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## Evaluation of a practical skills education method involving the determination of vital signs : consciousness, pulse, respiration, body temperature, and blood pressure

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### Abstract

In 2003, practical skills education in vital signs (VS) was introduced to fourth-year dental students. The practical skills education consisted of an assessment of consciousness, pulse, respiration, and the determination of body temperature and blood pressure (vital signs check, VSC). The effect of the practical skills VSC education among fourth-year dental students were evaluated and the findings are discussed in this report. The subjects were two groups of fourth-year dental students ; the 2003 practical skills education group (n=94) and the 2002 group not receiving the practical skills training (n=104).

The practical skills training with respect to VSC [involving a 60-minute lecture and a 20-minute video learning session, description examination, written examination (50 questions to confirm accurate base knowledge of operations), a reading (4200 characters, four figures, and five tables equivalent), demonstrations and commentary : Following the presentation of slides describing the subject matter, a qualified instructor demonstrated VSC and provided commentary to resolve student misunderstanding (10-minute session), mutual training in VSC performed with pairs of student, with 1 instructor for 2 pairs of students, second written examination : the same as the first immediately after the practical skill training, general comment and a third written examination], involved evaluation of consciousness, pulse, respiration, and the measurement of body temperature and blood pressure, offered sufficient content and appropriate educational outcomes.

**Key words ;** Vital signs, Dental education, Practical skill education

### Introduction

In 2003, practical skills education with respect to vital signs (VS) was introduced to fourth-year dental students. The practical skills education consisted of assessment of consciousness, pulse, respiration and the determination of body temperature and blood pressure (vital signs check, VSC). The effects of the practical skills VSC education among the fourth-year dental students were evaluated, and the findings are discussed in this report.

### Methods

#### 1. Subjects

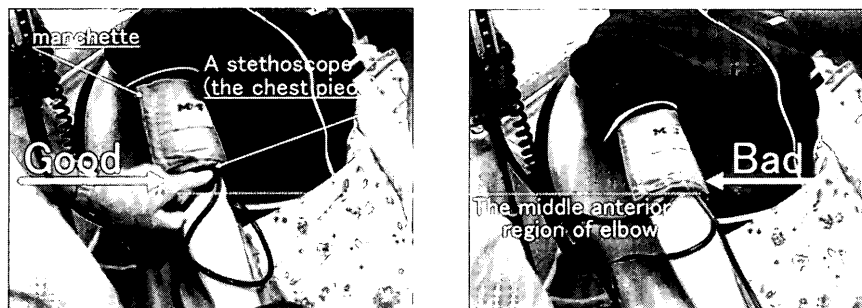
There were two groups of fourth-year dental students ; the 2003 group receiving practical skills education (n=94) and the 2002 group not receiving practical skills education (n=104).

#### 2. Assessment

The following items were assessed to determine the educational effect of the practical skills education after completion of

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**Fig. 1** A point to note with BP measurement  
A Riva-Rocci-type sphygmomanometer was applied to the brachial artery in order to measure blood pressure. The reason why you put the Stethoscope under the manchette on the brachial

the practical skills regimen.

- 1) Comparison of written test scores prior to and immediately after the training.
- 2) Practical skills evaluation immediately prior to the practical skills training.
- 3) Comparison of the results of VSC in the Trial Objective Structured Clinical Examination (T-OSCE). The results of the VSC in T-OSCE were compared with the 2002 group.

### 3. Vital Signs (VS)

#### 1) Consciousness

The degree of the state of consciousness was evaluated objectively employing the Japan Coma Scale (JCS, 3–3–9 degree method) and the Glasgow Coma Scale (GCS).

#### 2) Pulse

Pulse was examined by palpation using the forefinger, middle finger, and digitus anularis with the radial artery in the bilateral head of the radius of centrifugation rank extremitas. In the presence of a normal pulse, the pulse was determined for a period exceeding 15 seconds (measurements were conducted for 15, 20, 30 and 60 seconds and repeated 4, 3, 2, and 1 time).

In the event of arrhythmia, the pulse was determined over a period of more than 30 seconds ; a precise determination for up to one minute was also made. In adults, the pulse was defined as tachycardic, normal or bradycardic ; additionally, the presence of a regular or irregular rhythm was established. All data were recorded.

#### 3) Respiration

Respiration observations were conducted on the basis of thoracic movement to establish respiratory rate, depth, and rhythm ; as well as the presence of constrained respiration was examined. Bradypnea, normal, or tachypnea conditions were determined relative to the rest respiratory rate. In addition, the rate of respiration was measured in conjunction with the pulse number.

#### 4) Body temperature

The body temperature was measured with an electronic thermometer (axilla temperature ; length of measurement one minute) or with a far infrared electronic thermometer (drum temperature ; length of measurement a few seconds).

#### 5) Blood pressure

A Riva-Rocci-type sphygmomanometer was applied to the brachial artery to measure blood pressure. The systolic and diastolic pressures were measured via auscultation following the preliminary systolic blood pressure determination by touching.

### 4. Education in VSC

The practical skills education group participated in a 60-minute lecture and a 20-minute video learning session conducted in a lecture hall in the presence of a practical skills coach as well as a written examination was administered (50 questions aimed to confirm the base knowledge of the maneuvers ; first test) before the practical skills training. In addition, a reading (4200 characters, four figures, and five tables equivalent) which described the determination of consciousness, pulse, respiration, body temperature and blood pressure, was assigned prior to the lecture.

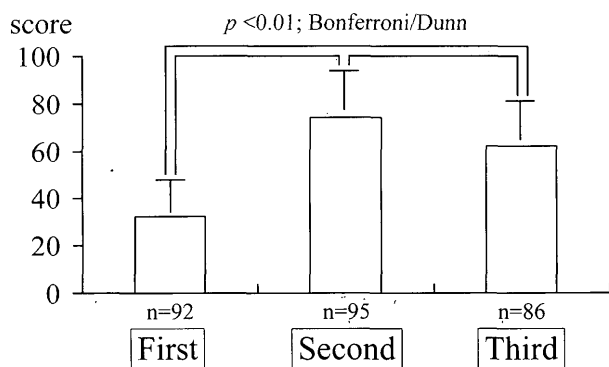


Fig.2 Description examinations

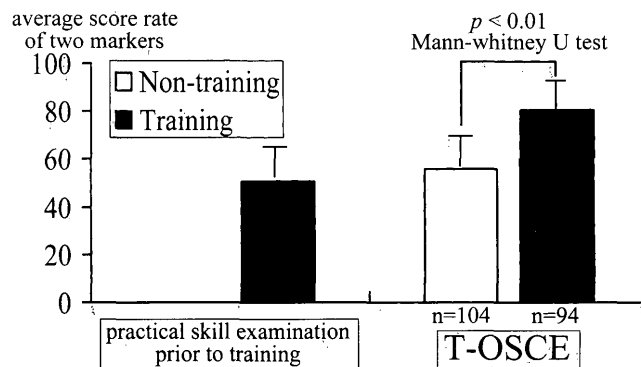


Fig.3 Average score of the practical skills examination prior to training and T-OSCE

The practical skills training was conducted in a practice room in the following order.

1) Practical skills evaluation immediately prior to practical skills training

Students checked the pulse, respiration, body temperature, and blood pressure over a five-minute period, which permitted assessment of the ability to perform this prior to the instruction and utilized as a basis for the evaluation.

2) Demonstrations and commentary

Following the presentation of the slides describing the subject matter, a qualified instructor demonstrated VSC and provided commentary to resolve student misunderstandings (10-minute session) (Fig. 1).

3) Instruction

Training was conducted by an instructor coach. Mutual training for VSC was performed with pairs of students, and with 1 instructor for 2 pairs of students. Each student checked consciousness, pulse, respiration, body temperature, and blood pressure over a five-minute period.

4) Written examination (second)

The same written examination was administered immediately after the practical skills training.

5) General comment

A third written examination for all fourth-year dental students was administered in a lecture hall; commentary was reserved for a later date.

## Results

1. Written examinations (three times)

The first written examination score of the practical skills education group was  $32.5 \pm 14.3$  (mean  $\pm$  SD), the second was  $74.3 \pm 15.2$ , and the third  $62.2 \pm 15.8$ . The second and the third scores were statistically significantly higher than the first score ( $p < 0.001$ , One-factor ANOVA and Post-hoc test) (Fig. 2).

2. Practical skills examination immediately prior to the practical skills training

The average score of the practical skills examination immediately prior to practical skill training was  $50.6 \pm 13.7\%$  (mean  $\pm$  SD) (Fig. 3).

3. Comparison of average T-OSCE score rates

The average T-OSCE score rate of the practical skills education group was  $80.7 \pm 15.8\%$  (21.4–100,  $n=94$ ), while the average T-OSCE score of the group not receiving practical skills instruction was  $55.8 \pm 15.1\%$  (18.5–81.5,  $n=104$ ). Statistically, the practical skills education group had a significantly higher average score of T-OSCE than the group not receiving the practical skills training ( $p < 0.001$ , Mann-Whitney's U test) (Fig. 3). The distributions of the scores are shown in Fig. 4 (Fig. 4).

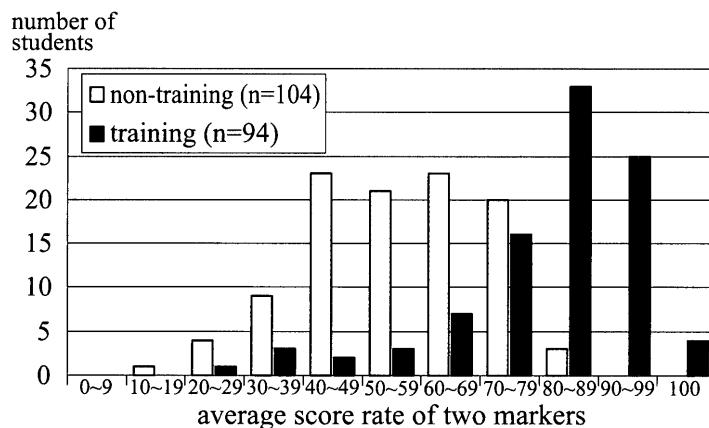


Fig. 4 Distributions of T-OSCE score

## Discussion

At the Faculty of Dentistry in Health Sciences University of Hokkaido, the Department of Dental Anesthesiology conducts practical skills education for VSC to provide fourth-year dental students with basic clinical training. In addition, instruction in determining pulse and blood pressure is included in oral physiology training (sphygmomanometry) by the second-year training faculty. Further, in 2004, the department of oral surgery implemented an 80-minute practical skills training program to measure the pulse and also in sphygmomanometry for all fourth-year dental students. The educational effects were adequate as seen in the difference with the results of the practical skills examination which was performed immediately prior to the practical skills training. From 2004, three written examinations were conducted together with the practical skills training with feedback. As a result of this program, the average T-OSCE scores of the practical skills education group were above 80%. These data show that the instruction involving practical skills relating to VSC was of sufficient effectiveness. It was further demonstrated that this instruction was adequate for evaluation by T-OSCE. The success of this education method was due to the results of a measured practical skills instruction that systematized the AHA (American Heart Association) Basic Life Support for healthcare providers with a model, high quality feed-back, sufficient motivation, and promotion of retention of the learned skills. However, there is still a need for efforts to enhance student desire to learn (Suzuki et al., 2001). The education method may be incompatible with the T-OSCE, which may result in increases in teaching load due to understaffing. Resolution of these problems may involve tutorials in practical skills enhancement among marginally qualified students as well as periodic practical skills examinations. Consequently, the program implemented here assures efficiency and retention of the knowledge of VSC.

It is not possible to verify whether students have acquired adequate VSC determination skills with respect to pulse and sphygmomanometry. Practical skills education must be further extended to an evaluation of the state of consciousness, pulse, respiration, body temperature, and blood pressure via VSC like performed here. Further, it is suggested, like also Furutani reported (Furutani et al., 2002), that an accurate evaluation of student measurements of VS and development of capable instructors are needed to improve the education methods for VSC (Karnath et al., 2002).

## Conclusion

The practical skills training with respect to VSC reported here, with the corresponding evaluation of consciousness, pulse, respiration, and measurements of body temperature and blood pressure, involved sufficient content and appropriate outcomes suggesting adequate educational retention.

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