Title: Differences in Medical Education Resources Used by Students in Basic Science Courses and Clinical Clerkships

Submission Type: Research Highlights in Medical Education

Submitting Author: Crystal Graff,

Submitting Author Institution: Medical College of Wisconsin

Purpose: Medical students allocate an enormous amount of time and money seeking and evaluating educational resources that are used to prepare for institutional and national board examinations.(1) Millennial students have matriculated into medical school from advanced undergraduate and K-12 curricula with the expectation that essential modern curricular resources are readily available within the program.(2) However, students quickly discover that they must purchase these ancillary curricular resources on their own in order to achieve optimal performance on important examinations which provides additional financial strain to an already stressful environment. The purpose of this study is to analyze the use of external medical educational resources between first- and second-year medical students in basic sciences courses and third-year students in the clinical clerkships.

Approach/Methods: In August 2017, a 13-item survey was completed by 148 of 711 (21%) medical students which included N=66 (45%) first-year students, N=46 (31%) second-year students, and N=36 (24%) third-year students. Student participants were primarily in the age range of 23-27 (78%) with 53% males/47% females. Survey items used categorical and 10-point scales (10=high) and open-ended text-response. Mean scores were compared with independent t-tests and Cohen’s d effect sizes. Mann-Whitney U-tests and Pearson chi-square tests compared ordinal and nominal scaled items, respectively. Stepwise multivariate linear regressions used for relational analysis. IBM® SPSS® 24.0 used for statistical analysis and NVivo 11 used for qualitative analysis. Study is IRB approved.

Results/Outcomes: Seventy-three percent of combined first-year/second-year medical students preferred to use lectures as their main source of learning materials compared to 43% of third-year students (p<.001). Using lectures was the best predictor of learning needs for first-year/second-year students (R²=0.60, p<.001), while relating basic science principles to clinical practice was for third-year students (R²=0.50, p<.001). No significant difference in learning needs was reported between medical student years (d=0.4, p=.069). All students, regardless of class, used approximately six outside resources to supplement lecture (mean(sd)=5.9(2.0)). Significantly higher percentages of first-year/second-year vs. third-year students used the First Aid textbook series (46% vs. 20%, p<.013) and Pathoma textbook (38% vs. 18%, p<.009). Several students reported being at a “disadvantage” because they could not afford some of the commonly used educational resources.

Discussion: The majority of first- and second-year medical students reported using lectures as their main source of learning, but are spending money on additional educational resources available outside of the formal curriculum to supplement their learning. This finding is aligned with research on the hidden curriculum of medical education, specifically in regard to resource allocation.(3) Ultimately, students use these resources to prepare for the USMLE Step 1 examination which has an inescapable impact on
residency selection and career choices.(4,5) Medical schools should provide students access to essential educational resources.(6)

**Significance:** Many medical students are spending their own money on educational resources to supplement standard class lectures which creates additional levels of debt and economic disparity and puts them at an educational disadvantage based on financial means. It is imperative that medical schools evaluate essential learning resources and make them available to students.
Title: Preventing Step 1 Failure: Early Results from a Longitudinal Medical Student Advising Model

Submission Type: Research Highlights in Medical Education

Submitting Author: Leslee Martin, M.A.

Submitting Author Institution: University of Louisville School of Medicine

Purpose: The purpose of this study is to examine the effectiveness of a data-driven medical student advising model that supports maximum passage for all first time University of Louisville School of Medical (ULSOM) test takers on the United States Medical Licensing Examination (USMLE) Step 1 (“Step 1”) exam. Most medical schools require students to pass Step 1 in order to progress in medical school and the exam remains the most important indicator used by program directors in evaluating applicants for residency and scheduling interviews.2,3

Approach/Methods: In 2016, the ULSOM convened a task force to examine trends in the school’s Step 1 scores over a five-year period. The task force recommended a new policy in 2017 requiring students to score 200 or better on an approved NBME self-assessment exam before sitting for Step 1. A newly hired Education Learning Specialist tracked student progress and reported results from the self-assessment exams back to a Student Progress Committee. These results, along with a risk assessment model-predicting Step 1 scores from scores on internal exams, customized NBME shelf exams, MCAT averages, quintile drops on internal exams and the customized NBME exams, were used to identify students at risk of failing Step 1. Students identified as high-risk completed additional practice tests and worked with the Education Learning Specialist to develop targeted study plans prior to taking Step 1.

Results/Outcomes: In 2017, 86% of eligible ULSOM students passed approved practice exams and were cleared to sit for Step 1. The 14% who did not score high enough on the practice exam by the end of their standard Step 1 study period were enrolled in a directed studies course to continue studying for the exam. Most of these students took Step 1 within a few weeks of enrolling in the course. Based upon practice test scores and predicted scores, eight students received intensive, individualized counseling and follow-up from the Education Learning Specialist. Of the 146 ULSOM students who have taken the Step 1 exam in 2017, 99% have passed. 2017 vs. 2016 mean scores improved by eight points and the standard deviation dropped by four points, indicating higher scores with less variability. Of students identified as high-risk, 17 of 18 passed Step 1 on the first attempt. Four students will take the exam in early 2018.

Discussion: While it is too early to gauge whether students’ residency match is affected by the changes the school has made, results from the first year of the new Step 1 advising model are very promising. The intensive targeting of scores and advising students regularly allowed for possible failures of Step 1 to be avoided.

Significance: Step 1 failure is expensive to students both from a cost perspective and from a residency match perspective. A program that successfully identifies students at risk for failure while preparing them to pass Step 1 on the first attempt can facilitate optimal success for students in medical school and result in more positive outcomes in matching to their chosen residencies.
Purpose: Early identification and support for at-risk students is essential for optimal USMLE Step 1 performance. Many studies define predictors of underperformance [1-4], but few describe implementation of these findings. We describe a unique process at our institution: the creation and implementation of a projected risk calculator leading to targeted student guidance and support.

Approach/Methods: Students at the University of Colorado School of Medicine must pass Step 1 at the end of year 2. To determine how early Step 1 underperformance could be identified, we compared the c-statistic from separate multivariate logistic regression models at three time points: beginning of year 1 (BY1), end of year 1 (EY1), and end of year 2 (EY2). Underperformance was defined if Step 1 score was below 2 standard errors of measurement above passing. For sufficient numbers, we combined 5 student cohorts. Potential predictors for each time point were included if bivariate Chi-square, Fisher’s exact, ordinal Cochran-Mantel-Haenszel or t-test p-value was <0.1 and available at that time point. The BY1 model considered only pre-matriculation characteristics (gender, age, under-represented minority, rural, financial assistance, first generation college, considered disadvantaged, MCAT special accommodations/number of sits/total and verbal scores, science GPA, pre-entry program, matriculation year). The EY1 model added year 1 course performance characteristics (overall average score, failure in course, number of exams =75%). The EY2 model added year 2 performance, overall year 1 and 2 average score, and Step 1 exam delay. Model building consisted of variable reduction using cluster and correlation analysis, backward selection to obtain final predictors, and interaction analysis. Continuous predictors were dichotomized to maximize outcome discrimination using bivariate regression trees; model-building was repeated replacing continuous with dichotomized predictors to ensure stability and inference consistency. To create a risk score [5-7], we calculated the inverse-logit from the final regression model and employed ROC analysis and Youden’s Index to define a risk score cut point above which a student was considered at risk. A decision tree risk calculator was created for each model. After entering known pre-matriculation values, the risk calculator provides risk scores for each of the course predictor levels.

Results/Outcomes: The c-statistic for Step 1 underperformance at BY1, EY1 and EY2 was 0.76, 0.84, and 0.87, respectively; earliest identification of risk was EY1. Since our course performance predictors were dichotomized, a ‘running risk score’ could be calculated at the end of each course throughout year 2. Reports provide student data for final model predictors, risk score and status, filterable by academic year and risk status. For mid-year students, the risk calculator provides projected risk scores based on known information.

Discussion: Many studies have described analytic approaches to identify predictors of underperformance on Step 1. These results, however, were not generalizable to our institution because predictors are dependent on institution-specific characteristics. It is critical to develop a streamlined
system to identify predictors and easily apply these findings to support at-risk students’ Step 1 performance.

**Significance:** Our dynamic process accounts for changing data definitions and cohorts, and it can be applied to other settings and outcomes.
Title: When passing is not enough: Early indicators of USMLE Step 1 struggles

Submission Type: Research Highlights in Medical Education

Submitting Author: Hanin Rashid,

Submitting Author Institution:

Purpose: Step 1 success is a critical milestone for medical students. Unfortunately, passing Step 1 is no longer enough to ensure a residency match(1). Considering that many medical schools are pass/fail, most schools identify at-risk students as those who have failed a course; yet a vast majority of medical students pass their courses. As a result, some medical students may not be aware that they are at risk for delaying Step 1 or scoring significantly below the national average which may limit their residency options. Earlier factors that predict USMLE Step 1 success could encourage more purposeful use of academic support resources in a timely manner. Research suggests that MCAT scores predict USMLE Step 1 and Step 2 CK scores (2), more specifically the Biological Sciences score (3-4). Most models for predicting USMLE Step 1 scores incorporate academic performance in the first two years of medical school, MCAT, and/or undergraduate GPA. This study investigates whether the first M1 course, a course in Biomedical Science, can predict USMLE step 1 performance.

Approach/Methods: Performance data from the first course, Biomedical Science (BMS), was collected from the entering classes of 2014 and 2015 (n=342). Biomedical Science is a foundational course on basic science concepts. Statistical analysis was conducted through logistic regression using MCAT and course grade for the first course to predict whether students landed in the bottom quartile of step scores for the school.

Results/Outcomes: The results revealed that after controlling for MCAT scores, BMS course grades were significant predictors of the bottom quartile of USMLE Step 1 scores, Exp(β)=1.14, 95% CI=[1.04, 1.25], p=.005>.05. The crosstabs demonstrated that students who scored just below the mean in the course, had unpredictable Step 1 scores.

Discussion: Grades from the first course predicted relative Step 1 performance. Students who score within range of their peers may feel secure in their performance, however students who scored just below the mean in the course had unpredictable Step 1 scores. This may make it more difficult for student to recognize a need for improvement, considering that certain learning strategies can improve student performance on assessments, yet students do not engage in these strategies without assistance(5).

Significance: The results of this study have implications for minimum passing scores for minimum competency. These findings makes the case for using early medical school performance to predict potential Step 1 difficulty and suggests better academic support interventions for students who are passing courses but remain below average(6).
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Submitting Author: Leslee Martin, M.A.

Submitting Author Institution: University of Louisville School of Medicine

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