Relationship of preadmission variables and first- and second-year course performance to performance on the National Board of Osteopathic Medical Examiners' COMLEX–USA Level 1 examination

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The purpose of this study was to examine the relationship of performance on the Comprehensive Osteopathic Medical Licensing Examination (COMLEX–USA) Level 1 licensing examination to (1) academic performance during the first 2 years of the curriculum, and (2) preadmission grade point averages (GPAs) and Medical College Admission Test (MCAT) scores for one osteopathic medical school with the unique mission of providing osteopathic family physicians for West Virginia and rural Appalachia.

Simple correlations were calculated for the 63 students at West Virginia School of Osteopathic Medicine who completed all requirements of the first 2 years of the curriculum in May 1998 and were first eligible for board exams in June 1998. These included 26 (41.3%) female students and 5 (7.9%) minority students. Students who had failed a year and/or a course but subsequently successfully completed the first 2 years of the curriculum in May 1998 were included in this study. Every student who qualified to take the June 1998 administration of COMLEX–USA Level 1 did so at that time. For the 55 academic or preadmissions variables of interest, correlation coefficients with COMLEX–USA Level 1 scores and significance levels were calculated using SPSS Base 9.0.

The correlation of COMLEX–USA Level 1 performance with GPA for Phase I was 0.64; with GPA for Phase II, 0.67; and total GPA for the first 2 years, 0.70. Grades in most individual courses also correlated significantly with COMLEX–USA Level 1 performance. Given the special focus of this curriculum on the needs of the Appalachian region and use of clinical performance measures or participation measures in calculating academic GPAs, these correlations show a remarkable degree of agreement between these two sets of performance measures. Further research is needed to see if similar relationships exist for osteopathic medical schools with other missions and with other curriculum structures. Preadmissions GPAs and MCATs did not significantly relate to performance on COMLEX–USA Level 1.

(Key words: COMLEX–USA, MCAT, licensure, osteopathic medical education, admissions, curriculum)

Each college of osteopathic medicine accredited by the American Osteopathic Association (AOA) is responsible for adopting admissions policies and a curriculum designed to meet the stated mission of that college; for developing a system of assessment and providing feedback to students regarding progress; and for assuring that students meet the educational objectives of the instructional program.[1(pp688-700)] Furthermore, AOA accreditation standards now specify that as one part of each college's assessment program, students must take the Comprehensive Osteopathic Medical Licensing Examination (COMLEX–USA) Level 1 and Level 2 prior to graduation.[1(pp688-700)]

The West Virginia School of Osteopathic Medicine (WVSOM) admissions policies are designed to select students who will become osteopathic family physicians in rural West Virginia and Appalachia, and the curriculum focuses on medical needs of the Appalachian region. Because of these unique characteristics, the WVSOM faculty expressed interest in the degree to which scores on the nationally standardized COMLEX–USA licensing examinations related to performance at WVSOM. The current study was designed to examine the relationship of test scores of WVSOM students who took the COMLEX–USA Level 1 examination first administered in June 1998 to (1) academic performance during the first 2 years of the WVSOM curriculum, and (2) preadmission variables.

WVSOM
Mission and outcomes
The primary mission of WVSOM is to provide osteopathic family physicians for rural West Virginia and Appalachia. WVSOM's success in producing family physicians is documented by the Amer-

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ican Osteopathic Association's *1999 Yearbook and Directory*, which shows that 621 (54%) of WVSOM's 1146 graduates specialized in family practice.[1(pp635-637)] Regarding the mission to produce rural practitioners, a retrospective study of recent graduates practicing in Appalachia in 1978 to 1990 found that WVSOM was the nation's leading institution in providing physicians for rural practices in the Appalachian region.[2]

Admissions policies

During the admissions process, the WVSOM Admissions Committee attempts to predict whether a candidate will be able to successfully meet the academic requirements of the WVSOM curriculum and the licensing process, but the most important criterion for admission is "potential as a rural osteopathic family physician in West Virginia." Accordingly, WVSOM places less emphasis on traditional measures such as test scores and undergraduate grades and more emphasis on other factors, including personal characteristics and orientation toward osteopathic medicine, rural practice, and family medicine.

Curriculum

Phase I of the WVSOM curriculum is from August through April of the first year of the program and includes the basic science and clinical courses that provide the initial foundation for clinical medicine. Emphasis is placed on integration of clinical and basic science information. For example, the PhD anatomy faculty works closely with physicians from family medicine and osteopathic principles and practices to teach the Phase I gross anatomy course in which all faculty members (including PhD anatomists) stress future clinical use of course content. The faculty regards emphasis on osteopathic principles and practices as a distinguishing characteristic of the program, and its integration is emphasized throughout all phases of the curriculum.[3]

Phase II of the WVSOM curriculum begins in April of the first year, is interrupted for a 2-month summer vacation, and continues until early May of the second year. During Phase II, biomedical and clinical instruction focus on each organ system. Students are required to pass each system, within which basic science information, clinical information, and osteopathic principles are integrated. Students are also required to pass each "discipline" within these systems (family practice, pathology, pharmacology, internal medicine, etc). Concurrent clinical courses, such as osteopathic principles and practices and geriatrics, are also taught in Phase II (see list in *Tables*). The osteopathic principles and practices component includes both traditional laboratories and supervised clinical practice in a student clinic. Because WVSOM's Phase III curriculum (Years 3 and 4) emphasizes hands-on education rather than a lecture-based program, some clinical content that would traditionally be taught during the clerkship years is taught within the systems curriculum.

Phase III of the WVSOM curriculum begins in mid-June of Year 2, approximately 1 week after COMLEX–USA Level 1 examinations. This instruction takes place in ambulatory and hospital sites, primarily in West Virginia but in other states as well. WVSOM requires a total of 4.5 months of clinical rotations in family practice, mostly with individual preceptors or in rural primary care clinics. Clinical rotations are also required in internal medicine (4 months), surgery (3 months), pediatrics (2 months), and geriatrics, psychiatry, obstetrics/gynecology, and emergency medicine (1 month each). Four additional months of rotations are electives. WVSOM requires that at least 3 months of these clinical rotations be in rural West Virginia, but for the 1997-1998 academic year, WVSOM students spent an average of 8 months in these settings. WVSOM is a full participant in the West Virginia Rural Health Education Partnerships program, a unique program involving all students from the seven health professions schools in the University System of West Virginia in rural, community-based service and education activities.[4]

WVSOM's curriculum is designed to focus on the medical needs of Appalachia and, specifically, West Virginia. These needs are different from those of the general population of the United States. For example, only 5% of West Virginia's 1996 population was minority (including Hispanic), compared to the national average of 27%.[5] West Virginia is fifth highest in obesity and overweight, but fifth lowest in chronic drinking.[6] West Virginia was 32% higher than the national average for death from chronic obstructive pulmonary disease, but 29% lower for homicide and legal intervention.[7] WVSOM's curriculum emphasizes characteristics and diseases of this region; for example, the occupational medicine component emphasizes hazards associated with coal mining, timbering, and farming.

COMLEX–USA requirements at WVSOM

The WVSOM class who took the COMLEX–USA Level 1 examination in June 1998 was required to pass both the first and second levels of COMLEX–USA in order to graduate. Although Hoffman[8] identified other reasons schools might require an external examination for graduation, a major reason the WVSOM faculty recommended the Level 2 passing requirement was that COMLEX–USA is the preferred route to licensure for osteopathic physicians in West Virginia. The United States Medical Licensing Examinations (USMLE) are not accepted for licensure of osteopathic physicians in West Virginia.

COMLEX–USA Level 1 examination

Since 1936, examinations written by the National Board of Osteopathic Medical Examiners (NBOME) or its precursor associations have been used for licensure of osteopathic physicians. These examinations are currently accepted by licensure boards in 49 states as a measure of osteopathic medical knowledge.[9]

As part of an effort to continually enhance the assessment process, NBOME recently redesigned its licensing examinations. The previous three-part exam was replaced by a three-level COMLEX–USA examination. As described by NBOME: "The COMLEX–USA program is designed to assess the osteopathic

medical knowledge considered essential for osteopathic generalist physicians to practice medicine without supervision. COMLEX is constructed in the context of medical problem solving which involves clinical presentations and physician tasks. Candidates are expected to utilize the philosophy and principles of osteopathic medicine to solve medical problems."[9]

Implementation of the new exam started with the most advanced clinical level. The COMLEX–USA Level 3 examination was first administered to interns in February 1995, and the first COMLEX–USA Level 2 examination was administered to clinical students in March 1997. The first COMLEX–USA Level 1 examination, designed for administration at the end of the first 2 years of osteopathic medical school, was administered in June 1998.[9]

The COMLEX–USA Level 1 examination is a 2-day, written, multiple-choice examination that emphasizes the underlying basic science knowledge relevant to the medical problems outlined in the table of specifications for the examination. As currently administered, the examination does not include a practical or skills-based examination. Applicants may take the examination after completion of the first half of the sophomore year at colleges accredited by the American Osteopathic Association.[9] Level 1 "emphasizes the medical concepts and principles necessary for understanding the mechanisms of medical problems and the disease process."[9]

The goal of the Level 1 examination is "to develop a clinically relevant licensure exam of highest quality which reflects our osteopathic uniqueness."[10] The COMLEX–USA Level 1 examination is organized around common primary care problems so that two thirds of the questions relate to clinical scenarios. Approximately 15% to 20% of the 1998 examination questions were designed specifically to test osteopathic principles and practices, but osteopathic content also was "integrated within the fabric of the entire examination."[11] In addition, the test includes behavioral sciences and questions about patient his-

tory and physical examination that had previously not been tested until the NBOME Part 2 examination.[10]

Related research
Osteopathic medical education
No studies could be identified correlating licensing examinations at the end of the first 2 years of osteopathic medical education with course performance or admissions variables.

Allopathic medical education
The United States Medical Licensing Examination (USMLE) was a joint program of the National Board of Medical Examiners (NBME) and the Federation of State Medical Boards of the United States, Inc.[12] Redesigned in format from the previous NBME Part 1 examination, the USMLE Step 1 is now the first step of the allopathic licensing process. Like the COMLEX–USA Level 1, USMLE Step 1 is an objective test designed for administration after the second year of medical education. USMLE Step 1 was first administered in June 1992.[13] Articles (discussed below) that provided simple correlations relating USMLE Step 1 performance with allopathic basic science performance or preadmissions data were identified.

Correlates of basic science performance with the USMLE Step 1
For the University of Kentucky School of Medicine, the following correlations were reported with total USMLE Step 1 examination scores: medical school first-year grade point average (GPA), 0.62; medical school second-year GPA, 0.73.[14] For seven other allopathic medical schools, within-school correlations between USMLE Step 1 performance in June 1994 or September 1994 and GPAs in allopathic basic science coursework ranged from 0.72 to 0.83, with a median correlation of 0.76.[15]

Correlates of preadmissions variables with the USMLE Step 1
For the University of Kentucky School of Medicine, the following correlations were reported with total USMLE Step 1 examination scores: undergraduate science

GPA, 0.37; all other GPA, 0.18; total GPA, 0.33; total (old) MCAT, 0.36; all (old) MCAT subscales, 0.22 to 0.29.[14] In a study of 11,145 examinees from 112 allopathic medical schools who took the USMLE Step 1 in June 1994 and who met other inclusion criteria, Swanson and colleagues[16] reported the following adjusted overall correlations between scores on the (new) MCAT and performance on the USMLE Step 1: biological sciences, 0.52; physical sciences, 0.49; verbal reasoning, 0.33; and writing samples (scaled numerically as J = 1, K = 2, ..., T = 11), 0.14.

Purpose of current study
The purpose of the current study was to examine the relationship of performance on the COMLEX–USA Level 1 licensing examination to (1) academic performance during the first 2 years of the curriculum, and (2) preadmission grade point averages (GPAs) and Medical College Admission Test (MCAT) scores for one osteopathic medical school with the unique mission of providing osteopathic family physicians for West Virginia and rural Appalachia.

Methods
Subjects
Subjects for this study were the 63 students at WVSOM who completed all requirements of the first 2 years of the WVSOM curriculum in May 1998 and were first eligible for board exams in June 1998. These included 26 (41.3%) female students and 5 (7.9%) minority students. Students who had failed a year and/or a course but subsequently successfully completed the first 2 years of the curriculum in May 1998 were included in this study. For this class, every student who qualified to sit for the June 1998 administration of COMLEX–USA Level 1 did so at that time. Full data sets, as described below, existed for all 63 of these students.

Measurements—COMLEX–USA Level 1
The single, total COMLEX–USA Level 1 score reported by NBOME to the institution was used in this analysis. On the

Variable	Mean	SD	Correlation coefficient	Original *P* value
☐ Total GPA, first 2 years	88.1	±3.5	0.702	.00000†
☐ Phase II GPA	89.5	±3.2	0.673	.00000†
☐ Phase I GPA	85.7	±4.6	0.644	.00000†

*Correlations of COMLEX–USA Level 1 scores with total grade point averages (GPAs) for the first 2 years of medical school, GPA for phase II only, and GPA for phase I only. Data from 63 students who completed the first 2 years of the West Virginia School of Osteopathic Medicine curriculum in May 1998 and completed the COMLEX–USA Level 1 examination as candidates in June 1998.
†Significant at .05 level after Bonferroni's adjustment for having calculated 55 correlations (critical *P*=.0091)

June 1998 administration of COMLEX–USA Level 1, the national mean and standard deviation for the 2139 "first-time takers" were 499.8 and 71.1, respectively. Nationally, 93% of these "first-time takers" passed the examination, and the reliability of the examination was 0.96.[17] For the WVSOM students in this study, the mean was 493.9 and the standard deviation was 59.8; the exam was passed by 62 (98.4%) of the 63 students.

Measurements—course performance

Most courses in the first 2 years of the WVSOM curriculum utilize a numerical scale, on which 90 to 100 (A) is considered "Excellent Performance," 80 to 89 (B) is considered "Good Performance," 70 to 79 (C) is considered "Adequate Performance," and grades below 70 (F) are failing. If a student fails a year and repeats the entire curriculum, the student's actual grades for the second taking of these courses are used to calculate the GPA. When a student initially fails a single course and passes it upon remediation (repeats a course), it is WVSOM policy to subsequently calculate the student's GPA based on "70" (the lowest passing grade), regardless of performance on remediation or repeating the course. Reliability data are not available regarding course grades.

Grading criteria vary. While many basic science course grades were determined entirely on objective written tests, most clinical courses used practical examinations or participation-based criteria. For all four semesters of WVSOM's osteopathic principles and practices courses, 40% of the grade was based on practical examinations or clinical performance, including performance in the supervised student osteopathic manipulative medicine clinic. Grades in sophomore physician skills and in geriatrics were based on clinical performance and course participation. Grades in physical diagnosis I and II were based on written tests, practical exams, and participation. Grades in psychology were based on an essay test. Grades for some components of the behavioral medicine discipline, such as the human sexuality component, were based on attendance. During this academic year, the curriculum included a special 10.5-hour osteopathic principles and practices integration discipline, which was graded primarily by participation in case presentations but included a brief (15 item) test. Medical terminology is a 0.25 credit-hour "course" consisting of a reading assignment to be completed before matriculation, followed by a single test on this content during the first week of medical school: most students have mastered the material, and score 100% on this test. Some other courses are graded pass/fail

and were not included in the calculation of GPA. For the class participating in this study, pass/fail grading was used for computer literacy, cardiopulmonary resuscitation, freshman physician skills, introduction to family medicine I, and medical history.

Measurements—preadmissions data

Preadmissions data were retrospectively recorded from student files, using Medical College Admission Test (MCAT) data generated by the American Association of Colleges of Osteopathic Medicine Application Service (AACOMAS). For students who had repeated the MCAT, the most recent scores were used in this analysis (even if the latest score was received after the student had been provisionally admitted to the class). Undergraduate GPA data were based on the student's final, official transcript.

Statistical analysis

For the 55 academic or preadmissions variables of interest, correlation coefficients with COMLEX–USA Level 1 scores and significance levels were calculated using SPSS Base 9.0.[18] Because calculating several correlations simultaneously might result in identifying some as significant by chance, *P* levels were adjusted using the Bonferroni method: for a correlation to be considered significant at the .05 level, the calculated *P* value must be less than .05 divided by 55, or 0.0091.[18]

Results
GPAs for the first two phases

Correlations between COMLEX–USA Level 1 performance and GPAs for the first two phases are shown as *Table 1*. The correlation with total GPA for the first 2 years was 0.70 (all noted data are statistically significant at the 0.05 level after applying Bonferroni's adjustment as described above). The correlation with the GPA for Phase II was 0.67, and for Phase I was 0.64.

Basic sciences courses

Correlations between COMLEX–USA Level 1 performance and performance in Phase I (first year) basic science courses

are shown as *Table 2*. The highest correlations are with pharmacology and pathology, 0.63 and 0.60, respectively. All correlations except the correlations with nutrition and with medical terminology were statistically significant.

Systems courses
Correlations between COMLEX–USA Level 1 performance and performance on systems courses are shown in *Table 3*. Correlations of 0.60 or above were found for three systems—renal, cardiovascular, and blood and lymphoid. Correlations for these and all other systems were statistically significant.

Disciplines within systems
Correlations between COMLEX–USA Level 1 scores and the "disciplines" within systems are shown in *Table 4*. All disciplines except three were significantly correlated with performance on the COMLEX–USA Level 1 examination. Exceptions were behavioral medicine, which had been graded primarily based on attendance; nutrition, which was only 5 contact hours; and osteopathic principles and practices discipline, a 10.5-contact-hour component that had been

graded on the bases of participation and a 15-item test.

Clinical courses
Correlations between COMLEX–USA Level 1 scores and clinical courses are shown in *Table 5*. Significant correlations were found for physical diagnosis I and II and osteopathic principles and practices III and IV. All clinical courses graded at least in part on factors other than multiple-choice tests, using performance, participation, or essay tests as part or all of the grade. All courses in the osteopathic principles and practices sequence based 40% of the grade on clinical performance.

Preadmissions data
Correlations between COMLEX–USA Level 1 performance and preadmissions data are shown in *Table 6*. None of these correlations was statistically significant at the 0.05 level after Bonferroni's adjustment for number of correlations was applied. The highest correlations were with the biological sciences and with overall undergraduate GPA, which both correlated 0.26 with performance on COMLEX–USA Level 1.

Conclusions
Considerations regarding course performance
The correlation between COMLEX– USA Level 1 performance and WVSOM's total GPA for the first 2 years was 0.70. The correlation with WVSOM's GPA for Phase II was 0.67, and for Phase I was 0.64. These correlations are relatively strong, and statistically significant. They are comparable to, but perhaps slightly lower than, correlations reported by allopathic programs between USMLE Step 1 and basic science achievement. The University of Kentucky study reported a Step 1 correlation of 0.62 with first-year GPA and a correlation of 0.73 with second-year GPA.[14] Swanson and colleagues[15] reported that for the seven allopathic schools that provided these data, the correlations of scores on the first administration of USMLE Step 1 with basic science GPA ranged from 0.72 to 0.83.

Attributes of WVSOM's program that might lower expected correlation
Several factors might tend to lower the correlation between grades at WVSOM and COMLEX-Level 1 scores. The stan-

Table 3
Systems Courses (Phase II)*

System	Credit hours	Mean	SD	Correlation coefficient	Original P value
☐ Renal	4.25	87.7	±4.7	0.667	.00000†
☐ Cardiovascular	0.75	90.3	±3.2	0.644	.00000†
☐ Blood and lymphoid	5.00	88.7	±5.4	0.604	.00000†
☐ Endocrine	5.00	84.0	±5.2	0.588	.00000†
☐ Gastrointestinal	5.25	90.6	±3.8	0.570	.00000†
☐ Skin	2.75	88.4	±5.5	0.562	.00000†
☐ Musculoskeletal	5.00	87.6	±5.8	0.559	.00000†
☐ Reproductive	6.75	86.5	±4.2	0.540	.00000†
☐ Nervous	7.00	92.4	±3.7	0.514	.00002†
☐ Respiratory	6.25	89.3	±3.8	0.476	.00008†
☐ Medical neuroscience	4.50	92.2	±3.8	0.417	.00068†

*Correlations between COMLEX–USA Level scores and systems courses (Phase II, spring of first year through end of second year) data for 63 students who completed the first 2 years of the West Virginia School of Osteopathic Medicine curriculum in May 1998 and completed the COMLEX–USA Level examination as candidates in June 1998. Ordered by degree of correlation with COMLEX–USA Level total score.
†Significant at .05 level after Bonferroni's adjustment for having calculated 55 correlations (critical P=.0091)

Table 4
Disciplines within Systems (Phase II)*

Discipline	Hours, No.	Mean	SD	Correlation coefficient	Original P value
☐ Pathology	103.50	87.0	±4.8	0.696	.00000†
☐ Pharmacology	83.60	84.6	±5.9	0.684	.00000†
☐ Internal medicine	104.00	88.8	±4.4	0.577	.00000†
☐ Physiology	26.00	87.0	±4.7	0.543	.00000†
☐ Microbiology	33.80	87.6	±5.3	0.536	.00001†
☐ Surgery	94.50	91.3	±3.2	0.533	.00001†
☐ Family practice	72.50	91.6	±3.2	0.497	.00003†
☐ Geriatrics	6.00	92.2	±3.9	0.472	.00008†
☐ Medical genetics	22.00	86.1	±5.7	0.465	.00013†
☐ Biochemistry	28.30	88.3	±5.8	0.453	.00019†
☐ Pediatrics	55.00	89.8	±4.0	0.435	.00037†
☐ Neuroanatomy	44.00	92.9	±4.0	0.397	.00127†
☐ Osteopathic principles and practices integration	10.50	94.2	±4.1	0.314	.01219
☐ Nutrition	5.00	89.4	±8.0	0.307	.01431
☐ Behavioral medicine	28.00	97.5	±3.8	0.165	.19737

*Correlations between COMLEX–USA Level scores and "disciplines" within the Phase II systems courses. Data from 63 students who completed the first 2 years of the West Virginia School of Osteopathic Medicine curriculum in May 1998 and completed the COMLEX–USA Level examination as candidates in June 1998. Ordered by degree of correlation with COMLEX–USA Level total score.
†Significant at .05 level after Bonferroni's adjustment for having calculated 55 correlations (critical P=.0091)

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Table 5
Clinical and Other Courses*

Course	Credit hours	Mean	SD	Correlation coefficient	Original *P* value
■ Phase I					
☐ Osteopathic principles and practice II	2.25	92.2	±2.3	0.282	.02493
☐ Osteopathic principles and practice I	2.25	94.3	±2.3	0.272	.03116
☐ Psychology	1.00	95.3	±3.1	0.016	.86784
■ Phase II					
☐ Physical diagnosis	2.25	67.0	±3.8	0.463	.00006†
☐ Osteopathic principles and practice IV	.50	69.0	±3.3	0.461	.00007†
☐ Physical diagnosis	.75	92.4	±3.4	0.427	.00049†
☐ Osteopathic principles and practice III	2.50	90.	±3.0	0.363	.00342†
☐ Geriatrics	.00	95.5	±2.9	0.284	.02493
☐ Sophomore physician skills	4.25	93.4	±3.4	0. 09	.39861

*Correlations between COMLEX–USA Level score and grades in clinical or other courses. Data from 63 students from the West Virginia School of Osteopathic Medicine who completed the first 2 years of the West Virginia School of Osteopathic Medicine curriculum in May 1998 and took the COMLEX–USA Level examination as candidates in June 1998. Courses ordered within phase by degree of correlation with COMLEX–USA Level total score.
†Significant at .05 level after Bonferroni's adjustment for having calculated 55 correlations (critical *P* = .0091).

Table 6
Preadmissions Data*

Variable†	Mean	SD	Correlation coefficient	Original *P* value
☐ MCAT—Biological sciences	7.0	±2.1	0.264	.03639
☐ Overall undergraduate GPA	3.4	±0.3	0.260	.03970
☐ Science undergraduate GPA	3.3	±0.3	0.226	.07516
☐ MCAT—physical sciences	6.8	± .6	0.217	.08621
☐ Nonscience undergraduate GPA	3.4	±0.3	0.215	.09047
☐ MCAT—verbal reasoning	7.5	±2.0	0. 6	.36496
☐ MCAT—Writing sample‡	5.1	±2.2	−0.127	.32139

*Correlations of COMLEX–USA Level score and preadmissions data. Data for 63 students from the West Virginia School of Osteopathic Medicine who completed the first 2 years of the West Virginia School of Osteopathic Medicine curriculum in May 1998 and took the COMLEX–USA Level examination as candidates in June 1998. Ordered by degree of correlation with COMLEX–USA Level total score. No correlations were significant at .05 level after Bonferroni's adjustment for having calculated 55 correlations (critical *P* = .0091).
†MCAT = Medical College Admission Test; GPA = grade point average.
‡Following a procedure used by Swanson and his colleagues,[17] scores for the writing sample were scaled numerically as J = 1, K = 2, and so forth through T = 1.

dard deviation on COMLEX–USA Level 1 for the students in this study was 59.8, compared to the national standard deviation of 71.1; therefore, the WVSOM students tended to be more homogeneous than the national population. Furthermore, grades for students who completed the first 2 years of the WVSOM curriculum tended to be restricted in range and relatively high, with the average overall GPA at the end of the 2 years being 88 of a possible 100, with a standard deviation of 3.5. Restricted range could contribute to a relatively low correlation. While the reliability of the COMLEX–USA Level 1 was high (0.96),[17] reliability values for course grades were not available, because grades in many cases were the composite of multiple examinations and in some cases included performance-based or participation-based components, and therefore had multiple dimensions. Any lack of reliability for course grades would also reduce the possible correlation with COMLEX–USA scores.

As previously described, factors other than multiple-choice test performance were used in grading of every WVSOM clinical course and some disciplines, including the four courses in the osteopathic principles and practices sequence and the osteopathic integration discipline. Grading criteria were not described for the allopathic schools for which correlations are published regarding USMLE examinations. If WVSOM's curriculum places more emphasis in grades on psychomotor skills, work habits, and interpersonal or communication skills than these allopathic schools, then lower correlations with the corresponding national written test might be expected. The current study found that correlations with COMLEX–USA Level 1 scores with WVSOM's individual discipline grades were strongest for pathology and pharmacology, which WVSOM tested exclusively using objective written tests.

Attributes of WVSOM's program that might raise expected correlation

Alternatively, there are reasons that correlations between performance in the first 2 years of WVSOM's curriculum and COMLEX–USA Level 1 performance might be higher than correlations that may be found at some other osteopathic schools. The COMLEX–USA Level 1 examination emphasizes integration of clinical and basic science content, which is also a distinctive feature of the WVSOM curriculum. The inclusion of clinical content into the first 2 years of the WVSOM curriculum as part of the systems courses would strengthen this correlation. Furthermore, while all osteopathic medical colleges accredited by the American Osteopathic Association are required to integrate osteopathic principles and practices throughout their curriculum,[1(pp688-700)] such integration is a distinctive characteristic of the WVSOM program.[3] To the extent that COMLEX–USA Level 1 examination achieves its stated goals of measuring concepts and principles unique to osteopathic medicine, WVSOM's emphasis on osteopathic integration throughout all components of the curriculum would contribute to a strong correlation.

Preadmissions data

None of the correlations between COMLEX–USA Level 1 performance and WVSOM's preadmissions data was statistically significant. The highest correlations were with biological sciences MCAT and undergraduate overall GPA, both correlating 0.26. Students who did not successfully complete the first 2 years of the WVSOM program did not take the COMLEX–USA Level 1 examination and were not included in this study. Furthermore, restriction of range in WVSOM's preadmissions data may lower the expected correlation with COMLEX–USA Level 1 performance.

Considerations regarding MCATs

Because the correlations between COMLEX–USA Level 1 scores and preadmissions data were lower than had been anticipated, supplemental analysis was performed to calculate correlations among preadmissions variables and GPAs for Phase I and for Phase II. None of these correlations was statistically significant at the 0.01 level (not adjusted). Correlations with Phase I GPA were biological sciences, 0.30; physical sciences, 0.06; verbal reasoning, 0.13; and writing sample (converted to a numeric scale), −0.18. Correlations with Phase II GPA were biological sciences, 0.02; physical sciences, 0.06; verbal reasoning, 0.13; and writing sample (converted to a numeric scale), −0.08.

The nineteen colleges of osteopathic medicine that are accredited by the AOA all currently require applicants to submit scores from the Medical College Admission Test (MCAT) to be considered for admission.[19] However, the MCAT examination was not designed specifically for use by osteopathic medical programs, and no previous studies could be identified that examined the predictive validity of the MCAT for use in osteopathic medicine. Research regarding the predictive validity of MCAT scores is needed, including analysis of students who are dropped from programs because of poor academic performance (such students were not included in the current study). Furthermore, it is possible that osteopathic medical education programs that have more conventional basic science curricula would find a stronger relationship than was established for WVSOM. The admissions policies of WVSOM, which give preference to students judged to have the values, skills, and attitudes necessary for rural family practice and place less emphasis on MCAT scores, may also be a factor in these low correlations.

Alternatively, if findings in the current study—strong correlations of COMLEX–USA Level 1 with total GPAs at the end of Year 2, but low correlations between COMLEX–USA Level 1 and MCATs—were confirmed with larger data sets, one possible explanation would be that the COMLEX–USA Level 1 examination assesses content and application taught in osteopathic medical education that are not strongly influenced by (1) generalized test-taking skills or (2) the general (factual) knowledge of premedical students. COMLEX–USA Level 1 may be assessing the "value added" by osteopathic medical education,[20] not these more general skills or knowledge. Further research is needed in this area.

Considerations regarding preadmissions GPAs

Regarding preadmission GPAs, supplemental analysis showed that preadmission science GPA correlated 0.34 with Phase I GPA ($P =.007$, not adjusted); with Phase II GPA, 0.32 ($P =.011$); and with COMLEX–USA Level 1 scores, 0.23 ($P =.005$). Nonscience GPA correlated 0.15 with Phase I GPA ($P =.256$); with Phase II GPA, 0.33 ($P =.008$); and with COMLEX–USA Level 1, 0.22 ($P =.090$). Finally, preadmission overall GPA correlated with Phase I GPA, 0.29 ($P =.020$); with Phase II GPA 0.38 ($P =.002$); and with Level 1, 0.26 ($P =.049$). Again, further analysis, using data that include students who left programs because they were unable to meet academic requirements, is needed. Also, in the current study, grades were not statistically adjusted to account for the competitiveness of the undergraduate institution, or adjustment, which might have strengthened the relationship. However, the limited data available suggest that preadmissions science GPA and overall GPA may be slightly more valuable in predicting performance in WVSOM's curriculum than in predicting performance on the licensing exam. It is possible that some behaviors not measured on COMLEX–USA Level 1—attendance, interpersonal skills, and study skills enhancing short-term performance—may have contributed to the stronger relationship between the two sets of grades.

Summary

Relatively strong correlations were found between COMLEX–USA Level 1 scores and academic performance measures during the first 2 years of the WVSOM curriculum. Given the special focus of this curriculum on the needs of the Appalachian region and use of clinical performance measures or participation measures in calculating academic GPAs, these correlations show a remarkable degree of agreement between these two sets of performance measures. Further research is needed to see if similar relationships exist for osteopathic medical schools with other missions and with other curriculum structures.

This study found a surprisingly low relationship between preadmissions variables and COMLEX–USA Level 1 performance, and supplemental analysis showed little relationship between MCAT scores and performance in the WVSOM academic program. Because alternative explanations for this finding are possible, further research is needed in this area.

Acknowledgment

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