Clinical performance of medical students in a whole-task emergency station for the objective structured clinical examination with the standardized patient who complains of palpitation in Korea

Song Yi Park1,5, Hyun-Hee Kong2, Min-Jeong Kim3, Yoo Sang Yoon4, Sang-Hwa Lee5, Sunju Im6, Ji-Hyun Seo7

1Department of Emergency Medicine, College of Medicine, Dong-A University, Busan, Korea;
2Department of Parasitology, College of Medicine, Dong-A University, Busan, Korea;
3Department of Medical Education and Neurology, Kosin University College of Medicine, Busan, Korea;
4Department of Emergency Medicine, Inje University College of Medicine, Busan, Korea;
5Department of Medical Education, College of Medicine, Dong-A University, Busan, Korea;
6Department of Medical Education, Pusan National University School of Medicine, Busan, Korea;
7Department of Pediatrics and Medical Education, Gyeongsang National University School of Medicine, Jinju, Korea

* Corresponding email: seozee@gnu.ac.kr

Editor: Sun Huh, Hallym University, Korea

Received: November 17, 2020; Accepted: December 16, 2020; Published: December 16, 2020

This article is available from: http://jeehp.org

© 2020, Korea Health Personnel Licensing Examination Institute

(cc) This is an open-access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
Abstract

This study assessed the clinical performance of 150 third-year medical students in a whole-task emergency objective structured clinical examination station that simulates a patient with palpitation visiting the emergency department from November 25 to 27, 2019. The clinical performance was assessed by the frequency and percentage of students who performed history taking (HT), physical examination (PE), electrocardiography (ECG) study, patient education (Ed), and clinical reasoning (CR), which were items on the checklist. There were 18.0% of students checked the patient’s pulse, 51.3% completed an ECG study, and 57.9% explained the results to the patient. There were 38.0% of students who did not even attempt an ECG study. In a whole-task emergency station, students were good at HT and CR but unsatisfactory to the PE, ECG study, and Ed. Clinical skill educational programs should focus on PE, timely diagnostic tests, and sufficient Ed.

Keywords: Medical student, Electrocardiography, Clinical competency, Emergency Medicine, Republic of Korea
Background/rationale: Palpitations are a common clinical presentation in patients who visit the emergency department (ED). The etiology of palpitations ranges from benign factors to life-threatening cardiac problems. Electrocardiography (ECG) is a non-invasive and applicable diagnostic tool that can be used at the patient’s bedside [1]. Students’ competency in performing structured and fast patient assessments and performing ECG studies should be acquired and assessed during undergraduate medical education.

In the clinical skill portion of the Korean Medical License Examination (KMLE), palpitations are considered one of 54 clinical presentations of the standardized patient (SP) encountered during the objective structured clinical examination (OSCE). Furthermore, ECG is one of 32 procedural skill tests (suppl. 1). In general, SPs can simulate symptoms of palpitations but cannot reproduce abnormal physical examination or ECG results. Thus, skills required during encounters of an SP (history taking, physical examination, diagnostic workup planning) and performing ECG studies used to be evaluated as a partial task in isolation. However, in real clinical contexts in the ED, the physician takes the patient history and performs the physical examination and ECG study simultaneously to differentiate the cause of palpations as a whole-task. There were studies on the advantages of whole-task OSCE [2,3]. However, few studies have reported clinical performance in whole-task emergency case OSCE station of a medical student.

Objectives: Therefore, we had a research question “How are the clinical performance of medical students in a whole-task emergency case station for OSCE with standardized patient who complains of palpitation?” The purpose of this study was to examine the clinical performance of third-year medical students in a whole-task emergency case OSCE station that simulates a patient visiting the ED due to sustained palpitations.

Methods

Ethics statement: This study was approved by the institutional review board of Dong-A University (IRB approval no., 2-1040709-AB-N-01-202002-HR-003-02). Informed consent was waived because subjects participated in the examination as a scheduled educational curriculum.

Study design:

This is a cross-sectional observational study.
Participants: A total of 150 third-year medical students who attended the first day of the Busan-Gyeongnam Clinical Skill Examination (BGCSE), which was summative and mandatory, were included in this study.

Setting: The BGCSE Consortium is an association of 5 medical schools in the Busan-Gyeongnam region in South Korea that have conducted joint clinical skill examinations for the OSCE for 3rd-year medical students annually since 2014. In 2019, a whole-task emergency case OSCE station was developed by faculty members from 5 medical schools, including 2 emergency physicians, 1 pediatrician, 1 neurologist, and 2 medical education experts who attended 5 half-day workshops. The examination was conducted with 11 other traditional OSCE stations (6 SP encounters and 5 technical skills) at the skill centers of four medical schools in Busan from November 25 to 27, 2019. The students were allowed 10 minutes at each station, and a 5-minute interval was allowed between stations.

The scenario involved a 28-year-old male with palpitations. He had palpitations occasionally; the palpitations usually lasted approximately 10 minutes, and they suddenly started and abruptly ended. He visited the ED after the palpitations lasted for an hour, which was considered unusual, earlier that day.

The SPs were trained by an SP trainer about the scenarios for two hours and rehearsed for standardization for another two hours. All the SPs had more than 5 years of SP experience for the BGCSE. Four experienced faculty members from 4 medical schools volunteered to be examiners.

Briefings about the scoring rubrics, how to mark the scores using the computer programs, and the importance of confidentiality were conducted at the orientation held for the examiners.

The setting of the station is shown in Fig. 1. The SP was first interviewed by the student and then laid on the bed for a physical examination and ECG study. ECG electrodes were placed on the SP by a student, and an assistant provided the prepared normal ECG results. The students were informed about the whole-task station at their BGCSE orientation.

Measurement: The instructions provided to the students (outside the station) were as follows: “you are the primary physician in the ED; you are expected to take a history from this patient; perform a focused physical examination; select an appropriate diagnostic tool and perform the evaluation; develop a treatment plan with the patient and educate the patient; and write down the most probable diagnosis after the station is completed”.


The checklist consisted of 5 categories of items: history taking (13 binary items), physical examination (5 items with scores ranging on a 3-point scale), ECG study (6 items including both binary and 3-point scale items), patient education (3 binary items), and clinical reasoning (1 item with an open-ended written question). The global rating scale included 2 items (5-point scale): the identification of the SP before the ECG study and the student's proficiency. There were no standards regarding passing/failing scores for this station because there were no data that could be used for reference. The clinical performance was presented as the number and percentage of students who successfully performed history taking, a physical examination, an ECG study, patient education, and clinical reasoning according to the checklist items.

**Statistical methods:** Descriptive statistics including the number and percentage of students who performed the clinical skills on checklist items were used to determine the clinical performance. All variables were arranged using an Excel spreadsheet (Microsoft, USA).

**Clinical performance for history taking and the physical examination:** For history taking, the performance rate was the highest for checklist item 3 (98.7%, check whether the patient has a previous history of palpitations) and the lowest for checklist item 9 (23.3%, accompanied by a loss of consciousness) (Table 1). In the physical examination, 18.0% of students checked the patient's pulse (Table 2). Raw data are available from Dataset 1.
Table 1. Clinical performance of the third-year medical students regarding taking the history of the SP with palpitations

| No. | Checklist                                                                                   | Clinical performance of 150 students |
|-----|---------------------------------------------------------------------------------------------|------------------------------------|
|     |                                                                             | Yes  | No  |
| 1   | I found that there are no palpitations now.                                                | 88   | 62  |
|     |                                                                             | (58.9) | (41.1) |
| 2   | I found that the palpitations began about an hour ago.                                     | 145  | 5   |
|     |                                                                             | (96.7) | (3.3) |
| 3   | I found that there were a few short palpitations in the past.                              | 148  | 2   |
|     |                                                                             | (98.7) | (1.3) |
| 4   | I found that I had palpitations once or twice a year.                                      | 70   | 80  |
|     |                                                                             | (46.7) | (53.3) |
| 5   | I found that the palpitations lasted about an hour.                                        | 93   | 57  |
|     |                                                                             | (62.0) | (38.0) |
| 6   | I found that palpitations occurred suddenly while resting after lunch.                     | 103  | 47  |
|     |                                                                             | (68.7) | (31.3) |
| 7   | I found that the palpitations began suddenly.                                              | 108  | 42  |
|     |                                                                             | (72.0) | (28.0) |
| 8   | I found that the palpitations ended suddenly.                                              | 77   | 73  |
|     |                                                                             | (51.3) | (48.7) |
| 9   | I found that I never lost consciousness when I had palpitations.                           | 35   | 115 |
|     |                                                                             | (23.3) | (76.7) |
| 10  | I found that I had no history of heart disease or heart surgery.                           | 63   | 87  |
|     |                                                                             | (42.0) | (58.0) |
| 11  | I found that no sudden weight loss or heat intolerance occurred recently.                  | 74   | 76  |
|     |                                                                             | (49.3) | (50.7) |
| 12  | I found that no medications were taken.                                                    | 134  | 16  |
|     |                                                                             | (89.3) | (10.7) |
| 13  | I found that no extreme anxiety or fear was accompanied by palpitations.                   | 42   | 108 |
|     |                                                                             | (28.0) | (72.0) |

SP; standardized patient, and the data are presented as the number (%)

Table 2. Clinical performance of the third-year medical students regarding performing a physical examination of the SP with palpitations

| No. | Checklist                                                                                   | Clinical performance of 150 students |
|-----|---------------------------------------------------------------------------------------------|------------------------------------|
|     |                                                                             | Performed | Partially performed | Not performed |
| 1   | performed a conjunctival examination.                                                     | 97          | 3              | 50            |
|     |                                                                             | (64.7) | (2.0) | (33.3) |
| 2   | checked the pulse.                                                                    | 27          | 6              | 117           |
|     |                                                                             | (18.0) | (4.0) | (78.0) |
| 3   | performed heartbeat auscultation.                                                        | 71          | 42             | 37            |
|     |                                                                             | (47.3) | (28.0) | (24.7) |
| 4   | performed lung sound auscultation.                                                       | 19          | 36             | 95            |
|     |                                                                             | (12.7) | (24.0) | (63.3) |
| 5   | palpated the thyroid gland.                                                             | 48          | 23             | 79            |
|     |                                                                             | (32.0) | (15.3) | (52.7) |

SP; standardized patient, the data are presented as the number (%)

Clinical performance for the ECG study: There were 93 (62.0%) students who tried an ECG study and 57 (38.0%) students who did not even attempt an ECG study (Table 3).
Table 3. Clinical performance of the third-year medical students for the ECG study of the SP with palpitations

| No. | Checklist                                                                 | Clinical performance of 150 students |
|-----|---------------------------------------------------------------------------|-------------------------------------|
|     |                                                                           | Performed | Partially performed | Not Performed |
| 1   | explained to patient the need for an ECG test.                           | 73 (48.7) | 77 (51.3)           |
| 2   | wiped the patient's skin with an alcohol swab for the ECG test.           | 75 (50.0) | 75 (50.0)           |
| 3   | attached standard limb electrodes to the patients at the correct locations.| 90 (60.0) | 60 (40.0)           |
| 4   | identified at least one intercostal space when attaching the chest electrode. | 50 (33.3) | 100 (66.7)          |
| 5   | attached standard chest electrodes to the patients at the correct locations. | 77 (51.3) | 16 (10.7)  | 57 (38.0) |
| 6   | asked the patient not to move before conducting the ECG test.             | 47 (31.3) | 103 (68.7)          |
| 7   | Overall ECG study.                                                        | 77 (51.3) | 16 (10.7)  | 57 (38.0) |

SP; standardized patient, ECG; electrocardiography, values are presented as number (%)

Clinical performance for patient education and clinical reasoning

Forty-two (28.0%) students explained the ECG results to the patient (Table 4). Of the 69 students who completed the ECG study, 40 (57.9%) explained the ECG results to the SP. A total of 98% of the students reported paroxysmal supraventricular tachycardia (PSVT) as the most likely diagnosis.

Table 4. Clinical performance of third-year medical students regarding patient education

| No. | Checklist                                                                 | Clinical performance of 150 students |
|-----|---------------------------------------------------------------------------|-------------------------------------|
|     |                                                                           | Performed | Not performed |
| 1   | explained the ECG results to the patient.                                | 42 (28.0) | 108 (72.0) |
| 2   | educated the SP to revisit the ED if the palpitations recur.             | 36 (24.0) | 114 (76.0) |
| 3   | explained to the patient that coffee or alcohol can cause palpitations.  | 30 (20.0) | 120 (80.0) |

ECG; electrocardiography, ED; emergency department, and the data are presented as the number (%)
Key results: This study examined the clinical performance of third-year medical students in a whole-task emergency case OSCE station where an ECG study was performed for an SP complaining of palpitations in a simulated ED. The main findings were that a third of students did not attempt an ECG study and focused on taking a detailed patient history and performing a non-emergent physical examination to rule out non-cardiac causes of palpitations, even though the ECG was prepared next to the patient’s bed (Fig. 1).

Interpretation: The key point in this whole task case was to check if the patient has a palpitation now and to differentiate the fatal arrhythmia first. Students listened to the patient's detailed and non-urgent medical history, as was the case with the existing SP encounter partial task. This will be because we separated, educated and evaluated SP encounter skill (palpitation) and procedural skill (ECG study) so far. Also, students would have had a basic assumption that the SP would not be able to simulate their palpitation at the OSCE station. The fact that students can do partial tasks does not seem to guarantee that they can do the whole task. And clinical skills seem to need to be acquired with abundant clinical context. While this study did not compare whether the OSCE design (whole vs partial task) affects students’ learning strategies, the whole task OSCE appears to have an advantage in controlling pre-assessment learning.

Comparison with previous studies: To the best of our knowledge, we could not find a study on the ECG performance rate of medical students in whole-task emergency case OSCEs. Few studies about emergency case OSCEs have been tried [4], and the ECG study was designed as a partial task station in the emergency case OSCE composed of 6 whole-task stations and 4 traditional technical-skill stations [5]. In a hybrid station that tried whole-task OSCE combined an SP encounter and a simulated Papanicolaou test for a CSE, the results showed that the station was highly authentic, acceptable, and feasible [6]. However, the study compared a new station with a traditional one, did not report the student’s clinical performance. According to the studies reporting the whole-task OSCE, it increases students’ use of diagnostic reasoning skills during the study period [2]. Whole-task OSCEs might make students use different learning strategies compared with that partial and fixed task OSCE stations which leads to the compartmentalization of certain skills for the examination [3, 7]. Cilliers et al. proposed these findings and educational effects as a model of the pre-assessment learning effect [8].
Limitations: First, only 1 case may not be enough to assess students’ clinical performance level. The medical students’ clinical performance in this study cannot be inferred as their future competence in a workplace [9]. Second, the responses of the students and examiners in this study have not been investigated in depth. Third, 10 minutes would not have been enough for students to examine patients. Forth, some students may have performed an ECG study, noticing that the ECG was ready at the station. We have not assessed how many students conduct an ECG study.

Conclusion: Few studies have assessed whole-task emergency case OSCE stations performed by medical students. The clinical performance of third-year medical students at a whole-task emergency station was fair regarding history taking and clinical reasoning but unsatisfactory regarding the physical examination, ECG study, and patient education. It is necessary to strengthen physical examination, procedural skills, and patient education in preparation for the revised clinical skills test of KMLE.

ORCID

Song Yi Park: https://orcid.org/0000-0003-4299-9986
Hyun-Hee Kong: https://orcid.org/0000-0002-0691-3957
Min-Jung Kim: https://orcid.org/0000-0002-1340-1060
Yoo Sang Yoon: https://orcid.org/0000-0003-4637-7420
Sang-Hwa Lee: https://orcid.org/0000-0003-4792-1248
Sunju Im: https://orcid.org/0000-0002-3038-3570
Ji-Hyun Seo: https://orcid.org/0000-0002-0691-3957

Authors’ contributions

Conceptualization: SYP, YSY, SHL
Data curation: SYP, HHK
Formal analysis: SYP, SHL
Funding acquisition: None
Methodology: SYP, HHK, MJK, SJI, JHS
Project administration: SYP, HHK, MJK, YSY, SHL, SI, JHS
Visualization: SYP, HHK, MJK, YSY, SHL, SI, JHS
Writing – original draft: SYP, HHK
Writing – review & editing: SYP, HHK, MJK, YSY, SHL, SI, JHS
Conflict of interest
No potential conflict of interest relevant to this article was reported.

Funding
None

Data availability
Dataset 1. Raw data of the students’ responses and the result data

Acknowledgments
None

Supplementary materials
Supplement. 1. Korean Medical License Examination (KMLE) Clinical Skill Test Topics

References
1. Probst MA, Mower WR, Kanzaria HK, Hoffman JR, Buch EF, Sun BC. Analysis of emergency department visits for palpitations (from the National Hospital Ambulatory Medical Care Survey). Am J Cardiol 2014;113:1685-1690 https://doi.org/10.1016/j.amjcard.2014.02.020
2. Lafleur A, Côté L, Leppink J. Influences of OSCE design on students’ diagnostic reasoning. Med Educ 2015;49:203-214 https://doi.org/10.1111/medu.12635
3. Lafleur A, Laflamme J, Leppink J, Côté L. Task demands in OSCEs influence learning strategies. Teach Learn Med 2017;29:286-295 https://doi.org/10.1080/10401334.2017.1282863
4. Wallenstein J, Ander D. Objective structured clinical examinations provide valid clinical skills assessment in emergency medicine education. West. J. Emerg 2015;16:121 https://doi.org/10.5811/westjem.2014.11.22440
5. Ruesseler M, Weinlich M, Byhahn C, Müller MP, Jünger J, Marzi I, Walcher F. Increased authenticity in practical assessment using emergency case OSCE stations. Adv Health Sci Educ Theory Pract 2010;15:81-95 https://doi.org/10.1007/s10459-009-9173-3
6. Seo J-H, Oh Y, Im S, Kim D-K, Kong H-H, Roh H. Authenticity, acceptability, and feasibility of a hybrid gynecology station for the Papanicolaou test as part of a clinical skills examination in Korea. J
7. Khan KZ, Ramachandran S, Gaunt K, Pushkar P. The objective structured clinical examination (OSCE): AMEE guide no. 81. Part I: an historical and theoretical perspective. Med Teach 2013;35:e1437-e1446 https://doi.org/10.3109/0142159X.2013.818634

8. Cilliers FJ, Schuwirth LW, Herman N, Adendorff HJ, van der Vleuten CP. A model of the pre-assessment learning effects of summative assessment in medical education. Adv Health Sci Educ Theory Pract 2012;17:39-53 https://doi.org/10.1007/s10459-011-9292-5

9. Khan K, Ramachandran S. Conceptual framework for performance assessment: competency, competence, and performance in the context of assessments in healthcare—deciphering the terminology. Med Teach 2012;34:920-928 https://doi.org/10.3109/0142159X.2012.722707

Legends for figures
Fig. 1. (A) A student taking history the SP. (B) A student performing ECG study the SP on the bed. SP, standardized patient, ECG; electrocardiography. Informed consent was obtained from the student and standardized patient.