

Relationship between academic achievement and COMLEX-USA Level 1 performance: a multisite study

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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 with academic performance at colleges accredited by the American Osteopathic Association (AOA). Eighteen (95%) of 19 AOA-accredited colleges and 2146 students (91% of those taking the June 1999 examination) met criteria and participated. Students were classified by school representatives on the basis of academic performance in the first 2 years of the curriculum. The relationships of Level 1 performance with assigned classifications and grade point averages (GPAs) were studied. Of students classified in the highest 20% academically, the Level 1 pass rate was 100%, with a mean score of 599. Of students classified in the lowest 5%, the pass rate was 63.5%, with a mean of 416.3. For 16 schools that provided GPAs, the within-school correlations between Level 1 scores and GPAs ranged from $r = 0.76$ to $r = 0.85$, with a mean correlation of $r = 0.79$. School representatives were also asked to indicate, for each student, whether they expected the student to pass the examination. Pass rate for students in the "sure pass" category was 98.9%; "borderline," 82.5%; and "concerns," 61.5%.

Academic performance in the first 2 years of osteopathic medical school was strongly associated with performance on COMLEX-USA Level 1. The national pass rate for this examination was similar to those in previous years, and it remains unclear why school representatives overpredicted the number of failures. Further research is needed.

(Key words: COMLEX-USA, osteopathic medical education, licensure, curriculum)

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To better assist state licensing boards in accurately measuring knowledge required of physicians, the National Board of Osteopathic Medical Examiners (NBOME) recently redesigned its licensing examinations to create the Comprehensive Osteopathic Medical Licensing Examination (COMLEX-USA). The COMLEX-USA examinations are the primary route to licensure for osteopathic physicians and are accepted by 49 states as a measure of osteopathic medical knowledge.¹ Furthermore, accreditation standards of the American Osteopathic Association (AOA) now specify that, as one part of each college's assessment program, students must take the Comprehensive Osteopathic Medical Licensing Examination (COMLEX-USA) Levels 1 and 2 prior to graduation.² Since students must pass Level 1 before taking Level 2, passage of Level 1 is now in effect a graduation requirement for all AOA-accredited colleges. Therefore, the validity of this examination is important to the osteopathic profession. Most students take the Level 1 examination immediately after completing their second year of osteopathic medical school.

The COMLEX-USA Level 1 was first administered in June 1998, and while studies have related COMLEX Level 1 performance to academic performance within individual osteopathic medical schools,^{3,4} no articles comparing COMLEX Level 1 performance to academic achievement across several schools could be found.

In allopathic medical education, the United States Medical Licensing Examination (USMLE) is somewhat analogous to COMLEX-USA. A joint program of NBOME and the Federation of State Medical Boards of the United States, Inc,⁵ the USMLE Step 1, first administered in 1992, is now the first "step" of the allopathic licensing process. In the validation process for the new USMLE Step 1, Swanson and colleagues⁶ examined the relationship between achievement in basic science coursework and performance on the 1994 USMLE Step 1 test administration. As part of the study, they related

Table 1
1999 COMLEX–USA Level 1 Scores From
Participating Schools (N=2146)

School	Mean	SD	Passes (%)
1	527.3	±69.8	95.5
2	523.2	±71.5	95.5
3	536.7	±74.6	100.0
4	432.6	±71.9	69.2
5	524.5	±73.3	98.2
6	511.6	±64.4	93.3
7	520.0	±71.9	95.2
8	552.5	±62.3	100.0
9	512.8	±70.1	94.6
10	530.6	±73.6	97
11	507.4	±67.9	93.8
12	486.9	±79.2	83.9
13	517.2	±71.4	98.3
14	516.5	±84.3	96.7
15	509.5	±71.8	90.4
16	512.2	±72.3	94.8
17	539.4	±68.7	97.8
18	504.9	±72.4	92.9
Total	517.9	±73.5	94.6

Step 1 performance to (1) ratings of students' academic performance by college representatives (usually associate deans), and (2) grade point averages (GPAs) earned during the basic science years. They found a "moderate-to-high level of agreement" between measures of student achievement in the basic sciences and performance on the USMLE Step 1. The current study used an approach similar to that of Swanson and colleagues (with some modification) to investigate the relationship between achievement in the first 2 years of osteopathic medical school and performance on the COMLEX–USA Level 1 examination.

Methods

Participating schools

All osteopathic medical schools accredited by the AOA were invited to par-

ticipate, and 18 (95%) of 19 contributed data. The academic dean of each participating school identified a person at that school with knowledge of student performance, often the associate dean for basic science education or the registrar.

Subjects

Subjects were students who had been accepted into the standard curriculum of a participating school and who first completed the COMLEX–USA Level 1 examination as a candidate in June 1999 immediately after completion of the sophomore year of osteopathic medical school. The study included students whose programs had been extended after matriculation for academic or personal reasons, but excluded students who initially had been admitted to a special program (for example, an accel-

erated program for students with doctorates in a related field).

To maintain confidentiality of student data, each school deleted student names and other identifiers from data prior to submission of data to an outside analysis team (CurryCorp, Ottawa, Ontario, Canada). Only the analysis team knew the identification of each school. Each school was identified in the analysis team report by random number, and subsequently was provided a confidential report that identified only that school, for internal use and to allow verification of data.

Data collection

The June administration of COMLEX–USA Level 1 was chosen for this study because (1) NBOME recommends that students take the Level 1 examination in June of the sophomore year,⁷ and (2) 2139 (92%) of 2327 first-time takers took the June examination rather than the October examination in 1998.⁷

Shortly after test administration but before scores were reported, each school was sent a list of students registered to take the COMLEX Level 1 examination. The school's representative was asked to develop a table that assigned each student's academic performance to one of the following categories: bottom 5%; next lowest 15%; middle 60%; or top 20%. Representatives were asked to make these classifications on the basis of GPAs, if available, but to use whatever procedures seemed most appropriate if GPAs were not available. Seventeen (94%) of the 18 participating schools were able to classify students in this way.

School representatives were also asked to classify each student into one of three categories to indicate whether, in the school representative's opinion, the student would pass COMLEX–USA Level 1. These expectation categories were defined as "sure pass" for an individual who had mastered the material and was expected to pass; "borderline" for a student who might or might not pass; and "concerns" for students who were not likely to pass this examination. All 18 participating schools were able to classify students in this way.

Table 2
COMLEX–USA Level 1 Scores and Academic Performance Categories

School*	Lowest 5% (N=105)		Next lowest 15% (N=299)		Middle 60% (N=1229)		Upper 20% (N=412)	
	Mean score	Passes (%)	Mean score	Passes (%)	Mean score	Passes (%)	Mean score	Passes (%)
1	405.4	42.9	480.2	100.0	522.6	97.5	610.3	100.0
2	414.0	60.0	453.3	92.3	521.5	98	609.2	100.0
3	428.0	100.0	464.0	100.0	546.2	100.0	612.8	100.0
4	393.0	66.7	348.6	0	425.6	76.7	523.6	100.0
5	442.0	100.0	431.2	88.2	525.8	100.0	611.6	100.0
6	441.2	60.0	462.6	78.6	505	98.0	583.7	100.0
7	424.1	63.6	449.0	80.0	517.6	100.0	605.2	100.0
8	448.0	100.0	486.5	100.0	554.8	100.0	621.5	100.0
9	406.5	50.0	457.2	93.8	511.3	97.0	583.5	100.0
10	434.9	77.8	451.0	90.0	526.7	99.2	619.7	100.0
11	387.2	50.0	441.9	76.5	514.9	100.0	560.0	100.0
12	395.0	66.7	383.2	22.2	489.0	94.6	573.9	100.0
13	429.0	77.8	450.4	95.2	511.0	100.0	602.4	100.0
14	329.6	0	456.7	100.0	508.2	100.0	619.9	100.0
15	391.5	36.4	440.2	75.0	511.3	97.1	587.3	100.0
16	437.0	66.7	441.9	88.2	508.0	97	596.5	100.0
17	417.6	57.1	476.2	100.0	540.8	100.0	615.6	100.0
Total	416.3	63.5	449.6	84.6	517.3	98.2	599.0	100.0

*One school did not provide raw grade point average (GPA) or GPA category information.

Additionally, each school was asked to provide the overall GPA for each student at the end of the second year of osteopathic medical school, or any available similar summary measure of academic performance calculated by the school at this point in the student's education. Sixteen (89%) of the 18 schools were able to provide GPAs.

To ensure that ratings were not influenced by knowledge of subsequent COMLEX test performance, school representatives were asked to record the above information before COMLEX Level 1 results were known. After COMLEX Level 1 results were reported to the schools, school representatives added Level 1 scores for each student and

removed names (to maintain confidentiality) before mailing data to CurryCorp for analysis.

Data were analyzed using Pearson's correlations and two-way analysis of variance (ANOVA).

Results

Overall performance of sample

Of 2361 candidates who took the COMLEX–USA Level 1 examination in June 1999, 2146 (91%) were included in this study. Eligible students were similar in their overall performance to the total group of students tested. The sample had a mean score of 517.9 and SD of 73.6, compared with the national "candidate" mean score of 514.4 and SD of

75.2. The lowest passing score for Level 1 is set at 400. The passing rate for the study sample was 94.6%, compared to the national pass rate of 94.0%. The national "candidate" group used for comparison included students who may have taken the Level 1 examination for the first time at a point in their career other than immediately after completing the first 2 years of the osteopathic medical curriculum; students who were excluded from this study because they were in special curricula; and students at the osteopathic college that did not participate in this study.

The study sample represented a broad range in average achievement (*Table 1*), and some variation was evident across

Table 3
COMLEX–USA Level 1 Scores and Expected Performance Rating Categories

School	'Sure pass' (N=1746)			'Borderline' (N=269)			'Concerns' (N=131)		
	Rated (%)	Mean score	Passes (%)	Rated (%)	Mean score	Passes (%)	Rated (%)	Mean score	Passes (%)
1	88.6	538.0	98.3	6.1	478.4	100.0	5.3	405.4	42.9
2	79.8	543.7	98.6	4.6	453.3	92.3	5.6	414.0	60.0
3	93.2	544.6	100.0	5.1	432.3	100.0	1.7	415.0	100.0
4	51.9	479.9	00.0	34.6	390.4	38.9	3.5	358.6	28.6
5	80.2	547.0	100.0	15.3	431.2	88.2	4.5	442.0	100.0
6	73.0	532.6	98.5	21.3	458.5	84.2	5.6	441.2	60.0
7	83.7	534.6	98.9	9.6	453.7	80.0	6.7	434.3	71.4
8	74.7	575.6	00.0	6.8	495.2	00.0	8.4	461.5	00.0
9	91.9	521.9	98.0	3.6	406.0	50.0	4.5	412.2	60.0
10	82.4	549.4	99.4	3.2	446	88.9	4.4	434.9	77.8
11	78.8	526.8	100.0	11.5	435.2	76.9	9.7	428.7	63.6
12	80.6	51	96.0	6.5	390.5	25.0	2.9	384.0	37.5
13	83.0	532.2	100.0	10.2	447.1	94.4	6.8	439.3	83.3
14	74.2	542.3	00.0	8.0	532.2	00.0	6.6	466.9	50.0
15	86.5	524.4	97.5	8.3	428.5	57.9	5.2	383.4	25.0
16	80.2	529.9	97.9	2	449.4	92.9	7.8	427.0	66.7
17	77.7	559.9	100.0	17.3	482.5	100.0	5.0	417.6	57.1
18	77.6	524.6	98.7	21.4	441.5	76.2	.0	336.0	0.0
Total	81.4	536.2	98.9	12.5	447.8	82.5	6.1	418.4	61.5

schools. All students in Schools 3 and 8 earned passing scores, and the lowest passing rate was 69.2% (School 4). School averages ranged from 432.6 to 552.5.

COMLEX Level 1 performance and academic performance categories

Overall, students who were ranked in the lowest 5% of their classes based on academic performance categories had a mean of 416.3 (Table 2); those in the next lowest 15% had a mean of 449.6; students ranked in the middle 60% of the academic performance range obtained a mean score of 517.3; and those in the upper 20% of the sample had an average score of 599.0. Therefore, academic performance categories

were associated with COMLEX–USA Level 1 scores in the expected direction. Similarly, the overall pass rate for the students ranked in the bottom 5% was 63.5%; for the next lowest category, 84.6%; for the middle 60%, 98.2%; and 100% of students ranked in the upper 20% of their classes passed the examination.

Correlation between COMLEX Level 1 performance and GPAs

Sixteen schools provided raw GPA data for each student. Pearson correlations between COMLEX Level 1 and GPAs within schools ranged from $r = 0.76$ to $r = 0.85$. Because schools calculated GPAs in different ways, an average correlation was calculated using the Fisher

transformation of r to z , resulting in a mean correlation of $r = 0.79$ across the 16 schools that provided GPA data.

Relationship with performance anticipated by college representatives

Of the students in the “sure pass” category, 98.9% passed the COMLEX Level 1 examination, and the mean score was 536.2 (Table 3). Ten of 18 schools had at least one student classified as “sure pass” who actually failed. For those students classified as “borderline,” 82.5% passed, with a mean score of 447.8. The “concerns” category had both the lowest pass rate (61.5%) and the lowest mean (418.4). All but one school had at least one student classified as “con-

cerns" (expected to fail) who actually passed.

The two-way ANOVA model for differences in expected performance ratings by school membership was a statistically significant predictor of COMLEX Level 1 scores (omnibus $F_{(53)} = 19.7$, $P < .001$). The three performance categories ("success," "borderline," and "concerns") and the school identifier were specified as factors for this model. A statistically significant association was found between scores and expected performance ratings ($F_{(2)} = 429$, $P < .001$), and also between scores and school attended ($F_{(17)} = 9.46$, $P < .001$). However, the interaction term representing school differences in expected performance ratings was not significant. Therefore, it appeared that schools' ratings of expected performance were assigned in a similar manner across the schools in this study.

Discussion

Student attainment in the first 2 years of osteopathic medical school was strongly associated with performance on the June 1999 COMLEX-USA Level 1 examination. All students who were academically in the upper 20% of their classes passed this exam, with a mean score of 599.0. This can be contrasted to a pass rate of 63.5% for students in the lowest 5%, who had a mean COMLEX Level 1 score of 416.3.

Furthermore, for the 16 schools that reported raw GPAs, correlations between COMLEX Level 1 scores and GPAs within schools ranged from $r = 0.76$ to $r = 0.85$, with a mean correlation of $r = 0.79$. These results are comparable to correlations between allopathic basic science coursework and USMLE Step 1 reported by Swanson and colleagues⁶ for seven medical schools whose correlations ranged from 0.72 to 0.83 with a median correlation of 0.76.

For "expected to pass" ratings, results were in the expected direction, with 98.9% of students in the "sure pass" category actually passing the exam. However, a higher-than-expected proportion of the "borderline" (82.5%) and "concerns" (61.5%) categories also

passed the examination. Given that the national pass rate for June 1999 was essentially unchanged from previous years (94% in June 1999, compared to 93% in June 1998⁷ and 95% for NBOME Part 1 in June 1997⁸), the reason that school representatives expected more students to fail than actually did remains unclear. Further research is needed regarding COMLEX-USA, both to better understand school representatives' understanding of the passing score and to see if comparable relationships exist between academic performance during clinical years and performance on COMLEX Levels 2 and 3.

Acknowledgments

The authors gratefully acknowledge assistance from Lynn Curry, PhD, and Krista Breithaupt of CurryCorp, Inc, in Ottawa, Ontario, who conducted all data analysis for this article, and from the American Association of Colleges of Osteopathic Medicine (AACOM) in Chevy Chase, Md, which provided financial support for CurryCorp's data analysis.

Also, in addition to co-authors Cope, Bates, McWilliams, and Yens, the authors thank the following faculty/staff at participating osteopathic medical schools for providing data: Jerry Alexander, PhD, University of North Texas Health Science Center at Fort Worth; Duane T. Brandau, DO, PhD, University of Health Sciences College of Osteopathic Medicine; Patricia A. Burnett, PhD, Ohio University College of Osteopathic Medicine; Paul Evans, DO, Oklahoma State University College of Osteopathic Medicine; William Falls, PhD, Michigan State University College of Osteopathic Medicine; Edward Finnerly, PhD, Des Moines University—University of Health Sciences College of Osteopathic Medicine; the late Jimmy Hicks, PhD, Western University—College of Osteopathic Medicine of the Pacific; Lawrence E. Jacobson, DO, Nova Southeastern University College of Osteopathic Medicine; Richard Kreibel, PhD, Philadelphia College of Osteopathic Medicine; Barbara Kriz, PhD, Touro University College of

Osteopathic Medicine; Tom O'Hare, DO, Midwestern University—Chicago College of Osteopathic Medicine; Dixie Tooke-Rawlins, DO, Kirksville College of Osteopathic Medicine; Stephen Payson, MS, Pikeville College School of Osteopathic Medicine; and Warren S. Wallace, EdD, University of Medicine and Dentistry of New Jersey—School of Osteopathic Medicine.

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