Does Performance on School-Administered Mock Boards Predict Performance on a Dental Licensure Exam?


Abstract: Many dental schools consider the successful completion of a state or regional dental licensure examination as one of the significant benchmarks for assessing effectiveness of the curriculum. At the University of Florida College of Dentistry (UFCD), performance on the state dental licensure examination is monitored and compared with senior year mock board performance and clinical productivity to identify factors that may contribute to state board “pass” rates. A retrospective analysis was conducted of “first-time” performance on the Florida Dental Licensure Exam for graduates from classes 1996 to 2003. Using ANOVA, licensure exam performance data was analyzed and compared with performance on the senior mock board exam and clinical productivity, determined by numbers of procedures completed in each discipline. Significant relationships were noted between four of thirteen aspects of mock board performance and clinical productivity data and performance on the Florida Dental Licensure Exam. First, a significant relationship (p<0.05) was found between passing the senior mock board fixed prosthodontic preparation and successful completion of that procedure on the state licensure exam. Second, a significant relationship (p<0.05) was noted between the clinical (patient-based) Class II amalgam on the senior mock board and passing that procedure on the state licensure exam. Third, a significant relationship was noted (p<0.05) between the number of Class IV clinical composite procedures completed during dental school and passing the licensure exam Class IV manikin composite procedure. Fourth, there was a significant relationship (p<0.01) between the number of clinical Class II amalgam procedures completed during the junior and senior years and passing the state licensure exam clinical amalgam procedure. No significance was found between the remaining five mock board procedures (Class II composites, Class IV composites, pin amalgams, endodontic, and periodontal scaling/root planing) and performance on the like procedures on the licensure exam. Likewise, no significance was found between the remaining four productivity measures (numbers of Class II composites, endodontic teeth treated, crowns and abutments completed, and quadrants of periodontal scaling/root planing) and performance of these procedures on the state licensure exam.

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procedures to be performed on the mock board exam. Students who fail any section are required to remediate the failed segment (such as patient Class II amalgam procedure, patient periodontal procedure, the entire manikin exam, the endodontic portion, and the laws and rules segment). Remediation is conducted using the same time constraints and evaluation protocols as the original. Feedback from graduates supports the mock board experience as being beneficial in preparation for state and regional licensure exams.

Various portions of most dental curricula prepare students for licensure exams. Candidate performance on licensure examinations has long been of interest to the profession, and trends in performance have been analyzed nationally. A recent report by Jessee indicated that most dental schools believed that mock board examinations help prepare candidates to pass licensure exams. While the design of mock board exams varied significantly among schools, Jessee reported that every dental school in the United States, as part of its curriculum, conducted some form of mock board examination for its graduating class, although the design of the exams varied significantly. The results of a questionnaire completed by fifty out of fifty-four dental schools indicated that 53.3 percent of schools have mock board grading criteria identical to their qualifying board. Also, 75 percent of the schools responding to this survey reported that students were required to pass their mock board examination for graduation. Jessee reported, however, that no single aspect of a mock board had a statistically significant effect on the outcome of qualifying examinations.

One could also hypothesize that a positive relationship could exist between the number of patient treatment procedures completed in dental school and successful completion of a licensure exam. The North East Regional Board of Dental Examiners, Inc. (NERB) supported this idea in its report from the 2001 Steering Committee/Educators’ meeting. A recent report by Ranney et al., however, failed to find a significant relationship between the number of Class II amalgams, Class III/IV composites, and fixed prosthodontic units performed during dental school and students’ performance on the NERB clinical restorative exercise.

Reports regarding performance predictors for licensure examinations are uncommon in the literature, due perhaps in part to the difficulty in achieving adequate statistical power for meaningful results. We have reported preliminary data from the University of Florida College of Dentistry, comparing state licensure exam performance with mock board results and clinical productivity. This article is an expansion of that data and includes mock board performance, clinical productivity, and performance on the Florida Dental Licensure Exam from the years 1996 to 2003.

**Methods**

Mock board exam performance and clinical productivity data were collected for the past eight dental classes that graduated from UFCD (1996-2003). These data were then combined with state dental licensure exam results supplied by the Florida Department of Health, Division of Medical Quality Assurance, with the written permission of the UFCD graduates taking the licensure examination. Once these data were collated into a single spreadsheet, individual names were removed, thus ensuring anonymity. The University of Florida Institutional Review Board granted approval for this study.

The senior mock board, which replicates the Florida Dental Licensure Exam, is given in January of the senior year, approximately five months prior to the state exam. The time between the mock board exam and the state board exam allows for remediation activities for those students who fail sections of the mock board. The clinical (patient-based) portion of the mock board exam consists of an incipient Class II amalgam preparation and restoration, as well as periodontal debridement of five teeth of moderate difficulty. The simulated (manikin) portion consists of a Class II composite restoration, Class II amalgam restoration, Class IV composite, a fixed prosthodontic preparation, and endodontic therapy on an extracted tooth. In June 2000, the manikin exam was modified to include a Class II composite restoration, and the single fixed abutment preparation was changed to a three-unit bridge preparation. The senior mock board exam was modified to include these changes.

Student performance evaluation on the mock board exam is conducted in a manner that mathematically duplicates the state licensure exam process. Three examiners assess the patient (or the manikin) in blinded fashion at the appropriate step. Examiners do not discuss the grades or know what scores other examiners reported. Each procedure (or procedure step) is then given a numerical score that is the averaged score from the three examiners. The
scores range from “0” (failure) to “5” (the highest score). A score of “3” is judged a passing grade.

In addition to tracking mock board performance, clinical productivity profiles, tracked by ADA codes, are completed during the students’ junior and senior years. Both measures have been tabulated for each graduate of the eight dental classes, allowing a retrospective analysis to be conducted. The clinical procedures assessed for this analysis included the following: numbers of Class II amalgams, Class II composites, Class IV composites, endodontic (root canal) procedures, crowns and bridge abutments, and quadrants of periodontal scaling/root planing. Productivity data for thirty-one students were incomplete and therefore not included in data analysis reflected below.

To assess possible relationships between state board performance and mock board performance on the same procedures and between state board performance and clinical productivity, a one-way analysis of variance (ANOVA) was employed. For each state board exam procedure, the mock board scores for those who passed this particular state licensure procedure were compared with the mock board scores of those who failed the licensure procedure using ANOVA. In each case the null hypothesis (H₀) assumed that the means were equal (m₁ = m₂), thus indicating no significant difference between the groups. The alternate hypothesis (H₁) assumed that the means were unequal (m₁ ≠ m₂) and that there are differences between groups. The calculated P value was then used to determine if the difference between groups is statistically significant.

### Results

**Relationship of Mock Board Manikin Procedure Scores to State Licensure Exam Performance**

The results of analyses comparing the mock board manikin procedures with the state board manikin procedures appear in Table 1. The mean mock board scores (MB score) for those graduates who passed the analogous state board procedure were compared to the mean mock board scores of those students who failed the procedure on the state board exam. Scores for both mock board and state board procedures range from 0 to 5. Those who passed the state board exam (St Bd Pass) are indicated by number (N) and percent (%). Those who failed the state board (St Bd Fail) are also depicted by number (N) and percent (%).

No significant relationship was found among mock board scores on the Class II composite, the Class IV composite, the Class II amalgam, or the

<table>
<thead>
<tr>
<th>Procedure</th>
<th>MB score (passed procedure on St Bd)</th>
<th>MB score (failed procedure on St Bd)</th>
<th>F</th>
<th>F, α = 0.05</th>
<th>Sig.?</th>
<th>p=</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class II Composite**</td>
<td>206 77</td>
<td>2.916 62</td>
<td>1.7798</td>
<td>3.8767</td>
<td>No</td>
<td>0.1833</td>
</tr>
<tr>
<td>Class IV Composite</td>
<td>409 78</td>
<td>3.259 117</td>
<td>1.9103</td>
<td>3.8593</td>
<td>No</td>
<td>0.1675</td>
</tr>
<tr>
<td>Class II Amalgam</td>
<td>428 81</td>
<td>2.548 98</td>
<td>0.1927</td>
<td>3.8593</td>
<td>No</td>
<td>0.6609</td>
</tr>
<tr>
<td>Fixed Abutment/ Bridge Prep</td>
<td>346 66</td>
<td>2.432 180</td>
<td>3.8829</td>
<td>3.8593</td>
<td>Yes</td>
<td>0.0493</td>
</tr>
<tr>
<td>Endodontic</td>
<td>386 73</td>
<td>2.602 140</td>
<td>0.2286</td>
<td>3.8593</td>
<td>No</td>
<td>0.6328</td>
</tr>
</tbody>
</table>

*Percentages are rounded to nearest whole percent.
**The Class II composite procedure was added in 2000.

The mean mock board score (MB score) for those who passed a particular state licensure procedure are compared with the mean mock board score for those who failed that procedure on the state licensure exam. Those who passed the state board exam (St Bd Pass) are indicated by number (N) and percent (%). Those who failed the state board (St Bd Fail) are also depicted by number (N) and percent (%).
endodontic procedure. There was, however, a significant relationship (p<0.05) between the scores on the mock board fixed prosthodontic procedure and the fixed prosthodontic procedure on the manikin portion of the state licensure exam.

**Relationship of Mock Board Clinical Procedure Scores to State Licensure Exam Performance**

The relationship of mock board clinical procedure scores with state board pass/fail status for the analogous procedure is presented in Table 2. The mean mock board score (MB score) for those who passed the state board clinical procedure was compared with the mean mock board procedure score for those who failed the analogous state board clinical procedures. Those who passed the state board exam (St Bd Pass) are indicated by number (N) and percent (%). Those who failed the state board (St Bd Fail) are also depicted by number (N) and percent (%).

<table>
<thead>
<tr>
<th>St Bd Clinical Procedure</th>
<th>St Bd Pass</th>
<th>St Bd Pass (passed procedure on St Bd)</th>
<th>MB score</th>
<th>St Bd Fail</th>
<th>St Bd Fail (failed procedure on St Bd)</th>
<th>MB score</th>
<th>F</th>
<th>F, α = 0.05</th>
<th>Sig.?</th>
<th>p=</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%* Mean Score Range 0-5</td>
<td>N</td>
<td>%* Mean Score Range 0-5</td>
<td>F</td>
<td>F, α = 0.05</td>
<td>Sig.?</td>
<td>p=</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cl II Amalgam*</td>
<td>396</td>
<td>75</td>
<td>2.271</td>
<td>130</td>
<td>25</td>
<td>2.483</td>
<td>4.7835</td>
<td>3.8593</td>
<td>Yes</td>
<td>0.0292</td>
</tr>
<tr>
<td>Periodontal S/RP</td>
<td>417</td>
<td>79</td>
<td>2.962</td>
<td>109</td>
<td>21</td>
<td>2.880</td>
<td>0.4762</td>
<td>3.8593</td>
<td>No</td>
<td>0.4904</td>
</tr>
</tbody>
</table>

*Percent are rounded to nearest whole percent.

No significant relationship was found for mock board scores on the periodontal scaling/root planing procedure. There was, however, a significant relationship between the scores on the mock board clinical Class II amalgam and the state board clinical Class II amalgam procedures (p<0.05).

**Relationship of Clinical Productivity to State Licensure Performance**

The results of comparing the clinical productivity (number of dental procedures completed) with the state licensure manikin exam appear in Table 3. For each state board manikin procedure, the number of clinical procedures completed by those graduates who passed the same state licensure exam procedure was compared with those students who failed that exam procedure.

No significant relationship was found for numbers of Class II composites, periodontal scaling/root planing procedures, endodontic teeth treated, or crowns/abutments completed and performance on the state licensure exam. There was, however, a significant relationship between the number of clinical Class IV composite procedures completed during dental school and passing this procedure on the Florida Dental Licensure Exam (p<0.05). Of note was the significant relationship (p<0.01) between the number of Class II amalgams completed during the graduate’s student career and passing the clinical Class II amalgam procedure on the state licensure exam.

**Discussion**

Mock board experience and repeated performance of clinical procedures are considered by many dental faculty to be important components in preparing dental students to successfully complete state and/or regional licensure examinations. Yet studies by Jesse3 and Ranney5 failed to find significant relationships between state board pass/fail rates (especially clinical procedures) and the numbers of student clinical procedures. The question as to what is significant is still open for discussion and research. The data from UFCD’s retrospective analysis did not support a consistent relationship between performance on clinical procedures (manikin and patient-
based) of the state licensure exam and mock board performance and/or numbers of clinical procedures completed.

The data gained from this analysis was shared with the chairs of the clinical departments (Operative, Prosthodontics, Endodontics, and Periodontics). As a result, curricular modifications and new strategies for mock board preparation are being considered. The Department of Operative Dentistry noted the relationship between the number of clinical Class IV composites completed and state board performance on this procedure. The department is considering modification of the clinical competency menu for juniors and seniors to include additional required experiences with Class IV composite technique. Additional emphasis on the Class IV composite procedure during the mock board course may also be helpful. Also in the operative dentistry exam section, a relationship was found between licensure exam performance on the Class II patient amalgam procedure and mock board performance as well as clinical productivity for Class II amalgams. The Class II amalgam procedure was the only state licensure exam procedure that demonstrated a relationship with both mock board performance and clinical productivity. This fact has been shared with students and included in the mock board course lectures. In scoring the Florida state board exam, the patient Class II amalgam procedure accounts for 25 percent of the entire exam score. This procedure is weighted such that two-thirds of the score is based on the preparation and one-third on the restoration.

We hypothesize a relationship between the mock board performance and clinical productivity for this procedure could be related to a combination of factors. First, the criteria for this preparation are well established and universally understood and accepted by students, faculty, and state board examiners. Second, these criteria are carefully reinforced during the mock board course and are uniformly applied during the mock board exam as well as during daily clinical procedures and competency assessments. Third, repetition of this skill during daily student clinic sessions with feedback assessments provided by calibrated faculty should contribute to student learning and maintenance of competency for that procedure. Additional clinical experiences might allow students to gain a greater level of self-confidence for successful completion of this procedure, particularly when the preparation becomes larger than initial expectations. A student’s ability to remain focused and calm during dynamic, unanticipated events associated with clinical care might also enhance his or her performance on a stressful licensure exam.

<table>
<thead>
<tr>
<th>St Bd Procedure</th>
<th>St Bd Pass</th>
<th>St Bd Fail</th>
<th>Passed procedure on St Bd</th>
<th>St Bd Pass</th>
<th>St Bd Fail</th>
<th>Failed procedure on St Bd</th>
<th>N</th>
<th>%*</th>
<th>Av. # of Clinical Procedures</th>
<th>N</th>
<th>%*</th>
<th>Av. # of Clinical Procedures</th>
<th>F</th>
<th>F, $\alpha = 0.05$</th>
<th>Sig.$\dagger$</th>
<th>p=</th>
</tr>
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<tbody>
<tr>
<td>Cl II Amalgams</td>
<td>368</td>
<td>127</td>
<td>23.192</td>
<td>19.984</td>
<td>13.8406</td>
<td>3.8604</td>
<td>Yes</td>
<td>0.0002</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Cl II Composite</td>
<td>208</td>
<td>65</td>
<td>10.168</td>
<td>8.785</td>
<td>1.4196</td>
<td>3.8760</td>
<td>No</td>
<td>0.2345</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cl IV Composite</td>
<td>384</td>
<td>111</td>
<td>3.526</td>
<td>3.811</td>
<td>5.0401</td>
<td>3.8604</td>
<td>Yes</td>
<td>0.0252</td>
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<tr>
<td>Perio S/RP</td>
<td>389</td>
<td>106</td>
<td>38.141</td>
<td>36.226</td>
<td>1.1802</td>
<td>3.8604</td>
<td>No</td>
<td>0.2779</td>
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<tr>
<td>Endodontic Teeth</td>
<td>364</td>
<td>131</td>
<td>6.129</td>
<td>6.252</td>
<td>0.6361</td>
<td>3.8604</td>
<td>No</td>
<td>0.4255</td>
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<tr>
<td>Fixed Pros</td>
<td>323</td>
<td>172</td>
<td>16.480</td>
<td>15.812</td>
<td>2.1302</td>
<td>3.8604</td>
<td>No</td>
<td>0.1451</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*p Percents are rounded to nearest whole percent.

The clinical productivity (average number of procedures completed during the junior and senior years) for a particular procedure for those who passed the same state licensure procedure is compared with the clinical productivity of a particular procedure for those who failed that state board procedure. Those who passed the state board exam (St Bd Pass) are indicated by number (N) and percent (%). Those who failed the state board (St Bd Fail) are also depicted by number (N) and percent (%).

Table 3. Relationship of clinical productivity with respective state board procedure pass/fail
Repetitions might also promote refinement of critical thinking skills allowing students to make correct decisions when faced with new clinical situations.

A relationship between the prosthodontic procedure on the state board and the mock board is most likely due to application of uniform criteria during initial preclinical training, the mock board preparation, and the state licensure exam. Because appropriate training in fixed prosthodontics is critical to graduation of a competent dentist, a significant portion of the curriculum is devoted to prosthodontics. Seminars and mock board practice sessions encourage precise preparations. One of the prosthodontic competency assessments is preparation of a three-unit fixed bridge, premolar to molar, and fabrication of a provisional restoration. The three-unit bridge preparation on a manikin is performed and critiqued by faculty two to three times during the course of predoctoral prosthodontic training. Clinical fixed prosthodontic productivity did not demonstrate a relationship with state board exam performance, possibly due to the fact that students have a smaller menu of procedures for attainment of competency than, for example, in operative dentistry. It is also possible that the fixed prosthodontic skills required to complete the state board manikin procedure are different from those required for clinical competency.

In this analysis, no relationship was found between endodontic mock board and state board performance. In addition, no relationship between clinical productivity and state licensure performance for the endodontic procedure was noted possibly because of the low number of endodontic procedures completed by each graduate.

Lack of relationships among state licensure exam performance on the clinical periodontal scaling/root planing portion, mock board performance, and clinical productivity is an interesting finding. We hypothesize that this might be due to an inadequate understanding by faculty regarding board examiners’ performance criteria or additional factors beyond the scope of this report.

These data and similar analyses can prove useful in designing clinical experiences and competencies and in structuring and emphasizing the mock board experience. Also, these data can be used to start or continue a dialogue between dental schools and the state or regional licensure boards.

There was, however, a significant relationship (p<0.05) between the Class II amalgam clinical procedure on the mock board and Class II amalgam patient procedure on the state licensure exam. There was also a significant relationship (p<0.05) between the manikin fixed prosthodontic procedure on the mock board and successful completion of that procedure on the state licensure exam.

When productivity data were compared with the state board pass/fail rate, no significant relationship was found for numbers of Class II composites, periodontal scaling/root planing, endodontic procedures, or crowns/abutments completed by students before taking the licensure examination. However, there was a significant relationship (p<0.05) between the number of Class IV composites completed during training and the pass rate the Class IV manikin composite on the state licensure exam. Consideration has been given as to why the number of Class II composites completed during training had no relationship with performance on the state licensure exam. We have speculated that one component might be the difference between conservative Class II composites placed in the UFCD clinical setting and the large Class II composite restoration included on the state licensure exam. The licensure exam requires students to place a four-surface composite restoration on a pre-prepared posterior molar, such as a MODB or MODL, with cusp replacement. Most Class II composite restorations placed in the predoctoral clinical program do not involve cusp replacement. Therefore, lack of a relationship between productivity and state board exam performance might be influenced by this situation.

Conclusions

When mock board performance and clinical productivity data for eight dental classes (1996-2003) were compared with Florida Dental Licensure Exam pass/fail rates, significant relationships (p<0.05) were found for the mock board fixed prosthodontic preparation and the clinical Class II amalgam. Significant (p<0.01) clinical productivity relationships were found between the number of Class II amalgams completed during the junior and senior year and passing the clinical Class II amalgam procedure on the state licensure exam. In addition, a significant relationship (p<0.05) between the number of Class IV composite procedures completed during clinical training and passing Class IV manikin composite procedure on the state licensure exam was noted.
Of the thirteen factors examined, scores on nine of the factors were not related to performance on the like procedure on the state licensure exam. No statistically significant relationship was found between the following mock board manikin procedures, Class II composites, Class IV composites, Class II amalgams, the endodontic procedure, and the clinical periodontal scaling/root planing and the like procedures on the licensure exam. Likewise, no relationship was found between the clinical productivity measured by the numbers of Class II composites, endodontic teeth treated, crowns and abutments completed, and quadrants of periodontal scaling/root planing and these procedures on the state licensure exam.

These results support beneficial aspects of mock board exams in preparing students for state licensure examinations in some areas of clinical performance and may be useful for assessing dental student clinical experiences and/or competencies and allocating curricular time for development of clinical proficiency. Future studies may elucidate additional trends and predictors for successful performance on state dental licensure examinations.

REFERENCES