Correlation Between United States Medical Licensing Examination and Comprehensive Osteopathic Medical Licensing Examination Scores for Applicants to a Dually Approved Emergency Medicine Residency.

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Education

CORRELATION BETWEEN UNITED STATES MEDICAL LICENSING EXAMINATION AND COMPREHENSIVE OSTEOPATHIC MEDICAL LICENSING EXAMINATION SCORES FOR APPLICANTS TO A DUALLY APPROVED EMERGENCY MEDICINE RESIDENCY

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☐ **Abstract—Background: It is important for emergency medicine (EM) residency programs to be able to correlate the United States (US) Medical Licensing Examination (USMLE) and Comprehensive Osteopathic Medical Licensing Examination (COMLEX) scores of applicants. Objective: We sought to determine the correlation between USMLE and COMLEX scores for EM residency applicants. Methods: Retrospectively, from 2006 through 2013, USMLE and COMLEX examination scores for applicants to our 4-year, 56-member, dually approved EM residency were analyzed. Using the COMLEX score as the outcome variable and USMLE score as the predictor, multiple linear regression models, stratified by test step, were created. Results: There were 556 students representing 25 discrete medical schools included. Pair 1 consisted of applicants submitting COMLEX Level-1 and USMLE Step-1 scores (n = 486). Pair 2 were those with COMLEX Level-2 and USMLE Step-2 scores (n = 356). For Pair 1, mean, standard deviation, and median scores on the COMLEX were 551, 69, and 548, respectively; for the USMLE, scores were 216, 16, and 217, respectively. Results for Pair 2 on COMLEX were 566, 80, and 562, respectively; USMLE results were 228, 18, and 229, respectively. A strong correlation was observed for Pair 1 ($r = 0.78$; $p < 0.001$). A 1-point increase in USMLE Step-1 is associated with a 3.55-point increase in the COMLEX Level-1 score ($\beta = 3.55$; 95% confidence interval [CI] 3.30–3.80; $p < 0.001$). A similar strong correlation was observed for Pair 2 ($r = 0.72$; $p < 0.001$), where a 1-point increase in USMLE Step-2 is associated with a 3.29-point increase in the COMLEX Level-2 score ($\beta = 3.29$; 95% CI 2.96–3.62; $p < 0.001$). Conclusions: A strong positive correlation between Steps 1 and 2 of the USMLE and COMLEX was found.**

☐ **Keywords—ACGME; USMLE; COMLEX; residency; application**

INTRODUCTION

The American Council for Graduate Medical Education (ACGME) and American Osteopathic Association (AOA) jointly announced a planned single-application pathway to graduate medical education (1). This new application process will likely increase the diversity of applications to emergency medicine (EM) residency programs. A recent study by Weizberg et al. concluded that osteopathic students who take the allopathic

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examinations have greater success in obtaining residency positions (2). Because of this, programs may see an increased proportion of students reporting multiple standardized test scores. In addition, with the advent of the Single Accreditation System, ultimately, osteopathic medical students may be free to apply to any approved EM residency (3).

Despite the planned unification described here, there are currently two paths to becoming a licensed physician in the United States (US). The US Medical Licensing Examination (USMLE) has traditionally been used by allopathic medical students, although it is open to osteopathic students, as well (4). For graduates of osteopathic medical schools, the Comprehensive Osteopathic Medical Licensing Examination of the United States (COMLEX-USA) has been the traditional pathway to licensure. Both of these series of examinations contain three separate written tests and one test of physical examination skills. The timing of the examinations, often referred to as "steps," is also similar. Step 1 is typically taken after the second year of medical school; Step 2 is taken sometime before graduation, and the third and final step is taken sometime thereafter. The timing of the third step typically eliminates the scores from Step 3 from a residency application. Some medical schools require passing scores on the first two steps for promotion and graduation. On the osteopathic side, all students enrolled in osteopathic medical schools must complete the COMLEX-USA series of examinations to graduate and gain licensure.

Currently, the two largest studies comparing the interchangeability of USMLE and COMLEX are based on the experience of medical school cohorts originating from a single medical school (5,6). These studies were also conducted on a broad swath of students, irrespective of their intended field of postgraduate study. The levels of observed agreement in the Slocum et al. study was found to be higher in Step 1 than Step 2, and the Step 1 correlation was similar to that observed in the Lee et al. cohort (5,6). In a third study focusing on applicants to internal medicine, Chick et al. found higher agreement for Step 1 than Step 2, but EM program directors may rightly be interested in the subgroup of students of these larger cohorts who are applying to EM (7). A 2-year cohort study of applicants to a single allopathic EM residency program by Sarko et al. found lower agreement than had been reported previously (8). As a whole, these studies cast doubt on whether a specific formula can be used to convert the scores from one test to another in the overall medical student application process.

The purpose of this study was to identify the degree of correlation that may exist between USMLE and COMLEX-USA scores among a longitudinal cross-section of osteopathic medical student (MS) applicants to an EM residency. These data would enlarge and update the current literature on this topic at a time when the issue is becoming more germane to EM program directors.

Table 1. Dispersal of Osteopathic Medical Students by School

Osteopathic Medical School	Percentage of Cohort
New York Institute of Technology	10.3
Philadelphia College of Osteopathic Medicine	8.8
Lake Erie College of Osteopathic Medicine	8.3
Arizona College of Osteopathic Medicine	6.8
Kansas City University of Medicine and Biosciences	6.7
Western University of Health Sciences	6.7
Touro College of Osteopathic Medicine	5.9
University of North Texas Health Sciences	5.8
Nova Southeastern University College of Osteopathic Medicine	5.6
Chicago College of Osteopathic Medicine	5.0
Edward Via Virginia College of Osteopathic Medicine	4.9
University of Medicine & Dentistry of New Jersey	4.7
A. T. Still University, Kirksville College of Osteopathic Medicine	3.8
University of New England College of Osteopathic Medicine	3.6
Des Moines University College of Osteopathic Medicine	3.2
Touro University Nevada College of Osteopathic Medicine	3.2
Rocky Vista University College of Osteopathic Medicine	1.6
West Virginia School of Osteopathic Medicine	1.4
Lincoln Memorial University, DeBusk College of Osteopathic Medicine	1.1
Ohio University, Heritage College of Osteopathic Medicine	0.7
Rowan University School of Osteopathic Medicine	0.7
Pacific Northwest University of Health	0.5
Oklahoma State University College of Osteopathic Medicine	0.4
Michigan State University College of Osteopathic Medicine	0.2
University of Pikeville, Kentucky College of Osteopathic Medicine	0.2

METHODS

This was a retrospective study of matched, reported test scores of both COMLEX-USA and USMLE between July 1, 2006 and December 31, 2013, among osteopathic MS applicants to a single 4-year, dually approved, 56-member EM residency at an independent academic medical center. The study protocol was reviewed and given expedited approval by our center's Institutional Review Board.

We examined the EM residency program's interview registry database for applicants who voluntarily

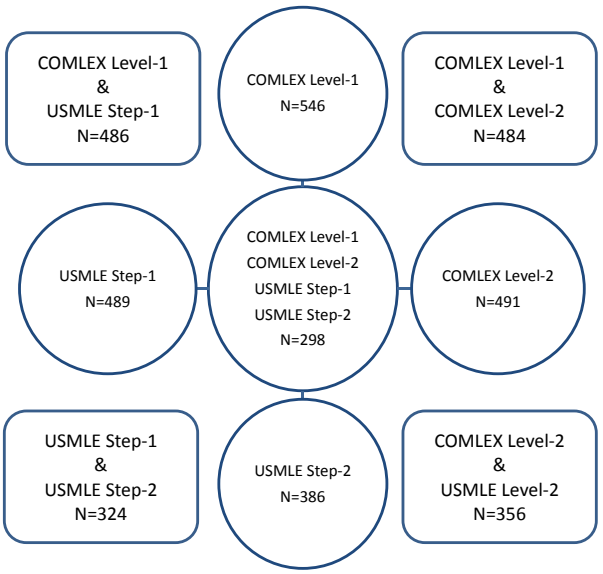


Figure 1. Participant test data. COMLEX = Comprehensive Osteopathic Medical Licensing Examination; USMLE = United States Medical Licensing Examination.

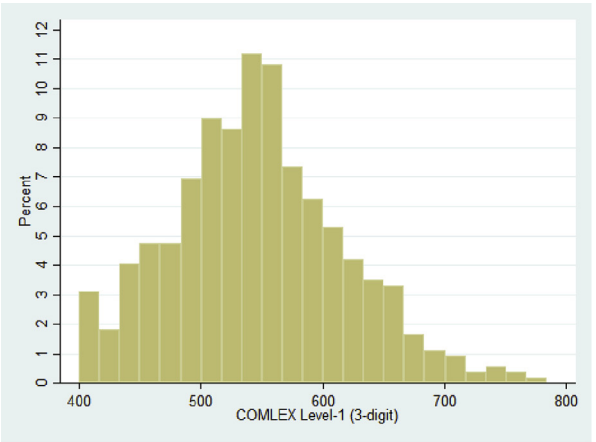
submitted both USMLE and COMLEX scores for possible study inclusion. Once identified for study inclusion, all participants' test scores were entered anonymously into a password-protected study database by a study coordinator. Demographic information obtained for the database included age, sex, examination year, and osteopathic medical school attended.

All recorded, matched COMLEX-USA and USMLE scores were included in the final dataset for analysis. Two- and three-digit examination scores were recorded, as the COMLEX-USA raw score is converted to both a two- and three-digit standard score for the purpose of making pass-fail decisions and reporting results.

Table 2. Descriptive Statistics of the Comprehensive Osteopathic Medical Licensing Examination and United States Medical Licensing Examination Scores

Pair	Variable	n	Mean	SD	Median	IQR	Min	Max
1	COMLEX Level-1	486	551.0	69.4	548	89	402	784
	USMLE Step-1	486	216.6	15.5	217	23	179	260
2	COMLEX Level-2	356	566.0	79.7	562	113	411	820
	USMLE Step-2	356	228.3	17.7	229	25.5	144	267

COMLEX = Comprehensive Osteopathic Medical Licensing Examination; IQR = interquartile range; SD = standard deviation; Max = maximum; Min = minimum; USMLE = US Medical Licensing Examination.



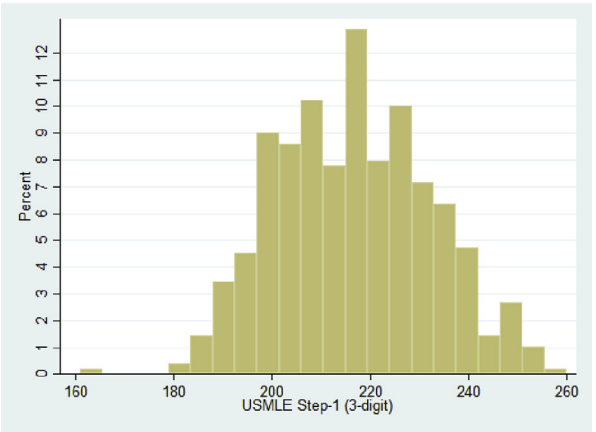


Figure 2. Histograms for the Comprehensive Osteopathic Medical Licensing Examination (COMLEX) Level-1 and United States Medical Licensing Examination (USMLE) Step-1 scores.

Statistical Analysis

Descriptive frequencies, relative proportions, and graphical methods were used to describe the study participants. Scatterplots were used to visualize the pairwise relationships of the COMLEX and USMLE scores by test step. Separate analyses were run for Step 1 and Step 2 results, as the participant mix was not identical. Pairwise correlations were assessed for Step 1 and Step 2 scores. Linear regression models, stratified by test step, were created with the COMLEX score as the outcome variable and USMLE score as the predictor variable. Participants' age and sex were included in each model. All analyses were performed with STATA SE software, version 12.1 (Stata Corp, College Station, Texas).

RESULTS

From 2006 to 2013, five hundred and sixty-six applications were located in the interview registry. Table 1 depicts the dispersal of medical students from the 25 discrete

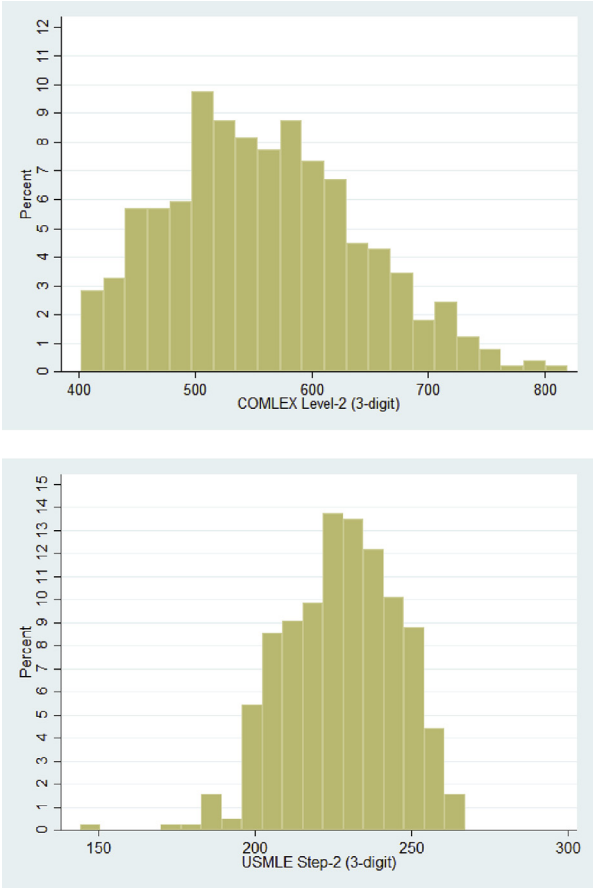


Figure 3. Histograms for the Comprehensive Osteopathic Medical Licensing Examination (COMLEX) Level-2 and United States Medical Licensing Examination (USMLE) Step-2 scores.

osteopathic medical schools who submitted applications. From the original 566 applications located in the registry, 546 had data for COMLEX Level-1 scores, 491 had COMLEX Level-2 scores, 489 had USMLE Step-1 scores, and 386 had USMLE Step-2 scores. There were 486 participants with both COMLEX Level-1 and USMLE Step-1 data. There were 356 participants with both COMLEX Level-2 and USMLE Step-2 scores. There were a total of 298 participants who had scores for both Steps for both tests. Figure 1 depicts this dispersal of voluntarily submitted USMLE and COMLEX scores.

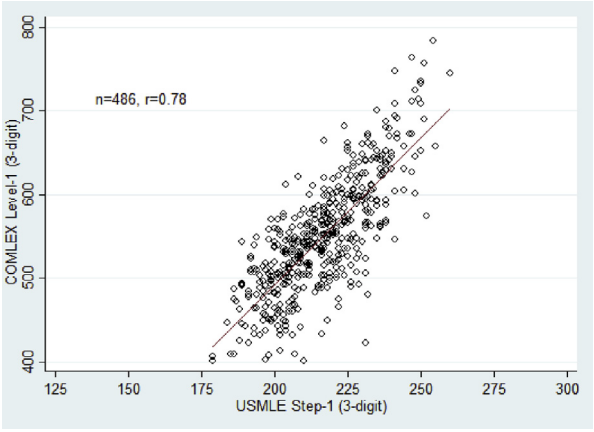


Figure 4. Scatterplot of United States Medical Licensing Examination (USMLE) Step-1 and Comprehensive Osteopathic Medical Licensing Examination (COMLEX) Level-1 scores with least squares regression line.

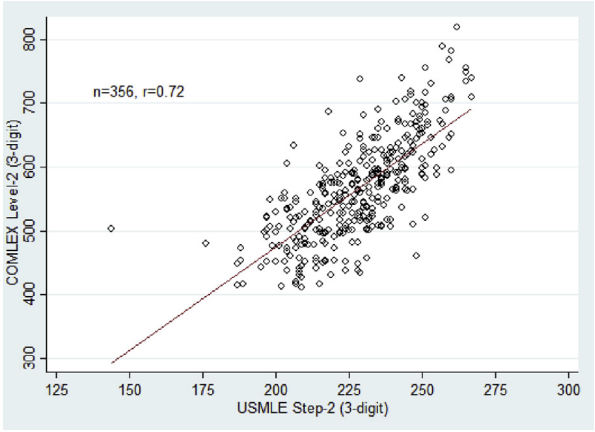


Figure 5. Scatterplot of United States Medical Licensing Examination (USMLE) Step-2 and Comprehensive Osteopathic Medical Licensing Examination (COMLEX) Level-2 scores with least squares regression line.

Two non-independent datasets were created to be used in the analyses (Figure 1). The first dataset (Pair I) contains those participants with both COMLEX Level-1 and USMLE Step-1 scores (n = 486), and the second (Pair II) is composed of participants with both COMLEX Level-2 and USMLE Step-2 scores (n = 356). Participants' demographic characteristics are similar for the two cohorts, with 66% of the Pair I participants being male with a mean age at time of application of 28 years. For Pair 2, 64% are male and their mean age at time of application was 28 years.

Descriptive statistics of the three-digit scores for the COMLEX and USMLE can be found in Table 2. The COMLEX and USMLE scores are normally distributed as visually demonstrated in Figure 2 for Step 1 and in Figure 3 for Step 2. Given the normal distribution, means were used as a measure of central tendency in order to perform linear regression to assess the test relationships.

A strong correlation is observed between the COMLEX Level-1 and the USMLE Step-1 scores, as depicted in Figure 4 ($r = 0.78$, $p < 0.001$). From a linear regression model controlling for sex and age, a 1-point increase in USMLE Step-1 is associated with a 3.55-point increase in the COMLEX Level-1 score ($\beta = 3.55$; 95% confidence interval [CI] 3.30–3.80; $p < 0.001$).

A similar strong correlation is observed for the COMLEX Level-2 and USMLE Step-2 scores, as depicted in

Figure 5 ($r = 0.72$; $p < 0.001$). Likewise, a 1-point increase in USMLE Step-2 was associated with a 3.29-point increase in the COMLEX Level-2 score ($\beta = 3.29$; 95% CI 2.96–3.62; $p < 0.001$).

DISCUSSION

Our study cohort is both the largest and most current reported EM-specific osteopathic student test scores to date. That being said, the correlation in this cohort for Step 1 was almost identical to that of the Sarko cohort, suggesting a degree of stability in the test score relationship for EM applicants (8). Our analysis found a relatively simple relationship between the two tests, with a 1-point USMLE increase being equated with a 3.5-point COMLEX increase on Step 1. For Step 2, this relationship was a 1-point increase in USMLE being equated with a 3.29 on the COMLEX. These associations should allow EM programs to convert one test score to another if they choose and may be easier to use than the formula suggested by Lee et al (6). Hopefully, the described relationship meets the need for an updated conversion rule, which has been called for multiple times in the literature (9–12).

It is important to recognize that although broadly COMLEX and USMLE test for medical knowledge and clinical skills, the COMLEX test is an examination that was designed and validated for a different curriculum and philosophy unique to the osteopathic profession. While the correlation discussed is present, it does not mean that one test can be substituted for the other. An area of future research that may be of interest to research directors might be to look at whether strong COMLEX performance predicts solid performance in allopathic residency programs.

Whether or not program directors may need to make a conversion is an interesting question. With the announced merger of the ACGME and AOA for application to postgraduate training, traditional allopathic programs may see an increase in osteopathic applicants. By regulation, these osteopathic applicants are required to pay for, take, and pass the COMLEX. The Weizberg et al. study seems to suggest to osteopathic students that taking both examinations is advantageous when seeking postgraduate training; however, if the examinations do correlate, is that the most appropriate strategy for medical students? (2). As an example of current student culture and attitudes, Hasty et al. surveyed 978 osteopathic students from 19 different schools and found that peers recommend to peers to take the USMLE in addition to the COMLEX (13). Taking the USMLE has inherent financial and temporal costs. Ultimately, specialty societies, such as the Council of Emergency Medicine Residency Directors, may need to review the issue and weigh in on it. Alternatively, the issue could become moot if the ACGME and AOA create a unified examination to go along with the single application and training already proposed.

Limitations

One of the greatest limitations of our study cohort is that the scores included were those voluntarily submitted by applicants. It is possible that disproportionately low scores may not have been submitted. This, along with the timing of the examinations, may have led to a selection bias in the study. Another limitation of our cohort is the single-program nature of our registry. That being said, given that there are 30 osteopathic medical schools with 42 campuses, our study population reflects 60% of the campuses (14). Furthermore, online advice provided to medical students suggests applying to 20 to 25 programs (15). Given that there are 59 osteopathic EM programs, if all students heed this advice, our program would receive 34% to 42% of each class (16).

CONCLUSIONS

In our study cohort, a 1-point increase in USMLE Step-1 is associated with a 3.55-point increase in the COMLEX Level-1 score, while for Step 2, the resulting COMLEX increase would be 3.29. Both simple relationships had statistical significance. EM residencies may find these relationships useful should the number of applicants submitting scores who are unfamiliar to them increase with the changes to graduate medical education proposed by the ACGME and AOA.

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ARTICLE SUMMARY

1. Why is this topic important?

Emergency medicine (EM) residency programs need to be able to correlate the US Medical Licensing Examination (USMLE) and Comprehensive Osteopathic Medical Licensing Examination (COMLEX) scores of applicants.

2. What does this study attempt to show?

We sought to determine the correlation between USMLE and COMLEX scores for EM residency applicants.

3. What are the key findings?

A 1-point increase in USMLE Step-1 is associated with a 3.55-point increase in the COMLEX Step-1 score, while for Step 2, the resulting COMLEX increase would be 3.29.

4. How is patient care impacted?

EM residencies may find these relationships useful should the number of applicants submitting scores who are unfamiliar to them increases with the changes to graduate medical education proposed by the American Council for Graduate Medical Education and American Osteopathic Association.