not performed, which may explain the larger standard deviation values found for OMM faculty responses. Fifth, our student population was limited to 2.4% of the population of all COMs and may not be representative of all osteopathic medical students.[23] However, our demographics reflect those reported previously for osteopathic medical school matriculants.[23] Sixth, our study sample from 3 COMs was small and may not represent nationwide perceptions.

Although anatomy was not listed in the response options for prerequisite modification, students and faculty indicated that anatomy should be considered as a prerequisite. This result is consistent with the high student rating for the general biology subtopic of anatomy/embryology. Considering that the basics of OMM are deeply rooted in anatomy and the neuromusculoskeletal system in both structure and function, it is not surprising that many students believed anatomy prerequisite knowledge to be beneficial. The suggestion of anatomy as a prerequisite was posed by Gimpel[24] in his 2007 article on reforming osteopathic medical education.

Future studies on this topic should be performed on a larger number of osteopathic participants and include allopathic students and faculty. This type of study should highlight specific requirements needed for OMM coursework not found in an allopathic curriculum. Lastly, other prerequisite knowledge, including statistics, human behavior, and communication, need to be considered for further study.

Conclusion

General biology and laboratory were the only standard prerequisites rated as "important" in our survey. Physiology, biochemistry, immunology, microbiology, and anatomy were identified as possible additions to prerequisites. It may be necessary for COMs to modify the present prerequisites to reflect information that is pertinent to the medical curriculum.

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