Evidenced-Based Admission Decisions: Predicting Student Performance in Medical School

AACOM Presentation
April 24, 2015
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Introduction

Context: Recent studies in medical education ¹, ², ³ indicate that the ability of preadmission selection criteria to predict student academic performance in medical school has not been well established.

Objectives:

To examine RVU’s preadmission selection criteria to determine if any variables emerged as effective predictors of student academic performance from the graduating classes of 2013, 2014, and 2015.

To extend the research in the discipline and to identify best practices in the selection process.
What, if any, associations exist between RVU preadmission selection criteria and measures of student academic performance for the classes of 2013, 2014, and 2015?

What, if any, RVU preadmission selection criteria can predict measures of student academic performance for the classes of 2013, 2014, and 2015?
# Variables

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Outcome Variable</th>
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<tr>
<td>1. Parent Physician</td>
<td>1. RVU 1\textsuperscript{st} Year GPA</td>
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<td>2. No. of UG schools attended</td>
<td>2. RVU 1\textsuperscript{st} Year Class Rank</td>
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<td>3. No. of Grad schools attended</td>
<td>3. RVU 2\textsuperscript{nd} Year GPA</td>
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<td>4. No. of Degrees Awarded (undergrad and grad)</td>
<td>4. RVU 2\textsuperscript{nd} Year Class Rank</td>
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<td>5. No. of Years to Complete Undergraduate Program</td>
<td>5. RVU Total GPA</td>
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<td>6. No. of UG Course Withdrawals</td>
<td>6. RVU Total Class Rank</td>
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<td>7. Year/Length out of School prior to Matriculation</td>
<td>7. COMLEX I (CK)</td>
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<td>8. Clinical Experience</td>
<td>8. COMLEX I (CKPF)</td>
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<td>9. Participation in Division Level Sports</td>
<td>9. COMLEX II (CE)</td>
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<tr>
<td>10. Grades in Organic Chemistry</td>
<td>10. COMLEX II (CEPF)</td>
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<td>11. Participation in A&amp;P Course</td>
<td>11. COMLEX III (CEPF)</td>
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<td>12. Preadmission Science GPA</td>
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<td>13. Total MCAT Score</td>
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Methods

Data were analyzed from three graduating classes (2013-2015) (N = 436) of the College of Osteopathic Medicine at Rocky Vista University (RVUCOM).

Associations were examined between 13 predictor variables (preadmission selection criteria) and 11 outcome variables.

Effective was defined as a positive association or relationship >.20 and predictive ability >.20 and statistically significant at the .01 or .05 level. Similar studies describe coefficients for similar variables range from .17-.35 due to highly homogenous populations with low variability in MCAT scores, GPA’s, etc., which creates a range restriction in the data and compresses correlation and regression coefficients.
Simple linear correlation was used to identify associations between preadmission criteria and student academic performance. Associations tell us the strength and the direction of the relationship between our criteria and outcome measures. Correlations also provide some predictive validity.

Multiple linear regression was used to estimate the ability of preadmission criteria to predict student academic performance. Prediction allows us to make better decisions regarding who is most likely to meet or surpass academic standards, and therefore, whom to admit.
2013 Correlation Results

Significant positive relationships:

1. UG Science GPA: Year 1 GPA  \( .355^{**} \)
2. UG Science GPA: Year 1 Rank  \( .335^{**} \)
3. UG Science GPA: Total GPA  \( .335^{**} \)
4. UG Science GPA: Total Rank  \( .328^{**} \)
5. MCAT: COMLEX I  \( .233^{**} \)
6. UG Science GPA: Year 2 GPA  \( .227^{**} \)
7. UG Science GPA: Year 2 Rank  \( .219^{**} \)
8. No. of UG Schools: Year 1 Rank  \( .219^{**} \)
9. UG Science GPA: COMLEX I  \( .213^{*} \)
10. Total Class Rank: No. of UG Schools  \( .206^{*} \)
11. MCAT: Year 1 GPA  \( .204^{*} \)

\* \( p < .01 \)
\** \( p < .05 \)
2014 Correlation Results

Significant positive relationships:

1. UG Science GPA: Year 1 GPA  \( .341^{**} \)
2. UG Science GPA: Year 1 Rank  \( .338^{**} \)
3. UG Science GPA: Total Rank  \( .331^{**} \)
4. UG Science GPA: Year 2 Rank  \( .324^{**} \)
5. UG Science GPA: Total GPA  \( .323^{**} \)
6. Organic Chemistry: COMLEX I  \( .323^{**} \)
7. Organic Chemistry: COMLEX II  \( .315^{**} \)
8. UG Science GPA: COMLEX I  \( .315^{**} \)
9. Organic Chemistry: Total GPA  \( .301^{**} \)
10. Organic Chemistry: Year 1 GPA  \( .299^{**} \)
11. Organic Chemistry: Total Rank  \( .299^{**} \)
12. Organic Chemistry: Year 1 Rank  \( .293^{**} \)
13. Organic Chemistry: Year 2 Rank  \( .292^{**} \)
14. UG Science GPA: Year 2 GPA  \( .271^{**} \)
15. Organic Chemistry: Year 2 GPA  \( .254^{**} \)
16. UG Science GPA: COMLEX I (PF)  \( .249^{**} \)

\* \( p < .01 \)
\** \( p < .05 \)
2015 Correlation Results

Significant positive relationships:

- UG Science GPA: Total Rank 0.404*
- UG Science GPA: Total GPA 0.376*
- UG Science GPA: Year 1 Rank 0.366*
- UG Science GPA: COMLEX I 0.276*
- UG Science GPA: COMLEX II 0.238*
- No. of Withdrawals: Year 1 Rank 0.230*
- Years in UG: Year 1 Rank 0.225*
- No. of Withdrawals: Total Rank 0.203**

* p < .01  
** p < .05
Correlation Results

<table>
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<tr>
<th>Preadmission Measures</th>
<th>Mean (SD)</th>
<th>Yr1 GPA</th>
<th>Yr1 Class Rank</th>
<th>Yr2 GPA</th>
<th>Yr2 Class Rank</th>
<th>Total GPA</th>
<th>Total Class Rank</th>
<th>COMLEXI</th>
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* $p < .01$

** $p < .05$
2013 Strongest Predictors:
1. UG Cum. Science GPA
2. Organic Chemistry Grades
3. Total MCAT Scores

2014 Strongest Predictors:
1. UG Cum. Science GPA
2. Organic Chemistry Grades
3. No. of Graduate Schools

2015 Strongest Predictors:
1. UG Cum. Science GPA
2. Clinical Experience
3. Total MCAT Scores
4. No. of Graduate Schools
Regression Results

Academic Outcomes of RVU Students, Predicted on Basis of Preadmission Variables, Class of 2013, 2014, 2015 (N = 436)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Yr1 GPA</th>
<th>Yr1 Class Rank</th>
<th>Yr2 GPA</th>
<th>Yr2 Class Rank</th>
<th>Total GPA</th>
<th>Total Class Rank</th>
<th>COMLEXI</th>
<th>COMLEXII (PF)</th>
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<tr>
<td>Cum. Science GPA</td>
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<tr>
<td>Total MCAT</td>
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* p<.01
** p<.05
Overall Findings

Strongest Positive Associations 2013, 2014, 2015:
1. UG Science GPA: Year 1 GPA
2. UG Science GPA: Year 1 Rank
3. UG Science GPA: Total GPA
4. UG Science GPA: Total Rank
5. Organic Chemistry: COMLEX I
6. Organic Chemistry: COMLEX II
7. UG Science GPA: COMLEX I

Strongest Overall Predictors 2013, 2014, 2015:
1. UG Science GPA
2. Organic Chemistry Grades
3. Clinical Experience
4. MCAT Scores
5. No. of Degrees
6. No. of Graduate Schools
What Did We Learn?

For RVU applicants, we can estimate that the factors which may contribute most to student academic success include:

1. High Cumulative UG Science GPA’s
2. High Grades in Organic Chemistry Courses (1st attempt)
3. Clinical Experience (hands-on experience in physician practice, clinic, hospital, and/or emergency setting)
4. High MCAT Scores
5. More than One Undergraduate Degree (number of degrees)
6. Some Graduate Education (number of graduate schools attended)
While examining the results within study’s parameters, some statistically significant negative associations emerged that may aid in identifying factors that hinder student academic success:

- **Years in UG Education (all years):** Year One GPA, Year Two GPA, Total GPA, and all COMLEX Scores
  - Range of -0.235** to -0.269**
- **No. of UG Schools Attended:** Year One GPA, Year Two GPA
  - Range of -0.202 to -0.228**
- **Years out of School (years between finishing prior degrees and matriculating into RVU):** Year One GPA, Total GPA
  - Range of -0.269** to -0.301**
Next Steps

- Perform the same analyses using RVU preparation/assistance criteria: e.g., Remediation, Honors tracks, Pre-matriculation course, Tutoring, Presentation to the Attending, Reading scores, Dean’s List, Student club participation, etc.
- Perform the same analyses to include demographic variables (Gender; Age; Economically Disadvantaged; Country of Birth; Native State; Race/Ethnicity).
- Begin building linear model specific to RVUCOM – entails structural equation modeling to establish the power of the model.
- Conduct a similar study on dismissed/withdrawn student populations to examine potential predictors of failure/departure.
References


Questions for Audience

What pre-screening admission criteria do you currently use?
What factors led you to choose these criteria?
How do you know you are making “good” decisions; e.g., do you track student performance, retention, graduation, withdrawal rates?
How do you assess institutional effectiveness related to student outcomes?