MCAT® Validity Data Report

New Findings About Predicting Performance Across Preclerkship Courses, Progression to the Third Year, and Performance on the USMLE Step 1 Exam

October 2019
Introduction

The Association of American Medical Colleges (AAMC) is conducting a 10-year, multi-site study to determine how well scores from the current version of the MCAT exam predict students’ performance in medical school.

This report describes the most recent validity findings from this study, led by AAMC’s MCAT Validity Committee (MVC). The MVC is a group of educators, admissions officers, researchers, and pre-health advisors from medical schools and undergraduate institutions in the United States and Canada charged with investigating the fairness, use, and predictive validity of the MCAT exam that was introduced in 2015.

The MCAT predictive validity study examines how well MCAT scores, together with other academic metrics, predict students’ performance throughout medical school. This study examines national medical student performance outcomes, such as students’ progression through medical school and their performance on the United States Medical Licensing Examination (USMLE) Step exams. It also examines locally defined outcomes tied to the curriculum, academic support, and learning environment of each school in the study.

Seventeen schools across North America are partnering with the AAMC on this research. They were selected from 65 schools that applied to participate in this study. The schools are diverse geographically and include public and private institutions with different missions, goals, and curricula that represent AAMC member institutions. Each school recruited several cohorts of medical students to participate in the study.

So far, the findings in this report show that:

- The relationships between MCAT scores and medical student performance outcomes are medium to large. MCAT scores do a good job of predicting grades in preclinical courses, Step 1 scores and pass rates, and progression to the third year of medical school.
- Applicants from different demographic and socio-economic backgrounds who enter medical school with the same MCAT scores have similar academic outcomes. MCAT scores predict performance comparably for medical students from racial/ethnic minority and majority groups, for those from lower- and higher-socioeconomic backgrounds, and for males and females.
- The vast majority of the students admitted, including with scores in the middle of the MCAT total score scale (495 to 504), are succeeding. Most of them pass Step 1 on the first attempt and progress to the third year of medical school on time or within one extra year.
- Applicants’ educational and economic backgrounds provide important context for interpreting MCAT scores and other academic data. The high progression rates show that admissions committees are doing good work to identify, admit, and support applicants who have the potential to do well in medical school.

Upcoming reports will summarize research on the validity of MCAT scores in predicting performance in clerkships, on the Step 2-CK and Step 2-CS exams, and graduation within four or five years for these and additional cohorts of medical students. Updated findings will be published annually in the guide to Using MCAT Data in Medical Student Selection (www.aamc.org/newmcatguide) and, if accepted, in the scientific literature.

Questions about this report may be sent to mcatvalidity@aamc.org.
On average, students with higher MCAT total scores have better outcomes in their preclerkship courses.

The current version of the MCAT exam is a good predictor of academic readiness for medical school. On average, students at the validity schools who entered medical school in 2016 and 2017 with higher scores from the current exam performed better in their preclerkship courses than students admitted with more modest scores. As also shown by Figure 1 below, there is variability in preclerkship performance for students with the same MCAT score.

Figure 1. Scatter plot of performance across preclerkship courses by MCAT total score for 2016 and 2017 entering students at one validity school

Figure 1 shows data for students at one school in the validity study. These data show the association of MCAT scores with students’ performance on outcomes tied to the school’s curriculum, grading practices, and student support services.

This scatter plot shows the performance across preclerkship courses by MCAT total score for 2016 and 2017 entering students at this validity school. The x-axis shows MCAT total scores from low to high. The y-axis shows students’ preclerkship performance, on a scale of 0 to 100. Each dot represents a student’s data – the MCAT score the student was admitted with and the student’s preclerkship performance. The diagonal line shows the estimated relationship of MCAT scores with preclerkship performance. At this validity school, the correlation of MCAT scores with preclerkship performance is 0.61.

On average at this school, students admitted with higher MCAT total scores showed higher performance across their preclerkship courses. Nonetheless, there is substantial variability in medical student performance. Some students show higher performance than others admitted with the same score, while others show lower performance. Some students with lower MCAT scores outperformed others with higher scores.
There is a strong relationship between MCAT total scores and students’ outcomes in preclerkship courses at schools in the validity study.

The analysis shown in Figure 1 was done three times for each validity school — once for MCAT scores alone as the predictor, once for undergraduate GPAs alone as the predictor, and once to examine the joint contribution of MCAT total scores and undergraduate GPAs in predicting students’ preclerkship performance. Then, the correlations for each predictor were grouped together to study the midpoint and the range of correlations obtained from the validity schools.

Figure 2 shows the correlations of MCAT total scores and undergraduate GPAs, alone and together, with students’ preclerkship performance. These findings reflect data from 2,772 medical students who matriculated at the validity schools in 2016 and 2017 with scores from the current MCAT exam and who volunteered for the study.

**Figure 2. Correlations of 2016 and 2017 entering students’ MCAT scores and undergraduate GPAs with performance across preclerkship courses: Medians and interquartile ranges of correlations from the validity schools (N\textsubscript{school} = 17)**

![Graph showing correlations of MCAT total scores, undergraduate GPAs, and combined scores with preclerkship performance.](image)

Using MCAT total scores with undergraduate GPAs provides stronger prediction of preclerkship performance than using either one alone.

The left panel in Figure 2 shows the correlations of MCAT total scores with preclerkship performance at the validity schools. The 17 correlations were ranked from low to high. The circle shows the median correlation (the correlation at the 50th percentile), and the two ends of the gray bar show the correlations at the 25th and 75th percentiles. The horizontal line at a correlation of 0.3 shows the threshold for a medium effect size in the social sciences.* The median correlation of MCAT total scores with preclerkship performance is 0.58.

The middle panel in Figure 2 shows the correlations of students’ total undergraduate GPAs with their preclerkship performance at these same validity schools. The median correlation of undergraduate GPAs with preclerkship performance is 0.54. Finally, the right panel in Figure 2 shows the correlations of MCAT total scores and undergraduate GPAs combined with preclerkship performance at these same validity schools. The median correlation is 0.66.

These results show that using MCAT total scores and undergraduate GPAs together provides better prediction of applicants’ preclerkship performance than using either one alone. Data not shown in this report also revealed that MCAT scores provide comparable prediction for students from different racial/ethnic minority and majority groups and for those from lower- and higher-socioeconomic backgrounds. Students from different backgrounds with the same MCAT score in the study, on average, had the same outcomes in their preclerkship coursework.
Nationally and on average, students with higher MCAT scores have higher Step 1 scores.

The data below show that nationally and on average, 2016 and 2017 entrants with higher MCAT scores obtain higher scores from their first attempt on the Step 1 exam. Like the data in Figure 1, there is variability in students' performance at every point of the MCAT score scale. This figure suggests that, in addition to premedical preparation, other factors also contribute to performance on licensure exams. Students have acquired significant learning during the first two years of medical school. They learn at different rates and resonate with curricular and instructional approaches in different ways, and their rank orders change over time.

Figure 3. Distribution of Step 1 scores by MCAT total score for 2016 and 2017 entering students1, 7, 8

This figure shows the distribution of Step 1 scores from the first attempt by MCAT total score for the nearly 23,000 2016 and 2017 entrants nationally who took the Step 1 exam by Summer 2019.

Nationally and on average, 2016 and 2017 entrants with higher MCAT scores obtain higher Step 1 scores. The jagged diagonal line shows the median Step 1 score for students who entered medical school with each MCAT total score. The blue vertical boxes show the Step 1 scores at the 25th to 75th percentiles, and the black vertical lines show the Step 1 scores at the 10th to 25th and 75th to 90th percentiles for students who entered at each MCAT total score. The slope of the jagged line shows that MCAT total scores are closely correlated with Step 1 scores. The correlation of MCAT total scores with Step 1 scores is 0.63.

This figure also suggests that MCAT scores, which reflect students' foundational preparation in scientific concepts and reasoning skills taught in college, do a good job of predicting performance on a test that measures students' demonstration of acquired medical knowledge from the first two years of medical school.
There is a strong relationship between MCAT total scores and Step 1 scores.

The analyses shown in Figure 3 were done for each medical school with at least 30 students who took the Step 1 exam by Summer 2019. This analysis was repeated three times for each of these medical schools — once for MCAT scores alone as the predictor, once for total undergraduate GPAs alone as the predictor, and once to examine the joint contribution of MCAT total scores and undergraduate GPAs in predicting students’ Step 1 performance on the first attempt. Conducting these correlational analyses by school illustrates how the correlations of academic metrics and Step 1 scores vary across schools with different curricula and student support services.

Similar to Figure 2, the data in Figure 4 show that using MCAT scores and undergraduate GPAs together provides more information about applicants’ likely performance on the Step 1 exam. Overall, it shows that the correlations of MCAT scores with Step 1 scores are medium to large at U.S. schools. The median correlation of MCAT total scores with Step 1 scores is 0.60. The median correlation of undergraduate GPAs with Step 1 scores is 0.49. The median correlation of MCAT total scores and undergraduate GPAs with Step 1 scores is 0.63. Data not shown in this report also reveal that MCAT scores provide comparable prediction for students from different racial/ethnic minority and majority groups and for those from lower- and higher-socioeconomic backgrounds. Students from different backgrounds with the same MCAT score, on average, have similar levels of performance on the Step 1 exam.

**Figure 4. Correlations of 2016 and 2017 entering students’ MCAT scores and undergraduate GPAs with Step 1 scores from the first attempt: Medians and interquartile ranges of correlations from 143 U.S. medical schools**

Using MCAT total scores with undergraduate GPAs provides stronger prediction of Step 1 scores than using either one alone.

The results in Figures 2 and 4 underscore the importance of using multiple sources of information when making decisions about applicants’ academic readiness for medical school. This practice is foundational to holistic review and is a recommended best practice by the AAMC and the Standards for Educational and Psychological Testing.
Students’ performance on the Step 1 exam is better predicted by using MCAT scores and undergraduate GPAs together.

Like Figure 4, Figure 5 demonstrates the value of using applicants’ MCAT scores and undergraduate GPAs in admissions decisions. The figure shows how Step 1 scores from students’ first attempts vary by MCAT total scores and undergraduate GPAs. The x-axis shows MCAT total scores from low to high, and the y-axis shows Step 1 scores from low to high. The lines show the median Step 1 score for undergraduate GPAs less than 3.4, ranging from 3.4 to 3.79, and at or above 3.8.

**Figure 5. Median Step 1 scores by different MCAT total scores and undergraduate GPA ranges**

The patterns in these data show that higher undergraduate GPAs can compensate for more modest MCAT total scores when predicting applicants’ future performance in medical school. For example, an applicant with an undergraduate GPA between 3.80 and 4.00 and an MCAT total score of 502 may perform equivalent to or better than those with higher MCAT scores and lower GPAs.

The same is true for MCAT total scores. Higher MCAT scores can sometimes compensate for more modest undergraduate GPAs. Applicants’ transcripts likely yield the clues to judging discrepant MCAT scores and undergraduate GPAs.

Both undergraduate GPAs and MCAT scores provide important information about applicants’ academic strengths and weaknesses. Omitting either one during the selection process can result in capable applicants being overlooked or challenges to schools’ ability to provide students with academic support.

The remaining figures in this report demonstrate the value of using MCAT scores together with undergraduate GPAs when making admissions decisions. Fully understanding applicants’ academic strengths and weaknesses can provide admissions officers flexibility in selecting applicants with more modest MCAT scores or undergraduate GPAs who have the capacity to do well at their schools.
Students with a wide range of MCAT total scores and undergraduate GPAs pass the Step 1 exam on the first attempt.

Analysis of 2016 and 2017 entering students’ Step 1 pass rates on the first attempt by their MCAT total scores and undergraduate GPAs provides more information about the success of students with different combinations of academic metrics.

The positive relationships of MCAT total scores and undergraduate GPAs with Step 1 pass rates in the grid below show that students admitted with varied academic credentials are succeeding. Overall, 97% of 2016 and 2017 entrants who took the Step 1 exam passed it on the first attempt.

Figure 6. Percentage and number of 2016 and 2017 entering students admitted with scores from the current MCAT exam who passed the Step 1 exam on the first attempt, by MCAT total score and undergraduate GPA range.1, 7, 10

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Students with a wide range of MCAT total scores and undergraduate GPAs progress to year 3 on time or within one additional year.

Figures 7 and 8 show that admissions officers are doing a good job of using MCAT scores in flexible ways to select the students who will succeed in their programs, and that when these students enter, their faculty support them. The tables below show, for 2016 entering medical students admitted with scores from the current MCAT exam, their success in progressing to year 3 on time and within one additional year. These data show that 93% of 2016 entrants progressed to year 3 on time, and 97% did so within one additional year. The pattern of results shows that most students progress on time, including those who entered with modest scores.

**Figure 7. Percentage and number of 2016 entering students admitted with scores from the current MCAT exam who progressed to year 3 on time, by MCAT total score and undergraduate GPA range**

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**Figure 8. Percentage and number of 2016 entering students admitted with scores from the current MCAT exam who progressed to year 3 within one additional year, by MCAT total score and undergraduate GPA range**

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Many factors contribute to success in medical school.

MCAT scores are a good predictor of important academic outcomes in medical school, but there are many factors that contribute to students’ performance. Admissions officers are knowledgeable about the academic metrics, attributes, and experiences that students need to be successful at their medical schools, and they use MCAT scores and undergraduate GPAs in flexible ways, as the data in this report show. Admissions officers carefully consider the rich and assorted information in students’ applications to build classes that will support their institutions’ mission and goals.

When admissions officers and their committees admit students with more modest MCAT scores or undergraduate GPAs, they do so because these applicants stand out to them as capable of succeeding and contributing to teaching and learning at their schools. Schools use their academic, social, and wellness support services and their curricula to provide resources that foster the success of their students, as shown by the high Step 1 pass rates and success in progressing to year 3 on time or within one extra year.

The data in this report support the use of MCAT scores with undergraduate GPAs and other application data that are important for admissions decisions. MCAT scores have high predictive value and when used flexibly, admissions officers can widen the applicant pool from which to select the best students for their programs and future physicians for the nation.

Future research

Upcoming reports from the MVC will summarize their research on the validity of MCAT scores in predicting performance in clerkships, on the Step 2-CK and Step 2-CS exams, and graduation within four or five years. They will include findings based on data from these and additional cohorts of medical students.

Updated findings will be published annually in the guide to Using MCAT Data in Medical Student Selection (www.aamc.org/newmcatguide) and, if accepted, in the scientific literature.
Read more about the MCAT validity research in *Academic Medicine*

This summer, the MVC published articles in *Academic Medicine* on their research to evaluate the fairness, use, and predictive validity of scores from the current version of the MCAT exam. Some of the findings described in this report expand upon the research in this collection of articles. New findings in this report will be published in next year’s guide to *Using MCAT Scores in 2021 Medical Student Selection*.


**References**


Technical Notes.

1. Students’ most recent MCAT scores at the time of matriculation were used in the analysis.

2. Performance across preclerkship courses is defined as the mean performance across preclerkship courses each validity school included in the MCAT validity research.

3. Corrections for range restriction were made at the institution level. Each observed correlation was corrected for range restriction on MCAT total scores and total undergraduate GPAs due to student selection in the admissions process but not for unreliability in MCAT total scores or the medical student outcome. Established statistical methods were used to correct for range restriction – to adjust the observed correlation to reflect what the correlation would have been for all applicants to a school if there had been no selection – that is, if all applicants had been selected for admission and were provided the same support throughout medical school as those provided for matriculants.*** At each medical school, the applicants from the 2017 application cycle served as the reference population.

4. These results are for the 106 medical students who entered in 2016 or 2017 with scores from the current version of the MCAT exam at this validity school and who volunteered to participate in the study.

5. These results are for the 2,772 medical students at the 17 validity schools who entered in 2016 or 2017 with scores from the current version of the MCAT exam and who volunteered to participate in the study.

6. The median corrected correlation is shown with a circle, and the two ends of the gray bar show the correlations at the 25th and 75th percentiles. The horizontal line at a correlation of 0.3 shows the threshold for a medium effect size for correlation coefficients in the social sciences.*

7. These results are for the 22,898 medical students who entered in 2016 or 2017 with scores from the current version of the MCAT exam who took Step 1 by Summer 2019. Students’ most recent MCAT scores at the time of matriculation were used in the analyses.

8. The blue vertical boxes show the Step 1 scores at the 25th to the 75th percentiles, and the black vertical ones show the Step 1 scores at the 10th to 25th and 75th to 90th percentiles for students who score at each MCAT total score. The numbers of students with MCAT scores at the bottom and top of the MCAT score scale are too small to be compared with those at other points. Therefore, the results for students with MCAT scores from 472 to 491 are reported together, as are the results for those who scored from 524 to 528. The applicants from the national 2017 application cycle served as the reference population in correcting the correlation of MCAT total scores with Step 1 scores for range restriction.

9. These results are for the medical students who entered in 2016 or 2017 with scores from the current version of the MCAT exam who took Step 1 by Summer 2019. Analyses were conducted separately for each school with at least 30 entrants with Step 1 scores. In total, the analyses were conducted on students at 143 schools using data from a total of 22,809 students.

10. Blue shading = pass rates of 90-100%; green shading = pass rates of 80-89%; orange shading = pass rates of 70-79%. Dashes = cells with fewer than 10 observations; blank cells = cells with 0 observations.

11. Blue shading = progression rates of 90-100%; green shading = progression rates of 80-89%; orange shading = progression rates of 70-79%. Dashes = cells with fewer than 10 observations; blank cells = cells with 0 observations. Students entering medical school with advanced standing from medical, graduate, or other programs, enrolled in a joint program (e.g., MD-PhD) at the time of matriculation or graduation, participating in special research/non-research studies, or deceased are not included in these tables.
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