Preclinical Restorative Training

Michael B. Ferguson, D.M.D.; Morton Sobel, D.D.S.; Richard Niederman, D.M.D.

Abstract: In conjunction with its problem-based learning curriculum, Harvard School of Dental Medicine (HSDM) developed a shortened preclinical restorative training curriculum. This study compared our curriculum with those in other dental schools and examined student reaction to it. Twenty-nine U.S. dental schools responded to a survey regarding the length of their preclinical course in Operative Dentistry. Nationally, preclinical courses ranged from 179 hours to 280 hours (mean ± SEM = 193 ± 9 hours; n = 29). In marked contrast, the new seventy-five-hour preclinical curriculum at Harvard was the lowest of any school, and significantly lower than the U.S. average (p<0.01). In Harvard’s previous curriculum, students spent 232 curriculum hours. Reactions of Harvard students to this compact preclinical curriculum were surveyed using a three-topic, three-category survey instrument. Results indicated that, prior to beginning clinical patient care, approximately 80 percent of students felt that the course was too short and 20 percent just right. Conversely, and retrospectively, after completing their dental school training, only 35 percent felt it was too short, and 65 percent felt it was just right. Retrospectively, in terms of clinical preparedness, 55 percent felt adequately prepared and 35 percent felt well prepared to treat their patients. No significant change was noted between Part II National Board scores following the change to the reduced curricula time. The average National Board Part II scores prior to initiating the new curriculum was 86.3, and afterwards, it was 86.2. Further, for the North East Regional Board, HSDM students in the past four years demonstrated a 98 percent overall success rate with 100 percent primary pass in the operative dentistry part of the examination. These results suggest that an abbreviated preclinical training is not only possible, but may make time available for training opportunities in other areas, such as aesthetic dental procedures and new biomaterials.

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The purpose of every curriculum is to provide the graduating dental student with a well-rounded, balanced educational experience and the preclinical and clinical exposures necessary for competence. However, significant changes in prevention, esthetics, and dental materials place significant time constraints on the educational system. No longer can the teaching of traditional amalgam and cast gold restorations alone be considered adequate preparation for the modern dental practitioner of restorative dentistry. Productivity, too, must be factored into the total educational experience, if dental school training is to be a valid preparation for the real world.

An area of dental education that traditionally consumes a large proportion of teaching hours is the preclinical operative course of study. This is an area that has come under close scrutiny at the Harvard School of Dental Medicine (HSDM), particularly the laboratory exercises involving waxing procedures and laboratory preparations on extracted or artificial teeth. With the development and implementation of the problem-based learning curriculum in 1996,1 we reevaluated and reduced the traditional preclinical training period. The previous course consisted of a six- to eight-month period of almost daily lectures and daily laboratory sessions of approximately six hours for a total of 232 hours. The duration of the restructured operative clinical course is now seven weeks for a total of seventy-five course hours. The training period consists of two one-hour lectures per week, each of which is followed by three to six hours of preclinical laboratory practice time. This laboratory time specifically focuses on the concepts taught in the classroom. At the end of this seven-week period, and after passing appropriate competency exams, the student enters the clinic and sees his or her first patient.

This system, of course, requires a very close and ongoing rapport between the Oral Diagnosis Section, which triages all incoming patients, and the clinical staff that oversees the students. The patient population must be carefully screened and assigned to correspond with the actual skill levels of the student clinicians. The director of the Oral Diagnosis Section is a full-time faculty member, so there is firsthand knowledge of student needs at the various levels of clinical skills. This constant liaison between the members of the teaching faculty and the students facilitates productivity and effective case completion. Students, in their first clinical encounters, are assigned patients whose dental needs are not too in-
involved. The more complex cases, or those requiring prosthetic reconstruction, must be referred to the postdoctoral department or to a fourth-year student. As the proficiency skills of the beginning student clinicians evolve and their competency levels are determined to be adequate, the levels of difficulty of the assigned cases increase as well.

We report here on the methods employed to achieve this abbreviated training period and compare our curriculum time devoted to preclinical operative dentistry to the time spent at other dental schools.

**Methods**

To compare this new program with other U.S. dental schools and determine its effectiveness, we did the following: 1) We surveyed, by mail, the U.S. dental schools for preclinical training time (total weeks and total time). The survey was addressed to the dean for dental education at these dental schools. 2) We surveyed Harvard students to determine their reactions and comfort with their training. This was done prior to students’ seeing their first patient and just prior to graduation. 3) We compared National Board scores and the North East Regional Board pass rates prior to and after initiating the new training program.

Figure 1 displays the time line and subject sequence for the seven weeks devoted to the preclinical operative program. From Figure 1, it can be seen that there is a sequenced engagement with the principle restorative procedures. Not apparent in the graphic is the student engagement with patients. Normally, students who are completing their competency examination for Class II amalgam preparations are seeing their first patients in the Student Teaching Clinic. As part of this initial clinical experience, the student is taking histories, doing intra-oral and extra-oral examinations, preparing study models, seeking specialty consultations from the various disciplines, and preparing treatment plans with the assistance of that student’s senior tutor. When indicated, and if competency levels have been ascertained preclinically, the student may begin providing restorative treatment for the patients.

**Results**

We compared our preclinical operative training to that of the other dental schools in the United

<table>
<thead>
<tr>
<th>Week</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
<td>Rubber Dam</td>
<td>Class I Amalgam Preparations</td>
<td>Class II Amalgam Preparations</td>
<td>Amalgam Restorations</td>
<td>Class V Amalgam Prep/Restoration</td>
<td>Class V Composite Prep/Restoration</td>
<td>Class III Composite Preparations</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Note: These 12 areas of training occur as follows:
- Tutorial in the morning, twice weekly for case-based learning, containing pertinent material associated with the subject/theme.
- 1 lecture/subject of approximately 1 hour in length
- 3 to 6 hours of laboratory practice, employing new skills in the laboratory setting

*Also referred to as the student’s “Clinical Entrance Examination.” When successfully completed, in a “State Board-type setting,” the student is allowed to progress to the clinic and begin treating patients.

**Figure 1. Training schedule**
States. Twenty-nine or roughly 54 percent of the dental schools surveyed responded to the questionnaire. The results are displayed in Table 1 and Figure 2. The results indicate that for the responding U.S. dental schools, the average preclinical training time was 193 hours ± 9 hours (mean ± SEM) (95 percent CI: 175 to 212; Range: 179-280). This was significantly more than the seventy-five hours of training time at Harvard (P<0.0001, t-test).

Because of the compressed training time in this new curriculum, we were concerned about student stress level, competency, and confidence. To examine these issues, we surveyed the students using a three-topic, three-category survey instrument (see Table 2). Of the 114 students in the classes surveyed, eighty-nine students completed the survey. The results indicated that, prior to beginning clinical care, approximately 70 percent of students felt that the training period was stressful, 20 percent felt that it was not stressful, and 10 percent felt that it was very stressful (see Figure 3). When surveyed as to their perception of preparedness, subsequent to this abbreviated preclinical program, 55 percent felt that they had been adequately prepared, 35 percent felt good about their preparation, and only 10 percent felt that they were poorly prepared for clinical responsibilities (see Figure 4). Further, despite the initial high level of stress, the majority of students at graduation and in retrospect reported that the experience prepared them adequately for clinical practice (data not shown).

When surveyed prospectively and retrospectively regarding course length, the students’ perceptions were quite different. In Figure 5, we can see that 80 percent felt, prospectively, that the course was too short. When surveyed retrospectively, however, 65 percent of the students felt that the course was just right.

We were also concerned about the students’ ability to pass the National Boards Part 2 and North East Regional Boards. Our data indicate that the average National Board Part 2 scores prior to initiating the new curriculum was 86.3; after, it was 86.2. Further, for the North East Regional Board, Harvard students in the past four years demonstrated a 98 percent overall success rate, with 100 percent primary pass in the operative dentistry part of the examination. Thus, there appears to be no significant difference in the clinical preparation of the HSDM students before and after implementation of the new curriculum.

Finally, nonsystematic informal qualitative questioning at graduation exit interviews suggests that most

**Table 1. Comparative preclinical operative course analysis**

<table>
<thead>
<tr>
<th>Duration</th>
<th># of Course Hours</th>
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<tbody>
<tr>
<td>Harvard's Previous Operative Preclinical Curriculum</td>
<td>6-8 Months</td>
</tr>
<tr>
<td>Harvard's Present Operative Preclinical Curriculum</td>
<td>7 Weeks</td>
</tr>
<tr>
<td>National Average</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Range: 179-280 Hrs.</td>
</tr>
</tbody>
</table>

**Figure 2. Preclinical time commitments in a sample of thirty U.S. dental schools**

*Note:* This information was gathered from the twenty-nine responding dental school surveys. The Harvard preclinical operative time commitment is clearly shorter than the time commitments of the other operative dentistry programs.

**Table 2. Format of the three-topic, three-category survey**

<table>
<thead>
<tr>
<th>Issue</th>
<th>Not Stressful</th>
<th>Stressful</th>
<th>Very Stressful</th>
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<tbody>
<tr>
<td></td>
<td>Poor</td>
<td>Adequate</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Too Short</td>
<td>Just Right</td>
<td>Too Long</td>
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course contents established within its problem-based learning curriculum and implemented an abbreviated seventy-five-hour preclinical training program.

This preclinical course may seem too brief to some dental educators, but the outcomes indicate that, in spite of the typical antecedent stress prior to patient visits, months of repetition in the laboratory does not necessarily better prepare students for the clinical phase of the curriculum.

The results also suggest that it may be useful to reevaluate the present preclinical curriculum allotments in other U.S. dental schools to determine whether these results can be repeated. The time saved may be used more productively in other areas of basic, behavioral, diagnostic, and preclinical science, scientific methods, and critical thinking exercises or for the introduction of new materials and techniques, thus maintaining a curriculum approach that mirrors the advances constantly being made in modern dentistry. At HSDM, we are now able to include in the curriculum such topics as smile analysis and design, bleaching techniques, posterior adhesive restorations (both direct and indirect), additional porcelain lectures, and direct composite veneers with microhybrids (a layered approach).

Discussion

Due to changing needs in dental education and increasing demands upon available curriculum hours to accommodate these changes, the Harvard School of Dental Medicine reevaluated the time allotments and

students would not alter this new curricular approach. None felt that it was too long. Students also commented that, when comparing their own preclinical experience with that of friends who are students at other dental schools, they felt that their training was complete and included the necessary content for competency, without the months of repetition described by their peers.

REFERENCE