

# A Problem-Based Learning Tutorial for Dental Students Regarding Elderly Residents in a Nursing Home in Japan

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*Abstract:* This educational trial was an eight-day problem-based learning (PBL) course for fourth-year predoctoral students at Okayama University's dental school who interviewed elderly residents living in a nursing home. The purpose of this PBL course was to introduce geriatric dentistry to the students by allowing them, independently, to discover the clinical problems of elderly patients as well as the solutions. The sixty-five students were divided into nine small groups and received patient information (age, gender, degree of care needed, medical history, food type, medications, and oral condition) in datasheets before visiting the nursing home. Each group of students directly interviewed one patient and the caregivers and identified the patient's medical, psychological, and social problems. After the interview, the students participated in a PBL tutorial to delineate a management approach for the patient's problems. To measure the efficacy of this program, the students completed a questionnaire before and after the course regarding their level of understanding of and attitudes toward geriatric dentistry, clinical research, and self-study. The results showed that students' perceptions of their knowledge about and attitudes toward oral health care for the elderly significantly increased after the PBL course, which suggests that such tutorials should be an option for dental curricula.

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Currently, the worldwide increase in life expectancy has caused a rise in the number of senior citizens,<sup>1</sup> which, in Japan, exceeds 20 percent of the total population.<sup>2</sup> As the number of seniors increases, specialized services have been developed and adopted to improve seniors' quality of life. In dentistry, several dental treatments, including prosthetic rehabilitation, have been largely reported to improve the oral health-related quality of life of elderly patients.<sup>3,4</sup>

It is important that dental students understand the daily life needs of elderly patients as well as approaches for managing them. Such an understanding of their needs should include not only their physical but also their social and psychological functioning. A particular group of individuals, however, who present more dramatic physical or mental impairments (e.g., Alzheimer's disease and cerebrovascular diseases) usually search for higher levels of personal care and support at long-term nursing homes. Additionally, these frail elderly or bedridden patients frequently have some difficulty eating or swallowing due to prosthodontics problems or oropharyngeal dysphagia (e.g., choking, coughing, and aspiration of food or saliva), which eventually may lead to malnutrition and immune system compromise, dehydration, or even aspiration pneumonia. Under these circumstances, predoctoral dental students rarely will have the opportunity to treat such frail elderly or bedridden patients in the usual dental curriculum because of these patients' inability or great difficulty in receiving treatment at dental schools.

Currently, it is becoming more common in Japan for general dentists to visit disabled elderly patients in their own homes or at nursing care facilities in order to deliver dental treatments, which are partially covered by Japanese national insurance. Henceforth, due to the growing demand of such services, there is also a need to increase the numbers of dental schools offering geriatric training courses at nursing care facilities in order to enable early student contact with this patient population and to expand students' future perspectives; at the same time, this would produce better prepared professionals and eventually enable the provision of better health services to communities. According to reports published in 2003 and 2005, there are only a few dental schools providing clinical training courses on geriatric dentistry in health care facilities outside schools in the United States and Europe.<sup>5,6</sup> Similarly, in Japan, only ten out of twenty-nine dental schools have geriatric clinical training programs; among

these, only six include geriatric clinical training at long-term nursing care facilities.<sup>7,8</sup>

In this context, Okayama University's dental school started a problem-based learning (PBL) course in 1996,<sup>9-11</sup> and in 2009 it started a visiting program to elderly nursing care facilities. Our previous study reported that student knowledge about evidence-based medicine (EBM) increased after the tutorial course.<sup>12</sup> In another study focused on dental students who visited elderly patients in nursing homes, Tohara et al. reported that internships in the nursing home helped students understand elderly patients,<sup>13</sup> but those students had already received some clinical experience and did not probe for the patients' problems in that study, i.e., that study did not involve a PBL program.

Although PBL has been widely adopted by many medical and dental schools, its efficacy is still debated. A systematic review of PBL in academic health education reported that, at the level of randomized controlled trials and comparative studies, no clear difference was observed between PBL and conventional teaching. Paradoxically, only comparative studies of single PBL interventions in a curriculum yielded results that were consistently in favor of PBL.<sup>14</sup> Particularly in the dental field, PBL track students have been found to score significantly higher than the traditional track students.<sup>15-19</sup> In another study, PBL improved the educational effect of self-study and clinical inference ability in comparison to lecture-based learning.<sup>20</sup> Although other studies reported that there was no difference in performance between the PBL and the traditional lecture students on examinations,<sup>21,22</sup> a four-year measurement of mock patient examinations and follow-up clinic patient examinations found that using the PBL methodology resulted in student performance of nonsurgical periodontics skills at a level equal to or greater than that of a conventional approach.<sup>22</sup>

In our current PBL course, the students interviewed elderly patients at a nursing care facility with the aim not only of prosthodontic treatment or EBM but also of treating other aspects related to patients' medical conditions or welfare (e.g., dementia, eating, and quality of life). This article reports the results from this course.

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## Materials and Methods

This PBL course focused on fourth-year dental students at Okayama University who had no previ-

ous clinical experience. In Japan, dental schools have six-year programs. At Okayama University, dental students start clinical courses during the fourth year. We conducted this tutorial course in the early period of the fourth year; therefore, the students had not taken clinical courses at that time. The sixty-five students were assigned to nine groups of seven to eight members, and the general instructional objectives and specific behavioral objectives of this course were explained to them (Table 1).

The training course lasted eight days (Figure 1). On day 1, all students received a lecture on general geriatric dentistry and received the patient

information datasheet (e.g., age, gender, degree of care needed, medical history, activities of daily life, food type, medications, and oral condition), as shown in Figure 2. If necessary, the dental chart was also utilized for additional consultations. On the second or third day, half of the groups interviewed and examined the patients alternately. A total of nine patients (female to male ratio 7:2), with an age range of seventy-five to ninety-two years, agreed to participate (Table 2). According to the classification of level of care (levels 1 to 5) of Japan's Ministry of Health, Labour, and Welfare, all patients needed some degree of care, and seven of them needed care level 3 or above (the elderly patient could not stand up or walk independently and needed toileting assistance). All patients had some history of systemic illness, with cardiovascular or cerebrovascular diseases being the most common. Bone fracture (four out of nine patients) and pneumonia (three out of nine patients) were also prevalent. Seven of the nine patients were receiving food of a normal consistency. The remaining tooth number was variant, and most patients were using removable dentures. Permission to visit the nursing home, conduct the program, and publish the results was obtained from the Okayama University Dental School Committee. On days 4 through 7, the students participated in a PBL tutorial and discussed the patients' problems and methods for managing them within each group. On day 8, each group presented the patient case.

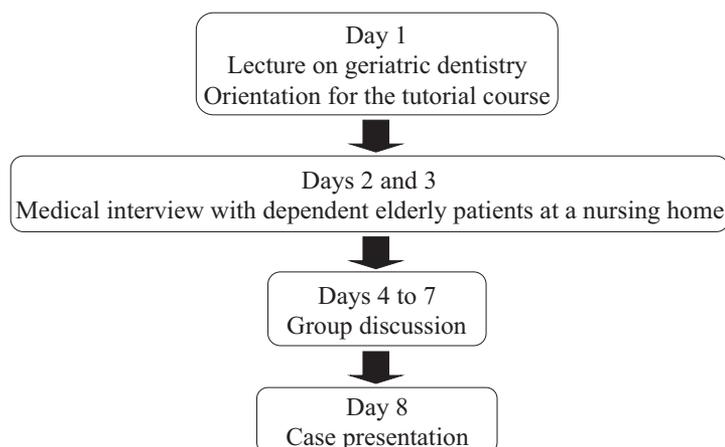
**Table 1. General instructional objectives and specific behavioral objectives of this PBL course**

General instructional objectives

1. To understand the concept of a patient-oriented system (POS).
2. To identify the problems of dependent elderly patients in a nursing home.
3. To provide management approaches.

Specific behavioral objectives

1. To be able to explain the medical treatment concept of a POS.
2. To experience a medical interview with an actual inpatient.
3. To understand patients' complaints and identify their needs.
4. To experience the process of how to manage patients' problems.
5. To make a case report.



**Figure 1. PBL course schedule**

DOS: doctor-oriented system, POS: patient-oriented system

Group B

Patient: 90 years old, female

Degree of care needed: 2 (needs help to stand up in daily activities, early signs of dementia)

Medical history:

Fundal hemorrhage, cholecystectomy, hip osteoarthritis, hypertension, asthma, cardiac arrest

Activities of daily living:

Needs some help in daily activities, riding a wheel chair, can communicate with others, currently no asthma attack, likes origami

Food form: general diet, can eat by herself

Medications:

Azosemide, Eplerenone, Torasemide, Olmesartan, Medoxomil, Amlodipine besilate, Allopurinol, Digoxin, Famotidine, Bezafibrate, Brotizolam

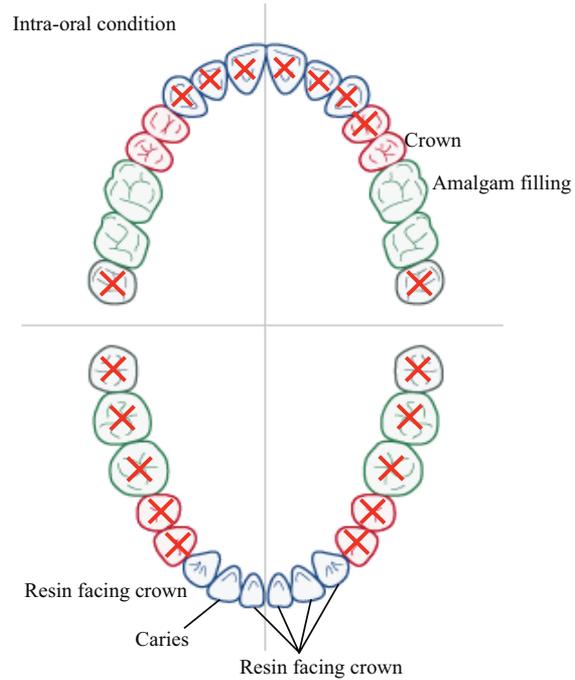


Figure 2. Example of a patient's information datasheet given to students before patient interviews

Note: The datasheet contained information regarding the patient's age, gender, degree of care needed, medical history, activities of daily living, food type, medications, and oral condition.

Table 2. Information on all patients included in course

| Age | Gender | Degree of Care Needed | Medical History   | Food Consistency                  | Remaining Tooth Number | Removable Denture |
|-----|--------|-----------------------|---|-----------------------------------|------------------------|-------------------|
| 88  | Female | 4                     | cerebral infarction, thoracic vertebra fracture, aspiration pneumonia, asthma | rice gruel, water added thickness | 8                      | yes               |
| 90  | Female | 2                     | hypertension, cardiac arrest, osteoarthritis of the hip, pneumonia            | normal                            | 13                     | yes               |
| 78  | Male   | 4                     | cerebral infarction, lumbar vertebra fracture, diabetes                       | normal                            | 2                      | yes               |
| 89  | Female | 3                     | infectious spondylitis, lymphadenitis, diabetes                               | normal                            | 0                      | yes               |
| 80  | Male   | 1                     | cerebral infarction, cardiac arrest, pneumonia                                | normal                            | 32                     | no                |
| 85  | Female | 5                     | femoral fracture, osteoarthritis of the spine, cataract, kidney calculus      | soft food                         | 26                     | no                |
| 89  | Female | 2                     | thoracic vertebra fracture, pneumonia   | normal                            | 0                      | yes               |
| 75  | Female | 4                     | dementia, fibroid of uterus   | normal                            | 7                      | yes               |
| 92  | Female | 3                     | hypertension, dementia, osteoporosis  | normal                            | 22                     | no                |

Note: Degree of care needed: 1=walking or standing up, are not stable and need partial help for toileting; 2=difficult to stand up or walk and need partial help for toileting; 3=cannot stand up or walk by themselves and need toileting assistance; 4=difficult to have daily life and need full assistance for toileting; 5=need to have full assistance for the daily life and difficult to communicate.

A self-administered questionnaire (Figure 3) was distributed to the students before and after the course to assess their perceptions about their efficiency in learning terms related to geriatric dentistry and clinical research (items 1 to 6), their attitudes relating to listening to elderly patients and group discussion (items 7 to 10), and their attitudes about and knowledge related to self-study (items 11 to 13). Also, the questionnaire contained blank sections where students could write open-ended comments. The students were informed that the questionnaire results would not influence their course evaluations, but they were asked to write their names on the questionnaire in order to enable data comparison between their responses before and after the PBL course. Differences in the means of the scores before and after the course were evaluated with the Wilcoxon signed rank test. The Sigma Stat 3.11 software (Systat, San Jose, CA, USA) was used for this analysis. The significance level was set at 0.05.

## Results

The students tried to identify the patients' needs through direct interviews, as well as to discover approaches to manage them through intragroup discussions. The students also decided the theme of the presentation during group discussion before they presented the patient case to all other members. The themes of all student groups are shown in Table 3. The themes were dementia (two groups), eating conditions (two groups), removable dentures (two groups), quality of life (two groups), and oral care (one group).

It was observed that all scores significantly increased after the PBL course (Figure 4). The score indicating an increase in the knowledge of terms related to geriatric dentistry and clinical research (items 1 to 6) was much higher than the evaluation of attitudes related to listening to elderly patients and group discussion (items 7 to 10) or the evaluation of

|  |                         |                        |                                |                              |         |
|--|-------------------------|------------------------|--------------------------------|------------------------------|---------|
|  | I have never heard/read | I have heard/read once | I understand but can't explain | I understand and can explain |         |
| 1. Late-stage elderly  | (0)                     | (1)                    | (2)                            | (3)                          |         |
| 2. Degree of caregiving  | (0)                     | (1)                    | (2)                            | (3)                          |         |
| 3. Aspiration pneumonia  | (0)                     | (1)                    | (2)                            | (3)                          |         |
| 4. Dysphagia rehabilitation  | (0)                     | (1)                    | (2)                            | (3)                          |         |
| 5. Clinical decision making for patient                                      | (0)                     | (1)                    | (2)                            | (3)                          |         |
| 6. Risks and benefits from treatment   | (0)                     | (1)                    | (2)                            | (3)                          |         |
|  | I can't do at all       | I can't do well        | I can do                       | I can do well                |         |
| 7. Listening to elder patient's complaint                                    | (0)                     | (1)                    | (2)                            | (3)                          |         |
| 8. Active participation on a study group                                     | (0)                     | (1)                    | (2)                            | (3)                          |         |
| 9. Presentation on own study to classmates                                   | (0)                     | (1)                    | (2)                            | (3)                          |         |
| 10. Discover and present new findings that the other people can not consider | (0)                     | (1)                    | (2)                            | (3)                          |         |
|  | I don't agree           | I tend not to agree    | Neutral                        | I tend to agree              | I agree |
| 11. My study time was increased  | (0)                     | (1)                    | (2)                            | (3)                          | (4)     |
| 12. My study fullness is high  | (0)                     | (1)                    | (2)                            | (3)                          | (4)     |
| 13. I need to read previous study reports                                    | (0)                     | (1)                    | (2)                            | (3)                          | (4)     |

**Figure 3. Students' self-assessment questionnaire**

Note: Items 1 to 6: evaluation of knowledge of terms related to geriatric dentistry and clinical research. Items 7 to 10: evaluation of attitudes related to listening to elderly patients and group discussion. Items 11 to 13: evaluation of attitudes and knowledge related to self-study.

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**Table 3. Theme of each group in the case presentation**

|  |  |
|--|--|
| Group A: Communication with dementia patients                            | A validation method for communicating with dementia patients                       |
| Group B: Effect of walking exercise on body and quality of life          | Body exercises for preventing the bedridden condition                              |
| Group C: Oral care for elderly patient                                   | Education on patient's oral care for the facility staff                            |
| Group D: Delightful life that the patient can eat sweet bean paste bread | Tooth and denture brushing is important for eating the favorite food in the future |
| Group E: Let's go home   | Comparison between living at home and staying at a nursing care facility           |
| Group F: How to eat well for long time                                   | Educating the facility staff about tooth brushing methods to preserve many teeth   |
| Group G: A case of ill-fitting removable complete dentures               | Suggestion of removable denture adjustments  |
| Group H: Increasing quality of life of elderly patients with dementia    | Dental treatment of the dementia patient who has terrible oral condition           |
| Group I: Case report: removable denture of Ms. T.Y.                      | Possibility of using removable denture for dementia patient                        |

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attitudes about and knowledge related to self-study (items 11 to 13). In regards to knowledge about geriatric dentistry, 58 percent of the students reported that they understood the term “late-stage elderly,” but only 12 percent reported that they understood the term “degree of caregiving” before the PBL course. After the course, 97 percent of the students reported they understood the term “degree of caregiving.” In regards to attitudes about group study, the scores for “listen to an elder patient’s complaint” and “discover and present new findings that other people did not consider” were not high before the course. In regards to attitudes about self-study, scores on all items were quite high before the PBL course although all of the items showed an increase after the course.

The student comments in the questionnaire’s open spaces are shown in Table 4. Interestingly, there were only twelve students who wrote comments before the PBL course, and most of them wrote about their concerns, more specifically that they were nervous or wanted to do their best during the PBL course. After the PBL course, however, a great majority of the students (n=56) wrote some comments expressing their satisfaction and their understanding of the importance of talking with elderly patients and managing their problems.

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## Discussion

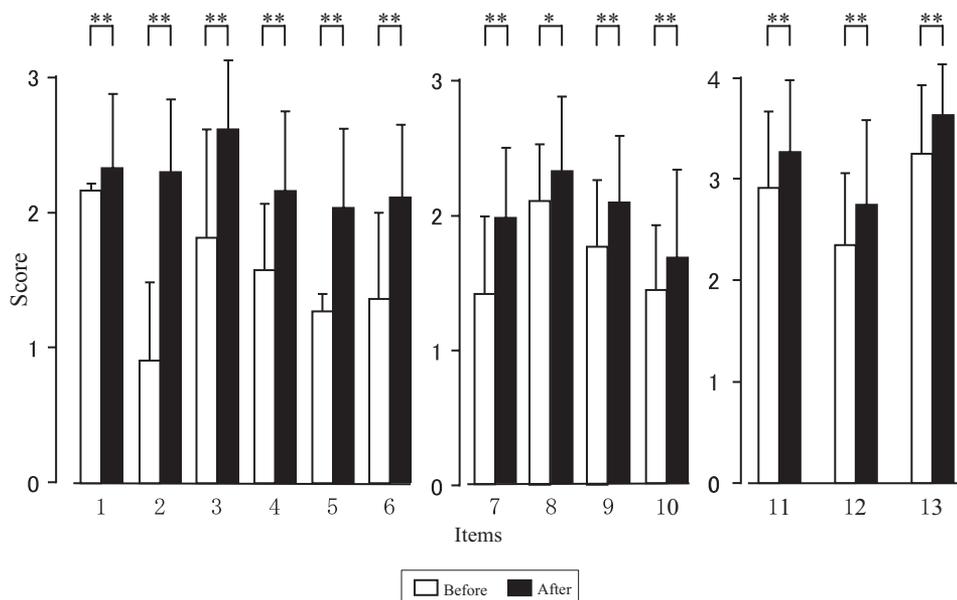
Currently, many countries in the world, including Japan, are facing the aging of their populations, and it is important that dental schools develop training courses on geriatric dentistry to educate students about the needs of elderly patients and give them experience in management approaches as well. Although the importance of these courses is widely recognized, less than 30 percent of dental schools in the United States and Europe offer clinical practices in geriatric dentistry.<sup>5,6</sup>

Okayama University’s dental school started a visiting program to elderly nursing care facilities in 2009. In this PBL course, the students interviewed elderly patients at a nursing care facility with the aim not only of providing prosthodontic treatment but also of attending to other aspects related to patients’ medical conditions or welfare (e.g., dementia, eating, and quality of life). In Japan, senior citizens exceed 20 percent of the total population,<sup>1,2</sup> and dental students should understand their daily life needs. Elderly patients presenting some sort of physical or mental impairment (e.g., Alzheimer’s disease and cerebrovascular diseases) usually search for higher levels of personal care and support at long-term nursing homes. Additionally, these frail elderly or

bedridden patients frequently have some difficulty eating or swallowing due to prosthodontics problems or oropharyngeal dysphagia (e.g., choking, coughing, aspiration of food, or saliva), which eventually may

lead to malnutrition and immune system compromise, dehydration, and even aspiration pneumonia.

The objectives of this PBL course, as shown in Table 1, were achieved. The students were able to un-



**Figure 4. Results of assessment of learning efficiency via problem-based learning**

Note: Results of the assessment of students' knowledge about and attitudes regarding geriatric dentistry, clinical research, and self-study by comparison of the self-assessment questionnaire administered before and after the PBL course. Total number of students was 65. Data are presented as mean ±SD.

\*p<0.05, \*\*p<0.01

**Table 4. Student comments before and after the PBL course**

|  |             |
|--|-------------|
| Before the PBL course                                      |             |
| I am nervous.  | 6 students  |
| I want to do my best.                                      | 5 students  |
| I am interested in elder patients' lives.                  | 1 student   |
| After the PBL course                                       |             |
| I talked with elderly patients and considered their lives. | 13 students |
| I realized the importance of elderly patient management.   | 11 students |
| It was a great course.                                     | 8 students  |
| Communication with patients is important.                  | 7 students  |
| Quality of life is important.                              | 4 students  |
| Group discussion is important.                             | 3 students  |
| I am interested in the management of dementia patients.    | 3 students  |
| I could study the validation method.                       | 1 student   |
| Previous papers are important.                             | 1 student   |
| Presentation is important.                                 | 1 student   |
| Searching evidence is difficult.                           | 1 student   |
| Decision making for therapeutic management is difficult.   | 1 student   |
| Evaluation of patient problems is difficult.               | 1 student   |
| Interview time was short.                                  | 1 student   |

derstand the concept of the patient-oriented system, to identify the problems of dependent elderly patients living in a nursing home via direct interviews, and to discuss and provide management via group discussion. Finally, all students presented and wrote a case report. For example, one group focused on the importance of systemic physical exercise. The patient was a ninety-year-old female complaining of a sore right knee and ill-fitting removable dentures. The patient had a history of aspiration pneumonia and was in a bedridden condition when she entered the nursing home. After some therapeutic sessions focusing on exercise, the patient recovered and could walk by herself. The students pointed out that her problem was the risk of falling during walks and consequent bone fractures, which, in turn, could cause her to become bedridden. Under these circumstances, the fact that the removable dentures were in an inadequate condition could be a risk factor for or at least increase the risk of aspiration pneumonia. The students concluded that simple physical exercises (e.g., walking around the living area) could be effective for the prevention of and/or recovery from a bedridden condition and, consequently, could improve life satisfaction. Additionally, they mentioned the importance of a well-fitting denture for the patient's eating comfort as well as for the prevention of other conditions, such as difficulty in swallowing and aspiration of saliva or food.

In regards to the assessment of students' knowledge about and attitudes related to medical treatment for the elderly, clinical research, and group discussion, their scores significantly increased after the PBL course. The terms related to gerontology most students reported as understanding after the PBL course included "degree of care needed," "aspiration pneumonia," and "dysphagia rehabilitation." Additionally, most students (57 out of 65=88 percent) had a positive reaction to the PBL course and/or reported an increase in their motivation to study dentistry in the open-ended comments section.

Previous reports have corroborated the importance of such training courses in motivating students to understand elderly patients as well as to learn geriatric dentistry. For example, two studies reported that communication training involving first-year dental students and elderly people became a strong motivation for students to study.<sup>23,24</sup> Additionally, a study found that after fifth-year dental students completed an internship involving nursing and helping patients in a nursing home, 90 percent

indicated they had deepened their understanding of the dependent elderly.<sup>13</sup>

It should be noted that the PBL course presented in this study varies from a traditional PBL course. In addition, our study had some limitations. First, this study was limited in that it did not include a control group not receiving the PBL course. We compared student perceptions about their attitudes regarding and the efficiency of learning geriatric dentistry via group study and self-study before and after the PBL course. Since we did not include a control group, we cannot conclude that this PBL course is better than no PBL course. Future studies, with larger numbers of groups, including control groups, should verify whether the results of this study are generalizable. Second, the other limitation of this educational trial was the tight time schedule for round-trip transportation, which, consequently, limited the time for student-patient interviews. Moreover, the selection of the nine patients for this PBL course was performed by the facility staff, who intentionally selected the healthier institutionalized patients. Future studies should attempt to make the schedule more flexible and consider the possibility of students interviewing bedridden patients or those requiring higher levels of care also. Third, it would be more appropriate if students did not need to write their names on the questionnaire; however, we asked them to identify themselves to enable data comparison of responses before and after the PBL course.

Finally, it was concluded that the problems of elderly patients living in health care facilities could be treated even by fourth-year dental students with little or no clinical knowledge. We also found that the students' self-evaluation scores on knowledge about and attitudes toward gerontology, clinical research, and self-study increased after this PBL course.

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