Study of Selected Outcomes of Medical Students Who Fail USMLE Step 1

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Abstract

Purpose: Passage of the United States Medical Licensing Exam (USMLE) is required to obtain a medical license in the United States. Currently the majority of US medical schools require passage of USMLE Step 1 for either promotion to the third year or graduation from medical school. Virginia Commonwealth University School of Medicine (VCUSOM) requires that students take the USMLE but does not require passing of USMLE Step 1 for promotion or graduation. This policy enabled the authors to analyze performance outcomes during clinical rotations and monitor the residency match for a group of students who failed USMLE Step 1 on the first attempt.

Methods: Third year clerkship grades and residency match results were reviewed for 64 students of the graduating classes of 1999-2005 who failed Step 1 on the first attempt. An equal number of students who passed Step 1 were randomly selected from each class as a comparison group. Average clinical performance ratings, NBME subject exam scores and final third year clerkship grades for the two groups were compared. Residency match rates and specialty certification were also compared.

Results: The USMLE Fail Group had more Pass and fewer Honors clerkship grades than the comparison group. Subject exam scores were significantly lower in the USMLE Fail Group in all clerkships. Clinical performance ratings were significantly lower in the Fail group in three out of six clerkships: Internal Medicine, Pediatrics, and Psychiatry. However, 82% of the USMLE Fail Group later passed USMLE Step 1 and 2. Fifty-nine of the 64 students in the USMLE Fail Group matched for a residency, whereas all of the students in the Pass Group matched for a residency.

Conclusion: Students who fail USMLE Step 1 have lower final clerkship grades due in part to lower NBME subject exam scores. The majority of these students, however, successfully pass USMLE Step 1 prior to graduation, go on to graduate medical training, and become board certified in their specialty.
Whether the USMLE Step 1 examination predicts actual clinical performance is a separate issue. Investigators have reported mixed results. Fields and others\(^4\) reported that performance in the first two years of medical school and USMLE Step 1 scores were related to third year clerkship GPA. Performance in the Principles of Clinical Medicine course, however, showed the strongest correlation with third year GPA. Roop and Pangaro\(^5\) similarly found that preclerkship GPA accounted for 28% of the variance of the medicine clerkship grade. They did not evaluate the relationship with USMLE scores. The relationship of NBME Part 1 scores with residency performance has also been studied. NBME Part 1 was reported to have a weak relationship with clinical ratings during Internal Medicine residency.\(^6\) Other studies reported no relationship between NBME Part I scores and faculty clinical ratings of residents.\(^7\)\(^8\) More recently the relationship between USMLE scores and performance in residency has been evaluated. Paolo and others\(^9\) reported a correlation between both USMLE Step 1 and 2 scores and residency director’s ratings. Andriole and others,\(^10\) as well, reported a modest correlation between USMLE Step 2 scores and surgical interns ratings by program directors but found no relationship with USMLE Step 1 scores.

Given the unique situation at VCUSOM in which students are required to take but not pass USMLE Step 1 prior to starting their clinical clerkships, we undertook the following study. We compared the performance of third year clerks who failed USMLE Step 1 on the first attempt and a group who passed it on the first try. Since clerkship grades are a composite of both multiple-choice examination scores and faculty and residents’ clinical ratings we were able to examine each component of the final grade for these two groups. None of the previous studies investigated the specific components of clerkship grades. We also compared residency match rates and board certification status in the subset of the groups who had completed Internal Medicine, Pediatrics, or Family Medicine training.

Methods

Sixty-six VCUSOM students of the graduating classes of 1999 through 2005 failed USMLE Step 1 on the first attempt. We analyzed third year clerkship grades and match results for 64 of these students (Fail Group) and a randomly chosen comparison group of an equal number of students picked from each class who passed Step 1 (Pass Group). The Pass Group was obtained using a random numbers table. Since we had to review individual student files to obtain all the information presented, we did not compare the Fail Group to the entire class. This number of Fail students constituted 5.7% of the 1163 total students from the classes of 1999 through 2005. We reviewed clerkship grades only on the 64 students who graduated from medical school. Two students who had failed Step 1 were dismissed from school during the third year for academic reasons and were not included in the analysis of clerkship grades since complete data was not available. In addition to examining clerkship grades, we analyzed NBME subject exam scores on the following clerkships: Internal Medicine, Surgery, Pediatrics, Neurology, and Obstetrics-Gynecology. The Psychiatry and Family Medicine clerkships do not use subject exams. We compared clinical performance ratings for the Internal Medicine, Neurology, Obstetrics-Gynecology, Pediatrics, Family Practice, and Psychiatry clerkships. The Surgery clerkship does not use numerical scores for the clinical grade so could not be included in the analysis. The grades and NBME Subject exam scores were entered into a database without any identifying factors. Grades at our institution are based on a five point grading system of Honors, High Pass, Pass, Marginal, and Fail. Finally, USMLE Step 2 scores and residency match results were also entered into the database for student group. For the students in the classes of 1999, 2000, and 2001 that had completed Internal Medicine, Family Medicine or Pediatrics residency we also evaluated licensure and board certification status within two years of completion of residency. Statistical analysis using a t-test was performed on the subject exam and clinical ratings to determine whether differences between the group means were statistically significant. Effect size was calculated using Cohen’s \(d\) to estimate the strength of our results (small effect = 0.2-0.4, moderate effect = 0.5-0.7, and large effect > 0.8). The study was approved by the VCU Institutional Review Board. No funding was provided for this study.

Results

By design, the Fail Group had significantly lower Step 1 scores than the Pass Group: 170 ± 9 (SD) versus 220 ± 17 (\(t=20.48, p<0.0001\)). In the Fail Group, 37 students scored between 170 and 181, 20 students between 160 and 169, and six students less than 160. USMLE Step 2 scores in the Fail Group were also significantly lower than the Pass Group: 190 ± 17 versus 226 ± 20 (\(t=7.95, p<0.001\)). In the Fail Group, 19 students failed Step 2 on their first attempt. Two of the USMLE Pass Group failed Step 2 on the first attempt but passed prior to graduation. Of the 64 students who failed Step 1 on the first try, 17 students had not passed one or both parts of USMLE by graduation (\(p<0.001\)): six had not yet passed Step 1, four had not passed Step 2, and seven had not passed either. Seven students in the Fail Group passed USMLE Step 1 and/or 2 after graduation indicating that 82% of the USMLE Fail group eventually passed...
USMLE Step 1 and 2. However, these data may be incomplete since students can elect not to release USMLE scores to the school after graduation.

The USMLE Fail Group had more grades of Pass and Marginal and fewer grades of Honors than the USMLE Pass Group. Figure 1 shows the percentage of clerkship grades by grade category and group. A Pass grade was the most common mark (52%) in the USMLE Fail Group compared to High Pass (44%) being most common in the USMLE Pass Group. In the Fail Group, 17 students received a total of 22 Marginal grades, whereas, in the Pass Group, five students received five Marginal and one Fail grade.

Since final clerkship grades are determined from both written NBME subject exam scores as well as clinical performance ratings, we looked at each component of the grade to try to determine why the USMLE Fail Group had fewer High Pass and Honors grades. The written exam counts for a significant percentage of the final grade in each clerkship. However, each clerkship weights the exams differently. In addition, each clerkship requires a minimal passing score on the subject exam to pass the clerkship. Table 1 shows the average scores on the NBME subject exams for each group and the weighting of the exams and minimum passing score for the clerkships that use NBME subject exams. All NBME subject exams were designed to have a mean of 70 and standard deviation of eight. The USMLE Fail Group had significantly lower exam scores than the Pass Group in all subjects. Cohen’s d revealed a high level of practical significance (d=1.25-1.42). We then evaluated the clinical performance ratings given by faculty and residents. This rating is a more subjective grade based on observation of performance on the wards or in outpatient clinics. The final clinical performance rating on most clerkships is a compilation of evaluations by multiple faculty attendings and residents. Table 2 lists the average clinical performance ratings for each group in six different clerkships. Each clerkship uses its own method of rating so ratings across clerkships are not comparable. Clinical performance ratings were not significantly different between groups in three out of six clerkships: Neurology, Obstetrics-Gynecology, and Family Practice. They were, however, significantly lower in the USMLE Fail Group in the Medicine, Psychiatry and Pediatrics clerkships. Cohen’s d reveals a small level of practical significance between groups in Psychiatry (d=0.4) but a stronger impact in Medicine (d=0.69) and Pediatrics (d=0.77).

Finally, we looked at the results of the residency match for students in these two groups. In both cases, the largest number of students matched in Internal Medicine. In the USMLE Fail Group, a total of five students had not matched for a residency at the time of graduation. All of these students had not passed one or both parts of USMLE by graduation. All of the USMLE Pass Group matched for a residency. The American Boards of Internal Medicine, Pediatrics and Family Medicine publish on their websites all physicians who are board certi-
Of the 15 USMLE Fail Group students who have completed Internal Medicine, Pediatrics or Family Medicine residency, 11 were board certified within two years of completing residency. Of the 11 students who have completed one of these residencies and were in the USMLE Pass Group, 10 were board certified two years after completing their residency.

Table 1: Subject Exam Score by USMLE Step 1 Result

| Clerkship       | Pass Group (n=64) | Fail Group (n=64) | t     | Cohen’s d |
|-----------------|-------------------|------------------|-------|-----------|
|                 | M     | SD    | M    | SD    |       |         |
| Medicine        | 76.33 | 9.10  | 66.76| 5.90  | -7.04* | 1.25    |
| Neurology       | 75.29 | 6.70  | 66.82| 5.90  | -7.20* | 1.34    |
| OB/GYN          | 76.88 | 7.80  | 68.98| 7.00  | -5.81* | 1.36    |
| Surgery         | 76.65 | 7.30  | 66.71| 5.70  | -7.82* | 1.52    |
| Pediatrics      | 74.90 | 7.30  | 66.73| 4.80  | -7.43* | 1.32    |

* p < 0.001

Of the 15 USMLE Fail Group students who have completed Internal Medicine, Pediatrics or Family Medicine residency, 11 were board certified within two years of completing residency. Of the 11 students who have completed one of these residencies and were in the USMLE Pass Group, 10 were board certified two years after completing their residency.

Table 2: Clinical Performance Ratings by USMLE Step 1 Result

| Clinical ratings | Pass Group (n=64) | Fail Group (n=64) | t     | Cohen’s d |
|------------------|-------------------|------------------|-------|-----------|
| Clinical Ratings (% final grade) | M     | SD    | M    | SD    |       |         |
| Medicine (54 point scale) | 55% | 48.51 | 3 | 46.43 | 3 | -3.9* | 0.69 |
| Neurology (100 point scale) | 50% | 90.3 | 5 | 89.8 | 3.7 | -0.54 | 0.11 |
| OB/GYN (100 point scale) | 75% | 86 | 6.7 | 84.1 | 7.5 | -1.48 | 0.27 |
| Psychiatry (4 point scale) | 35% | 3.44 | 0.32 | 3.3 | 0.4 | -2.15† | 0.39 |
| Pediatrics (10 point scale) | 65% | 8.92 | 0.4 | 8.58 | 0.48 | -4.35* | 0.77 |
| Family medicine (10 point scale) | 40% | 8.74 | 0.82 | 8.62 | 0.71 | -0.75 | 0.16 |

Note: Each clerkship uses their own rating scale for clinical performance.

Comparison of fail versus Pass Group in each clerkship

* p<0.001
† p=0.034
after completion of residency. Using the available data, 
Table 3 summarizes the percentage of students in each 
group who passed USMLE Step 1 and 2, and matched 
for a residency. In addition, licensure data and board 
certification rates are given for those in each group who 
have completed Internal Medicine, Pediatrics or Family Medicine training. Licensure and board certification data 
may be limited by name changes or change in specialty 
after the initial residency match.

**Discussion**

Our results suggest that VCUSOM students who fail 
USMLE Step 1 will score lower on subject exams dur 
during the third year than those who pass Step 1. The low 
exam scores tend to lower final grades in the clerkships, 
reflected in the higher proportion of students with Pass 
grades in the USMLE Fail Group because the NBME 
subject exam score accounts for a significant portion of 
clerkship grades. These findings are, however, consist 
tent with a report by Fields and others that third year 
GPA was related to USMLE Step 1 score and with Case 
and Swanson’s observation that students who do well on 
past exams will continue to do well on exams. Whether 
the lower exam scores are a reflection of differences in 
medical knowledge, test taking ability, or reading skills 
cannot be determined from our data. Recently, however, 
Haught and Walls suggested that reading ability might 
be a factor in medical school success. They reported that 
the Nelson-Denny Reading Test subscore for Vocabulary 
and the Total Score were positively correlated with the 
USMLE Step 1 score. In a stepwise regression analysis, 
they determined that the vocabulary subscore was a 
significant predictor. Perhaps this should not be surprising 
given the fact that Ripkey and Case reported 75% of the 
students who answered their post Step 2 survey used to 
assess performance attribution indicated that reading was 
perceived to affect performance, sometimes helping other 
times hurting it. It has been our experience that reading 
and test taking ability do play a role in academic perfor 
mance as do knowledge of content and general ability. 
We suspect that any or all of these factors played a role in 
both the Fail and Pass groups in our study.

Interestingly, the clinical rating portion of the final 
clerkship grade was not significantly different between 
groups in three of the six clerkships. This may indi 
cate that board exam scores do not predict performance 
in the clinical setting but rather could be a measure of 
test taking or reading skills. Alternatively, it may reflect 
the difficulty in obtaining a valid measure of a student’s 
performance in the clinical setting. Kreiter and others reported that the validity of a standard clinical evalua 
tion form increases with the number of raters for each 
clerkship. At our institution third year students spend 
the greatest clerkship time on Internal Medicine. During 
the 12 weeks of the Internal Medicine clerkship they are 
evaluated by at least four faculty and two residents. On 
Pediatrics, students are also evaluated by at least four dif 
derent raters in several different settings over eight weeks. 
Psychiatry has anywhere from two to eight raters depend 
ing on the clerkship site. On other clerkships there are 
generally fewer number of raters and the time on each 
clerkship is eight weeks or less. The fact that there is 
a statistically significantly difference in clinical perfor 
mance ratings between the two groups in the Medicine, 
Pediatrics, and Psychiatry clerkship may reflect a greater 
number of evaluators resulting in better discrimination 
between individual students. The effect size analysis 
tends to support this conclusion.

| Table 3 | Comparison of Rates of USMLE Passage, Residency Match and Board Certification |
|---------|--------------------------------------------------|
| Pass USMLE Step 1 and 2 before graduation | 100% | 71% |
| Match for Residency | 100% | 89% |
| Pass USMLE Step 1 and 2 before or after graduation | NA | 82% |
| Medical license | 91% (n=11) | 87% (n=15) |
| Board certified in specialty | 91% (n=11) | 73% (n=15) |

Match and USMLE passage rate are for the entire cohort (n=64). Licensure and board certification are only for those in each group who have completed an Internal Medicine, Pediatrics or Family Medicine residency.
Studies have found that clinical ratings by faculty during clerkships correlate with performance on USMLE Step 2 and 3, suggesting that clinical ratings may be valid measures of competence. Interestingly, clinical ratings during clerkships correlated with ratings of postgraduate clinical competence by program directors. Specifically, Callahan and others reported clinical competence ratings in Family Medicine, Internal Medicine, and Pediatrics significantly and consistently predicted residency performance. The ratings in the Internal Medicine clerkship were the best predictor of performance. Gunzburger and others also reported that clerkship grades significantly predicted competence as residents. In their study, third and fourth year Medicine clerkship performance, as well as performance during the Surgery clerkship, was the strongest predictors of residency performance. Markert and Paolo and Bonaminio also reported a moderate correlation between clerkship GPA and postgraduate ratings. In the Paolo and Bonaminio study USMLE Step 1 score was found to correlate with postgraduate ratings, as well.

The most difficult task for a residency program director is to predict which applicants will perform well as residents. There have been several studies evaluating the ability of ratings during medical school to accurately predict outcomes during residency. Prior to the development of the USMLE, NBME exams were used as a measure of medical school performance. Several studies have shown a relationship between performance on NBME Part I and specialty certifying exams. However, the ability to perform well on standardized tests does not always predict performance in the clinical setting. Studies analyzing the ability of NBME or USMLE basic science exams to predict performance as a resident have been mixed. Both Markert and Paola and Bonaminio in the previously described studies, showed a correlation between NBME Part I or USMLE Step 1 scores and residency directors’ ratings. However, other studies have shown no relationship between USMLE Step 1 or NBME Part I scores and clinical ratings of residents. The divergence between basic science exam scores and clinical ratings by residency directors is likely because residency directors’ performance ratings are a reflection not just of medical knowledge but also other important aspects of patient care including communication, empathy, teamwork, professionalism, and leadership. These characteristics can not be ascertained from a multiple choice basic science exam.

A concern from our findings is the match results in the USMLE Fail Group. A small minority of the USMLE Fail Group did not pass either Step 1 and/or Step 2 by graduation. Of the 17 students who had not successfully passed Step 1 or 2 by graduation, five did not match in a residency program. For some students, this was true one to two years after graduation and after participation in more than one match cycle. Other students never participated in the match for unknown reasons. We have identified a high risk group of students who may be unable to pass USMLE and become licensed physicians. It is beyond the scope of this study to determine long term outcomes in this group.

In summary, because our institution does not require passage of USMLE, we were able to analyze third year clerkship performance and residency match results in a group of students who failed USMLE Step 1 on the first attempt. Our findings indicate that initial failure of USMLE Step 1 does not foretell overall poor clinical performance during third year clerkships at our institution. However, many students who fail USMLE Step 1 on the first attempt do continue to have difficulties on standardized exams. On average, they score lower on subject exams and more often fail Step 2. As a result of lower exam scores, these students generally have lower final clerkship grades. We found a small minority of students did not pass USMLE Step 1 or 2 by graduation and did not go on to enter graduate medical education. Yet, most students (82%) successfully complete medical school, eventually pass USMLE Step 1 and 2, and match for a residency. In addition, we have shown evidence that the majority of the USMLE Fail Group go on to become board certified in their chosen specialty. This is the only published data on outcomes in students who fail USMLE Step 1 on the first attempt. USMLE Step 1 performance is just one of many variables that may predict success during third year clerkships and postgraduate training. However, whether it is predictive of performance in the long term practice of medicine is not known. The new ACGME shift toward measurement of patient outcomes during residency may help answer this question in the future.

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