Dental education development reflection from an objective structured clinical examination

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Abstract

Background/purpose: Recently, dental education has put emphasis on the assessment of clinical competencies using an objective structured clinical examination (OSCE). The purpose of this study was to assess several clinical competencies required for dental graduates by having dental students and residents of different levels take the same set of OSCEs.

Materials and methods: Twelve 5th-grade dental students (D5), 12 dental interns (Ri), and 12 1st-year dental residents (R1) were recruited to take the same set of OSCEs composed of six stations: Station 1, explanation of a treatment plan for restoration of a missing tooth; Station 2, taking a study cast impression with alginate; Station 3, explanation of a treatment plan for restoration of an inlay; Station 4, explanation to a mother for taking a radiograph of her child’s tooth; Station 5, placement of a rubber dam on a designated tooth and Station 6, explanation of pulpitis diagnosis and treatment. The examinee’s performance was graded using both global rating and checklist scores.

Results: There were significant differences in the mean global rating and checklist scores of Stations 3, 5, and 6 among the three groups. In Stations 3 and 5, R1 performed best, followed by R1 and D5. In Station 6, R1 performed best, followed by Ri and D5. In Stations 1, 2, and 4, there were no significant differences among the three groups. However, Ri performed better than R1 in Station 1.

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Introduction

The focus of dental education worldwide has expanded during the past few years. Discussions have ranged from core competencies of dentists and academic programs to clinical assessment strategies. Current emphasis has focused on patient-centered medical service and advanced clinical training, including especially the appropriate attitude and good communication skills. As a result, clinical performance assessment using the objective structured clinical examination (OSCE) has gained popularity. Moreover, its usage in dental assessment has been broadly discussed. After analyzing the results of OSCE tests, academic courses could be adjusted to achieve the most suitable combination of teaching, testing, learning, and performing.

The purpose of this study was to assess several clinical competencies required for dental graduates by having dental students and residents of different levels take the same set of OSCEs. In the beginning, the teaching committee raised several clinical competencies required for a dental graduate. However, no general consensus has been reached regarding the extent and degree of preparedness of these individuals—especially considering that these are students of different levels. By utilizing OSCE, participants of different levels were examined for certain clinical skills, and their performance outcomes were correlated with current dental education. Furthermore, by evaluating the variation between learning and performance outcomes, curriculum guidance can be re-established.

Materials and methods

An OSCE composed of six stations was designed for this study. Clinical scenarios were set up in the dental clinics of the National Taiwan University Hospital, Taipei, Taiwan where the examination took place. The process of station development began by assembling a multidisciplinary committee consisting of nine clinically well-experienced instructors from the Department of Dentistry, National Taiwan University Hospital. The committee provided a blueprint of certain core competencies required for a dental graduate (Table 1). The development of the questionnaire was based on this blueprint. After generating the six OSCE stations, both reliability and validity were tested. Six clinical scenarios were set up, including four using standardized patients and two testing the clinical skills. In the four stations using standardized patients, participants were asked to give treatment plans for restoration of a missing tooth and an inlay, an explanation to a mother for taking a radiograph of her child’s tooth, and an explanation of pulpitis diagnosis and treatment. In the two stations testing clinical skills, participants were asked to take a study cast impression with alginate and to place a rubber dam on a designated tooth. The examinees’ performance was graded using a checklist score (successful items/total items evaluated, expressed as a percentage) and a global rating score (1 = clear fail; 2 = borderline; 3 = clear pass; 4 = very good pass; 5 = excellent pass). Nine clinically well-experienced dental staff members were recruited as OSCE examiners. OSCE examiner workshops were held once a week for 4 weeks. During the workshop, OSCE examiners were given a basic introduction about performance-based assessment and a more detailed instruction about the rating tool and the principle of formulating the checklists. Rehearsals were provided by video presentation and video rehearsal. Through team discussion, feedback, and educational programs, the confidence of the raters was enhanced. Furthermore, the validity and consistency were improved. In the examination, residents of the dental department acted as standardized patients. A panel discussion was held 2 hours prior to the examination to improve the reliability of the actor’s performance.

Participants

Thirty-six participants—consisting of 12 5th-grade dental students (D5), 12 dental interns (Ri, also called 6th-year dental students), and 12 1st-year dental residents (R1)—were randomly selected and included in this study. Details on age, sex, and the past year’s average school grade are listed in Table 2.

Methods

Thirty-six examinees were randomly assigned into six groups, with six participants in each group. Six 10-minute OSCE stations were designed: Station 1, explanation of a treatment plan for restoration of a missing tooth; Station 2, taking a study cast impression with alginate; Station 3, explanation of a treatment plan for restoration of an inlay; Station 4, explanation to a mother for taking a radiograph of her child’s tooth; Station 5, placement of a rubber dam on a designated tooth; and Station 6, explanation of pulpitis diagnosis and treatment. Each station provided 2 minutes for reading of the question and making the clinical judgment and 8 minutes for clinical performance. The whole procedure was recorded with a videocassette recorder. A faculty member was assigned in each station to monitor the whole procedure. Clinical performance was assessed using a checklist score and a global rating score, which were
previously formulated in the pretest meeting as a performance assessment in each clinical scenario.

Statistical analysis

The software SPSS version 11.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. The mean global rating and checklist scores among the three groups of 12 5th-year dental students (D5), 12 dental interns (Ri), and 12 1st-year dental residents (R1) were compared using multivariate analysis of variance, and the variances among the three groups were compared using Wilk’s lambda.

Results

As shown in Table 2, there was no significant difference in baseline sex, age, and school grade among the three groups (D5, Ri, and R1). However, there were significant differences in the mean global rating and checklist scores in Stations 3, 5, and 6 among the three groups with values of $P = 0.0041$, $P = 0.0003$, and $P = 0.0003$, respectively. In Stations 3 and 5, Ri performed best, followed by R1 and D5. In Station 6, R1 performed best, followed by Ri and D5. In Stations 1, 2, and 4, there were no significant differences among the three groups. However, Ri performed better than R1 in Station 1 (Table 3).

Discussion

The aim of the study was to evaluate whether there was an effective bridge between teaching or examining and practicing, and to assess whether the lecture goal and core competence fully fulfilled clinical needs. We analyzed three groups of dental students before and after graduation by using the same setting of clinical scenario to see whether participants from different phases of dental education had different performances. The OSCE stations were set up according to the basic clinical skills that a dental student should acquire prior to graduation.

Theoretically, the 1st-year dental resident (R1) should perform better than the dental intern (Ri). However, in Station 1 (explanation of a treatment plan for restoration of a missing tooth), Station 3 (explanation of a treatment plan for restoration of an inlay), and Station 5 (placement of a rubber dam on a designated tooth), Ri performed best among the three groups. Stations 1, 3, and 4 comprised examinations using standardized patients, with the aim of analyzing professionality including attitude and communication skills toward doctor—patient relationship. In particular, in Station 3, wherein the dentist’s communication attitude was analyzed, R1 performed significantly worse than Ri. According to a previous study, this may be due to paying less attention and having busier routine work, and thus R1 neglected the importance of communication attitude and skill. As a result, this reminds us that in the resident training program after graduation, clinical communication skills and attitude should be reemphasized. In Station 5, a clinical skill was examined. However, R1 performed significantly worse than Ri. This could be because this clinical skill is no longer as necessary as other
core competencies as time passes by, and dentists are no longer familiar with this skill. Consequently, we should reconsider the necessity of requiring this clinical skill as a core competence, and narrow down the gap between lecture-based teaching and clinical practice.

In Station 2 (taking a study cast impression with alginate) and Station 6 (explanation of pulpitis diagnosis and treatment), R1 performed best, followed by Ri and D5; especially in Station 6, in which performance showed a significant difference. This reveals that the bridging between teaching or learning and practicing underlying these two stations has a good coordination. Moreover, the performance goals are set appropriately. We suggest that our results may be helpful in setting up other clinical core competencies.

There were no significant differences in performance in Stations 1, 2, and 4 among the three groups. This means that certain courses may be delivered in the earlier phase of dental education, such as in the clerkship, and higher standards of required competence can be given during the internship.

Table 2

| Demographic data of 5th-year dental students (D5; n = 12), dental interns (Ri; n = 12), and 1st-year dental residents (R1; n = 12). |
|---|---|---|---|
| Age (y) | D5 | Ri | R1 | Percentage (%) |
| 20–23 | 9 | 1 | 0 | 27.8 |
| 24–27 | 3 | 11 | 10 | 66.7 |
| 28–31 | 0 | 0 | 2 | 5.5 |
| Sex | | | | |
| Male | 7 | 6 | 6 | 52.8 |
| Female | 5 | 6 | 6 | 47.2 |
| Average school grade | 83.6 ± 8.6 | 86.2 ± 10.3 | 87.4 ± 12.7 |
| Total | 12 | 12 | 12 | 100 |

Considering the examination procedures and the grading systems, the global rating scores and the checklist scores were very similar, demonstrating that this examiner training program could efficiently train examiners to reach a certain standardized grading ability. Because of the limited number of participants, our results were not suitable for further evaluation using the borderline regression method. However, our results could be used in discriminating between any two of the three groups, and in building up a database or a reference using the Angoff method by a specialist committee after further reorganizing the difficulties and sorting them into an appropriate order.

In this study, we allowed dental students and residents of different levels to take the same set of OSCEs. The examinees were assessed in an effort to measure their learning and clinical performance. With constructive feedback from the examinees, we can further develop a guideline in setting up the criteria and teaching goals that would be suitable for the different phases of dental education. Furthermore, our results indicate that the dental

Table 3

<table>
<thead>
<tr>
<th>Station</th>
<th>Mean global rating scores</th>
<th>Mean checklist score (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D5</td>
<td>Ri</td>
<td>R1</td>
</tr>
<tr>
<td>1</td>
<td>3.00 ± 1.21</td>
<td>4.17 ± 0.83</td>
</tr>
<tr>
<td>2</td>
<td>3.42 ± 0.79</td>
<td>3.92 ± 0.51</td>
</tr>
<tr>
<td>3</td>
<td>1.92 ± 0.67</td>
<td>3.50 ± 1.00</td>
</tr>
<tr>
<td>4</td>
<td>3.33 ± 0.78</td>
<td>3.75 ± 0.75</td>
</tr>
<tr>
<td>5</td>
<td>2.75 ± 0.75</td>
<td>3.92 ± 0.29</td>
</tr>
<tr>
<td>6</td>
<td>2.08 ± 1.00</td>
<td>3.25 ± 0.87</td>
</tr>
</tbody>
</table>

SD = standard deviation.
* Significant difference.

a The mean global rating and checklist scores among the three groups of D5, Ri, and R1 were compared using multivariate analysis of variance, and the variances among the three groups were compared using Wilk’s lambda with P < 0.05.

b Station 1 = explanation of a treatment plan for restoration of a missing tooth. Station 2 = taking a study cast impression with alginate. Station 3 = explanation of a treatment plan for restoration of an inlay. Station 4 = explanation to a mother for taking a radiograph of her child’s tooth. Station 5 = explanation of pulpitis diagnosis and treatment.
resident training program should focus more on professional communication skills.

Conflicts of interest

All contributing authors declare no conflicts of interest.

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