United States Medical Licensing Examination Step 1 Scores Directly Correlate with American Board of Neurological Surgery Scores: A Single-Institution Experience

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■ BACKGROUND: Neurosurgery residency is becoming an increasingly competitive match. The process of screening and ranking applicants is a multifactorial process that lacks uniformity across residency programs. A significant factor is the applicant's performance on the United States Medical Licensing Examination (USMLE) Step 1. USMLE Step 1 scores are often used to project future success in residency and performance on specialty boards like the American Board of Neurological Surgery (ABNS) examination. The authors of this study investigate the strength of correlations between USMLE Step 1 and ABNS scores.

■ METHODS: Data were extracted from records of graduating residents from the neurosurgery residency program at the University of California, Los Angeles, between 2003 and 2010. Twenty-one residents were selected. USMLE Step 1 scores were deidentified and paired with ABNS scores. Correlation and regression analyses were performed.

■ RESULTS: Higher USMLE Step 1 scores significantly correlated with higher ABNS scores ($P = 0.01$; Spearman correlation coefficient, 0.7).

■ CONCLUSIONS: USMLE Step 1 and ABNS scores are directly correlated. USMLE Step 1 scores will continue to be a valuable measure of projected success on ABNS written examinations, but more sophisticated measures are needed.

INTRODUCTION

Neurosurgery residency is becoming an increasingly competitive match, with a mean United States Medical Licensing Examination (USMLE) Step 1 score, for U.S. matched seniors, reported at 244 (a 5-point increase in only 2 years).[1] Performance on the USMLE Step 1 plays a significant role in the screening and ranking of neurosurgery applicants. However, other quantitative factors taken into consideration include class rank, clerkship grades, and the number of indexed publications.[2-4] Qualitative factors include Alpha Omega Alpha membership, letters of recommendation, clerkship evaluations, interview performances, and personal statement.[2-4] The goal of the National Resident Matching Program is to pair qualified applicants with a residency program based on Rank Order Lists created by both the applicant and the program. This process is challenging, especially for neurosurgery residency programs that have a limited number of available positions. The overarching goal of any residency program is to graduate qualified and competent physicians. Thus, applicants with higher USMLE Step 1 scores are sought after based on projected success on subspecialty boards, such as the American Board of Neurological Surgery (ABNS) written examination.[3,5-7]

A national survey of residency program directors across all specialties[8] showed USMLE Step 1 scores to be the second-most important factor in a residency application; grades in required clerkships were the most important. Board scores do not fully represent the overall quality of an applicant, and qualitative factors remain subtle, but critical aspects in the evaluation of residency candidates. Unfortunately, objective measures of quality are difficult to define. Further complicating this process are cognitive biases, which have the potential to affect evaluation of applicants.[9,10]

Key words
- Licensure
- Neurosurgery
- Specialty boards

Abbreviations and Acronyms
ABNS: American Board of Neurological Surgery
ABOS: American Board of Orthopedic Surgery
ABSITE: American Board of Surgical In-Training Examination
ITE: In-Training Examination
OITE: Orthopedic In-Training Examination
PGY: Post-graduate year
SD: Standard deviation
USMLE: United States Medical Licensing Examination

The results of the a priori survey[8] support our rationale to investigate USMLE and ABNS scores. It remains poorly understood why the USMLE Step 1 is so important in the evaluation of potential residents. The intuitive and pragmatic answer is that higher scores equate to higher levels of intelligence. Neurosurgery house staff selection committees use scores on the USMLE Step 1 as a proxy indicator of projected resident success. Neurosurgery resident success, at the most fundamental level, means achieving a passing score on the ABNS and completing the residency training program.

To our knowledge, this is the first study to identify and evaluate a correlation between USMLE Step 1 and ABNS written examination scores. A specific aim of this study is to offer neurosurgery residency program directors and selection committees, both nationally and worldwide, insight into how these scores relate and provide support for the influence of Step 1 scores in the selection of neurosurgery residents. Additionally, we review the literature and summarize reported correlations between USMLE Step 1 scores and board scores across a variety of subspecialties.

METHODS

A retrospective review of deidentified USMLE Step 1 and ABNS scores for graduating residents in the Department of Neurosurgery at the University of California, Los Angeles was conducted. Under Category 4 of the Office for Human Research Protections exempt categories, this study did not require Institutional Review Board approval because we analyzed preexisting, nonhealth-related data. Furthermore, the scores were fully deidentified before receipt, ensuring that scores could not be matched to residents (45 CFR 46.101(B)-(HRP-312)).

Statistical Analysis

Statistical analyses were performed using GraphPad (GraphPad Software Inc., San Diego, California, USA). Descriptive statistics and correlation analyses were performed to ascertain associations between the independent and dependent variables. Regression analyses were conducted and models were created to describe the predictive capabilities of the independent variable. A Spearman rank correlation test for nonparametric data determined a Pearson product-moment correlation coefficient (R), which was used to describe the strength and the direction of the correlation between USMLE Step 1 and ABNS scores. Linear regression was applied to determine variation in ABNS written examination scores, predicted from USMLE Step 1 scores, and is described by the coefficient of determination (R^2). Statistical significance was set at a P value less than 0.01.

RESULTS

Twenty-one post-graduate year (PGY) 7 neurosurgery residents were included in this study. **Table 1** shows the results of USMLE Step 1 and ABNS board examinations for the selected residents. Mean USMLE Step 1 score was 242.1 (range, 184–271). Mean ABNS score was 493.2 (range, 341–651). USMLE Step 1 scores (standard deviation [SD] = 20.3) were less variable than ABNS scores (SD = 80.2). Spearman correlation coefficient R = 0.706 (99% confidence interval, 0.248–0.906) was identified with a 2-tailed P value <0.01 between USMLE Step 1 and ABNS scores.

Table 1. Summary Statistics

Examination	Mean Score (Standard Deviation)	Median Score (Interquartile Range)	Range
United States Medical Licensing Examination Step 1	242 (20)	249 (184–256)	184–271
American Board of Neurological Surgery Written Component	493 (80)	505 (437–557)	341–651

These data are presented in scatter plot and table format in **Figure 1** and **Table 2**, respectively. Linear regression analysis showed USMLE Step 1 score to be a significant predictor of ABNS score ($R^2 = 0.429$; F = 14.26; $P < 0.01$).

DISCUSSION

Table 3 shows published studies that have demonstrated correlations between USMLE Step 1 and corresponding subspecialty board scores. These correlations are nearly all positive and moderately strong, regardless of specialty.

General Surgery

Several studies have focused on the relationship between USMLE Step 1 scores and the American Board of Surgery In-Training Examination (ABSITE).[9,10] In a 2010, multi-institutional, retrospective study of 17 general surgery residency programs, de Virgilio et al.[9] reported that a score lower than 200 on the USMLE Step 1 predicted failure on the ABSITE qualifying examination ($P < 0.01$) and certifying examination ($P = 0.02$). In addition, a score lower than the 35th percentile was also associated with failure on the ABSITE qualifying examination ($P < 0.01$) and certifying examination ($P < 0.01$), regardless of PGY. Alterman et al.,[10] in an 18-year retrospective study of 101 residents, reported that USMLE Step 1 ($P < 0.01$) and ABSITE ($P < 0.01$) scores are strong predictors of successful completion of general surgery residency. However, not all studies evaluating USMLE and ABSITE scores describe a correlation between performances on both examinations. In a retrospective analysis of USMLE Step 1, Step 2, and ABSITE scores from 34 residents, Spurlock et al.[11] failed to show statistically significant correlations between Step 1 and ABSITE scores (qualifying and certifying) ($P > 0.108$).

Orthopedic Surgery

Similar associations have been reported between USMLE Step 1, Orthopedic In-Training Examination (OITE), and American Board of Orthopedic Surgery (ABOS) Part 1 scores.[12-14] Dougherty et al.[12] reported USMLE Step 1 scores lower than 210 to be correlated with an ABOS Part 1 failure rate of 33% ($P < 0.01$). In addition, OITE scores below the 30th percentile were associated with increased risk of failure on the ABOS Part 1 ($P < 0.01$). An expansive cohort of 2654 orthopedic residents, by Swanson et al.,[13] showed that USMLE Step 1 scores individually contribute to ABOS Part 1 variance ($R^2 = 0.29$) and have strong predictive capacity for ABOS scores. Residents with Step 1 scores of 180 had a 60% probability of passing ABOS Part 1; scores of 220 correlated with