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The Relationship Between Nursing Students' Objective Structured Clinical Examination Skills in Care Practices with Theoretical Knowledge and Practical Achievements: A Retrospective, Descriptive Study

Hemşirelik Öğrencilerinin Bakım Uygulamalarındaki Objektif Yapılandırılmış Klinik Sınav Becerilerinin Teorik Bilgi ve Uygulama Başarıları ile İlişkisi: Retrospektif, Tanımlayıcı Bir Çalışma

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ABSTRACT Objective: Assessing nursing students' competence requires valid, reliable, and objective tools. The Objective Structured Clinical Examination (OSCE) evaluates cognitive and behavioral dimensions of learning. This study aimed to identify common errors made by nursing students during OSCE exams and examine the relationship between their theoretical and clinical practice grades with OSCE performance. **Material and Methods:** The study was conducted retrospectively. The study sample consisted of 443 students who took the fundamentals of nursing course during the 2018-2019 and 2019-2020 academic years. Data were collected retrospectively from student OSCE records and student information system between 2nd and 30th November 2020. The Students' Descriptive Characteristics Form, Categorised Steps of Care-oriented Skills Form, and Care-oriented Skills Checklists, which were developed by the researchers, were used for data collection. **Results:** In care-oriented OSCE, students commonly performed well in providing patient information, selecting appropriate materials, removing used materials properly, and recording procedures. However, frequent mistakes included poor skill execution and noncompliance with infection control principles. A significant positive correlation was found between OSCE grades and theoretical (r=0.812), practice (r=0.263), and final grades (r=0.265) (p<0.001 for all). **Conclusion:** OSCE was a valid and reliable method for skill assessment. Increasing the number of skill stations could enhance its representativeness. Future studies could explore factors behind students' low OSCE grades.

Keywords: Clinical competence; examination questions; psychomotor skill; students; nursing

ÖZET Amaç: Hemşirelik öğrencilerinin yeterliklerini değerlendirmek için geçerli, güvenilir ve objektif araçlar gereklidir. Objektif Yapılandırılmış Klinik Sınav (OYKS), öğrenmenin bilişsel ve davranışsal boyutlarını değerlendirir. Bu çalışma, hemşirelik öğrencilerinin OYKS sınavlarında sık yaptığı hataları belirlemeyi ve teorik ile klinik uygulama notları ile OYKS performansları arasındaki ilişkiyi incelemeyi amaçlamıştır. **Gereç ve Yöntemler:** Çalışma, retrospektif olarak yürütülmüştür. Örneklem, 2018-2019 ve 2019-2020 akademik yıllarında hemşirelik esasları dersini alan 443 öğrenciden oluşmaktadır. Veriler, 2-30 Kasım 2020 tarihleri arasında öğrenci OYKS kayıtları ve not giriş sisteminden retrospektif olarak toplanmıştır. Verilerin toplanmasında araştırmacılar tarafından oluşturulan Öğrenci Tanıtım Özellikleri Formu, Bakım Odaklı Becerilere Yönelik Kategorize Edilmiş Adımlar Formu ve Bakım Odaklı Beceriler Kontrol Listeleri kullanılmıştır. **Bulgular:** Bakım odaklı OYKS'de öğrenciler, hasta bilgilendirme, uygun malzeme seçimi, kullanılan malzemeleri uygun şekilde uzaklaştırma ve işlemi doğru kaydetme adımlarında genellikle başarılı olmuştur. Ancak, sık yapılan hatalar arasında beceri uygulamalarında yetersizlik ve enfeksiyon kontrol ilkelerine uyulmaması yer almıştır. OYKS notları ile teorik (r=0.812), uygulama (r=0.263) ve final notları (r=0.265) arasında anlamlı pozitif yönde bir ilişki bulunmuştur (p<0.001). **Sonuç:** OYKS, beceri değerlendirmede geçerli ve güvenilir bir yöntemdir. Beceri istasyonlarının artırılması, sınavın tüm becerileri temsil etme gücünü artırabilir. Gelecekteki çalışmalarda, öğrencilerin düşük OYKS notlarının nedenleri incelenebilir.

Anahtar Kelimeler: Klinik yeterlilik; sınav soruları; psikomotor beceri; öğrenciler; hemşirelik

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The acquisition of clinical knowledge and skills encompasses nearly the entirety of nursing students' educational experience. Assessment and evaluation have an important role in controlling students' access to competence in terms of skills and practices for the purposes of the program.[1,2] While different assessment and evaluation methods such as written exams, assignments and projects can be used to evaluate students' cognitive field learning, different clinical exam methods such as the Objective Structured Clinical Examination (OSCE), Mini-Clinical Exam, Direct Observation of Transactional Skills, portfolio evaluation, Performance Observation, and 360 Degree Evaluation designed to assess the affective and behavioural dimensions of learning can be used.[1,3-9]

OSCE, first defined by Harden et al. is an exam recommended for the evaluation of professional skills and aims to measure clinical competence through direct observation.[10] It has been accepted as the main standard thanks to its validity and reliability.[11] Today, it is widely used in health fields such as nursing, midwifery, medicine, radiology, physiotherapy, dentistry, and paramedics.[1,4,12-23] It is known that the OSCE is used in various nursing faculties in Türkiye to evaluate nursing skills.[1,13,14,24]

In the OSCE exam, students are provided a clinical case scenario to practice and asked to practice it. The student is expected to encounter this scenario in the time period determined for the station, by thinking seriously and critically. The student's knowledge, skills and behaviour are evaluated with pre-prepared checklists as the purpose of the exam foresees. Thus, an objective and structured clinical exam is created and standardized by checklists, the content of which is pre-designed to asses various levels of clinical skills.[1,25] With this exam structure, the OSCE allows to evaluate the cognitive, effective, behavioural dimensions of students according to Bloom's taxonomy, and the competence and performance on the path from knowledge to action according to Miller's pyramid of competence. Thus, it is possible to evaluate the knowledge, skills, behaviour and attitude towards the clinic as a whole with the performance of the students.[26-28]

There are studies suggesting that the OSCE, which is usually applied at the end of the academic year as a summative assessment tool, can actually serve as a predictor of scores obtained from other summative assessment methods that reflect annual academic success.[1,19,20,22] These studies, conducted in the fields of nursing, medicine, and physiotherapy, have reported a strong correlation between OSCE performance and subsequent clinical practices as well as mid-term or final exams.[1,19,20,22] In nursing, literature includes validity and reliability studies related to OSCE, which evaluates a range of profession-specific skills such as communication, care, and treatment.[1,12,29-33] Some studies have specifically focused on the assessment of communication skills, as well as those that examine both care and treatment practices within the same study.[1,12-14,24,29-32,34,35] However, this study focuses solely on care-related skills and does not include any treatment-based skill practices. While national-level studies have typically examined only 2, 3 or 4 skills, a greater number of skills were analyzed, and the total sample size was considerably large in the present study.[1,13,14,24] Similar to the study by Özden et al. both validity and reliability analyses were conducted, and the relationship between clinical performance and theoretical achievement was examined.[1] These features contribute to the originality of the study.

In this study, the validity and reliability results of OSCE for nursing care skills are presented. In addition, the relationship between the OSCE scores for care skills and the scores obtained from midterm exams, clinical practice, and final exams during the semester is examined.

MATERIAL AND METHODS

DESIGN AND SETTING

The research was carried out retrospectively at the faculty of nursing of a university. The research questions are as follows:

A. What is the validity and reliability of OSCE checklists?

B. What are the procedure steps in which students often make mistakes in the OSCE exam?

C. What is the relationship between students' OSCE, clinical practice, final exams, and end-term grades end of the year?

PARTICIPANTS

The population of the study was composed of 539 students who studied in the second year of the faculty of nursing in the fall semester of the 2018-2019 (n=209) and 2019-2020 (n=234) academic years and took nursing principles courses. The OSCE skills with a Cronbach's alpha coefficient below 0.67, as well as 86 evaluated students and 10 students repeating the semester, were excluded from the sample.[36] The study was completed with 443 (82.18%) students.

DATA COLLECTION

Institutional permission and ethics committee approval were obtained to conduct the study. Then, the students' OSCE exam documents were obtained from the student affairs archive office. The data of the study were collected between November 2nd-30th, in 2020 by 2 researchers. Data on students' descriptives and exam scores were retrieved from the Student Information and Grading System, while OSCE scores and procedural step data were extracted from archived student exam documents and transferred to data collection forms. The data were collected using the Students' Descriptive Characteristics Form, the Categorised Steps of Care-oriented Skills Form and the Checklists of the Care-oriented Skills Checklists for OSCE. The data collection forms were developed based on the relevant literature.[4,19,25,28,37-39]

Students' Descriptive Characteristics Form: It was composed of eight questions to determine students' age, gender, wards where they went to practice, OSCE grade, laboratory grade (care-oriented and drug administration-oriented OSCE grade), clinical practice grade and final exam grade. The scores that students can receive from midterm exam, final exam, and clinical practice range between 0-100.

The midterm and final examinations are administered in a multiple-choice format and are revised annually in accordance with the results of item analyses. The clinical grades of the students are assigned based on the performance of clinic-specific skills, the attitudes and behaviours performed in clinics, and the care plans they implemented for individuals. Success in practical procedures is evaluated based on checklists derived from professional skill manuals which is also used in laboratory sessions. The assessment of care plans is grounded in the Functional Health Patterns Model and the principles taught in the care plan preparation course introduced at the beginning of the semester. At the end of the semester, a 25-item evaluation form (totaling 100 points) is used to assess clinical practice performance.

Categorised Steps of Care-oriented Skills Form: Communication with the patient, appropriate material selection, inspection, main procedure steps related to skills, infection control (compliance with asepsis principles, hand washing, wearing sterile gloves, contamination status), appropriate disposal of contaminated materials, recording of the procedure were categorised from the OSCE checklists in order to examine the most common incorrect mistakes.

Care-oriented Skills Checklists for OSCE: At the beginning of the fall semester of the academic year for 2018-2019, by 2 different lecturers, oral care, central venous catheter (CVC) care, tracheostomy stoma care, Foley catheter care, wound care, abdominal examination, peripheral venous catheter (PVC) care, posterior and anterior respiratory sounds oscultation checklists were created. The checklists were given to 7 academics who are experts in the field of fundamentals of nursing department to evaluate the content validity of the checklists. It was edited and sent again in accordance with the feedback received. The Content Validity Indexes (CVI's) of all checklists were between 0.97-0.99. After the checklists were revised, they were applied for the OSCEs for 2 consecutive years. All the checklists were studied in one sub-dimension. The checklists were created between 11-16 items according to the skill practice. A maximum of 100 points could be obtained from the skill in scoring the checklists. 8-12 points were given to the items related to the skill itself, and 4-8 points were given to items such as hand washing, preparing materials, providing information to the patient, and recording, which were applied commonly in all skills. The students' ability to apply the skill items was evaluated in three categories: completed (*x points*), un-

TABLE 1: Checklist name of the skills and their psychometric properties used in the OSCE exam

Name of the skill	Total item number	Total number of students' who took the exam	Cronbach alpha value
Wound care	14	84	0.686
Tracheostomy stoma care	16	83	0.838
Central venous catheter care	15	51	0.430
Foley catheter care	17	89	0.825
Oral care	14	51	0.799
Oscultation of the respiratory sounds (posterior)	16	36	0.845
Oscultation of the respiratory sounds (anterior)	15	34	0.741
Peripheral venous catheter care	15	35	0.652
Abdominal examination	18	66	0.835

completed (*x/2 points*), never done (*0 points*). Table 1 shows the skills and their psychometric properties.

Table 1 shows that Cronbach's alpha values of the care checklists. Checklists of the CVC care and PVC care were excluded from the analyses because Cronbach alpha values were 0.430 and 0.652, respectively.

CONDUCTING THE OSCE

Starting from the 2018-2019 academic year fall semester, OSCE was applied to undergraduate students by Dokuz Eylül University Faculty of Nursing, Department of Nursing Fundamentals before clinical practice. Students were given oral and written information in the first lecture at the beginning of the semester, 1 week before the exam and immediately before the exam. In order to standardize the evaluators' behaviour, meetings were held with lecturers and guide nurses a week before the exam and the day before the exam. Clinical nurses were assigned to each station alongside faculty members to observe the exam and to conduct joint evaluations after each student completed their performance. In this way, 2 observers assessed each student's exam, ensuring that no aspects of the performance were overlooked.

The students were randomly allocated into the stations. The randomization list was created, multiplied, and then saved in opaque envelope the day before the OSCE by one of the researchers. In the morning of the exam, the lists were distributed to the lecturers and guide nurses by the researcher in a private way. Thus, the students did not see the station where they would take the exam. On the exam day, all mobile phones and bags of the students were collected and left in a safe room and locked before the exam to prevent them from communicating with each other.

A total of nine stations were created for the OSCE exam. The students were assessed on two different skills-one related to nursing care and the other to treatment procedures. A closed-draw method was implemented for each OSCE station. The drawing box was created by 2 lecturers from a closed opaque box and folded papers of the same colour and size. In this method, the number of lots prepared for each skill matched the number of students. Students were examined on the skill they randomly selected through the closed-draw process. This approach eliminated the possibility of students disclosing which skill was assessed at which station after completing the exam.

Just before the exam, the seating arrangements in the exam rooms were organized to allow both the nurses and lecturers to observe students' manual skills from different angles. Then, the students were called in turn according to the random class list and asked to lean through the one-way corridors to the station areas. When the students entered the exam rooms, after a short welcome, they passed an identity check, and drew lot for care skills. The students were directed to the exam rooms twice: first for the clinical care practices, 2nd for the drug administration. OSCE regarding treatment skills were studied in Özden et al. study.[1]

After the lot was drawn, the places of the materials related to the skills were shown to the students. Then, the students were provided the scenario of the related skill. The scenarios were created as 3 or 4 sentences that describe the skill that needs to be done. The scenarios were prepared in a consistedt, objective and comprehensible manner. The students did not perform the "washed her/his hands" step because this item was standardized in the scenario. The student was given a minute to prepare and then asked to start the application of the skill.

Students had 8 minutes to apply the skills. After the students finished the exam at one station, they went to the other station. The classrooms and exam halls where the students who would take the exam were on the same floor. To ensure the exam's security, academic staff and non-departmental lecturers were involved in blocking students' face-to-face communication in the exam corridors. The exam area was arranged in the form of a one-way corridor with an entrance from one place and an exit from the other. The evaluation of the students' exam order was carried out by a lecturer from within the department and a nurse who works as a guide nurse in laboratory and clinical practices in the faculty so that there is no evaluation bias. As soon as the student left the room at the end of the exam, all the items included in the skill checklist were evaluated with the guide nurse from first item to the last item, and then the student's grade was given. After the exam, each student was given a blanck shhet of paper and askes to provide feedback by writng down their opinions and thoughts about the exam.

ETHICAL APPROVAL

This study was approved by the Dokuz Eylül University Non-invasive Research Ethics Board of the University (date: September 14, 2020; no: 2020/21-32). Institution in which the research was conducted also provided the written permission.

DATA ANALYSIS

In the evaluation of the data obtained from the study, SPSS (22.0 for Windows) program was used. In the evaluation of the data, number, percentage, mean, and standard deviation values were used. The relationship between exam grades was evaluated by correlation.

RESULTS

As shown in Table 2, 66.8% of the study participants were female. The mean age of the participants was 20.37±1.02, and 52.8% of the students took the exam in the 2019-2020 academic year. The mean of the care-oriented OSCE grades was 61.47±18.19 (over 100 points), the mean of the laboratory grades was 64.36±13.17 (over 100 points), the mean of the clinical practice grades was 81.72±9.42, and the mean of the final exam grades was 63.53±9.15 points.

TABLE 2: Students' descriptive characteristics (n=443)

	n	%
Gender		
Female	275	62.1
Male	168	37.9
Academic years		
2018-2019	209	47.2
2019-2020	234	52.8
Wards		
Internal units	221	49.89
Surgical units	222	50.11
	X̄±SD	**Minimım-maximum**
Age	20.37±1.02	19-24
Exam grades		
Care-oriented OSCE	61.47±18.19	4-96
Laboratory (total OSCE)	64.36±13.17	18-95
Clinical practice	81.72±9.42	50-100
Final	63.53±9.15	39-89

SD: Standard deviation; OSCE: Objective Structured Clinical Examination

Table 3 shows the distribution of the caregiving skills practiced. In the care-oriented OSCE exam, students often provide information to the patient, select the material appropriately, and record the procedural steps correctly. The procedures that students often skipped were the practice of skills and infection control. It was determined that more than half of the students did not observed wound area, tracheostomy stoma, perineal area and oral mucosa. At least half of the students did not apply or skipped foley catheter care, auscultation of the anterior area of the lungs, and the oral care steps.

Table 4 shows that the Pearson product-moment correlation coefficient analysis reveals a statistically significant positive correlation between students' grades for care-related courses, laboratory (total OSCE), practice and final grades ($r=0.812$, $r=0.263$, $r= 0.265$, respectively; $p<0.001$ for all).

DISCUSSION

Practical, valid and reliable assessment methods are one of the most important indicators of the level of competence and skill development of students and instructors.[2,11] The OSCE is recognized as the gold standard when assessing clinical competence.[2] In this

TABLE 3: Distribution of caregiving skills practised*

	Completed		Completed with error/fault		Uncompleted		Completed with error/ fault and uncompleted in total	
	n	%	n	%	n	%	n	%
Providing information to the patient								
Wound care (n=84)	58	69.0	3	3.6	23	27.4	26	31
Tracheostomy stoma care (n=83)	66	79.5	1	1.2	16	19.3	17	20.5
Foley catheter care (n=89)	77	86.5	1	1.1	11	12.4	12	13.5
Oral care (n=51)	40	78.4	1	2.0	10	19.6	11	21.6
Auscultation from the posterior region of the lungs (n=36)	33	91.7	0	0	3	8.3	3	8.3
Auscultation from the anterior region of the lungs (n=34)	28	82.4	0	0	6	17.6	6	17.6
Abdominal examination (n=66)	62	93.9	1	1.5	3	4.5	4	6
Proper selection of materials								
Wound care (n=84)	84	100	0	0	0	0	0	0
Tracheostomy stoma care (n=83)	83	100	0	0	0	0	0	0
Foley catheter care (n=89)	89	100	0	0	0	0	0	0
Oral care (n=51)	51	100	0	0	0	0	0	0
Auscultation from the posterior region of the lungs (n=36)	36	100	0	0	0	0	0	0
Auscultation from the anterior region of the lungs (n=34)	34	100	0	0	0	0	0	0
Abdominal examination (n=66)	66	100	0	0	0	0	0	0
Inspection/area observation								
Wound care (n=84)	3	3.6	43	51.2	38	45.2	81	96.4
Tracheostomy stoma care (n=83)	37	44.6	19	22.9	27	32.5	46	55.4
Foley catheter care (n=89)	30	33.7	7	7.9	52	58.4	59	66.3
Oral care (n=51)	19	37.3	6	11.8	26	51.0	32	62.7
Auscultation from the posterior region of the lungs (n=36)	36	100	0	0	0	0	0	0
Auscultation from the anterior region of the lungs (n=34)	34	100	0	0	0	0	0	0
Abdominal examination (n=66)	39	59.1	4	6.1	23	34.8	27	40.9
Practice of the skill								
Wound care (8 items for the skill; total 84x8=672 items for 84 students)	424	63.09	161	23.96	87	12.95	248	36.91
Tracheostomy stoma care (9 items for the skill; total 83x10=830 items for 83 students)	421	50.72	196	23.61	213	25.67	409	49.28
Foley catheter care (11 items for the skill; total 89x11=979 items for 89 students)	486	49.65	172	17.56	321	32.79	493	50.35
Oral care (8 items for the skill; total 51x8=408 items for 51 students)	211	51.72	95	23.28	102	25	120	48.28
Auscultation from posterior region of the lungs (6 items for the skill; total 36x6=216 items for 36 students)	170	78.70	38	17.60	8	3.70	46	21.30
Auscultation from anterior region of the lungs (9 items for the skill; total 34x9=306 items for 34 students)	90	29.42	107	34.96	109	35.62	216	70.58
Abdominal examination (12 items for the skill; total 66x12=792 items for 66 students)	411	51.89	97	12.25	284	35.86	381	48.11
Infection control								
Wound care (n=84)	8	9.5	11	13.1	65	77.4	76	90.5
Tracheostomy stoma care (n=83)	11	13.3	19	22.9	53	63.9	72	86.7
Foley catheter care (n=89)	33	37.1	33	37.1	23	25.8	56	62.9
Oral care (n=51)	25	49.0	24	47.1	2	3.9	26	51
Auscultation from the posterior region of the lungs (n=36)	36	100	0	0	0	0	0	0
Auscultation from the anterior region of the lungs (n=34)	34	100	0	0	0	0	0	0
Abdominal examination (n=66)	66	100	0	0	0	0	0	0
Removing correctly the used materials from the environment								
Wound care (n=84)	57	67.9	11	13.1	16	19.0	27	32.1
Tracheostomy stoma care (n=83)	57	68.7	13	15.7	13	15.7	26	31.3
Foley catheter care (n=89)	66	74.2	4	4.5	19	21.3	23	25.8
Oral care (n=51)	40	78.4	3	5.9	8	15.7	11	21.6
Auscultation from the posterior region of the lungs (n=36)	36	100	0	0	0	0	0	0
Auscultation from the anterior region of the lungs (n=34)	34	100	0	0	0	0	0	0
Abdominal examination (n=66)	66	100	0	0	0	0	0	0
Recording the procedure								
Wound care (n=84)	70	83.3	1	1.2	13	15.5	14	16.7
Tracheostomy stoma care (n=83)	54	65.1	3	3.6	26	31.3	29	34.9
Foley catheter care (n=89)	65	73.0	1	1.1	23	25.8	24	27
Oral care (n=51)	37	72.5	0	0	14	27.5	14	27.5
Auscultation from the posterior region of the lungs (n=36)	33	91.7	0	0	3	8.3	3	8.3
Auscultation from the anterior region of the lungs (n=34)	27	79.4	1	2.9	6	17.6	7	20.6
Abdominal examination (n=66)	59	89.4	1	1.5	6	9.1	7	10.6

*Row percentage was calculated.

TABLE 4: Correlation analysis between students' grades for care-related OSCE, total OSCE (laboratory), practice and final grades (n=443)

		Laboratory	Clinical practice	Final
OSCE-care	Pearson correlation (r)	0.812	0.263	0.265
	p value	<0.001	<0.001	<0.001
LAB	Pearson correlation (r)		0.318	0.331
	p value		<0.001	<0.001

OSCE: Objective Structured Clinical Examination; LAB:

context, the study was carried out to determine the validity and reliability of the current and future checklists of the OSCE exam, to find out the relationship between the grade point averages of the students and these checklists, and to determine the frequently made malpractices. Seven of the 9 different skills were determined to be valid and reliable. Furthermore, a significant correlation was found between the OSCE grades and the overall laboratory grade, practice and final grade of the students. It was determined that students often made mistakes in the procedural steps such as performing skill-specific items and infection control.

Many studies have reported validity and reliability coefficients for OSCE checklists. In the present study, the CVI of the checklists were found to be at good and excellent levels. Additionally, the reliability levels of the checklists were also high; however, 2 checklists were excluded from the study as their Cronbach's alpha values were below the acceptable threshold. In the study by Chabrera et al. the CVI values for 10 different OSCE checklists were reported to range between 0.82 and 0.95, indicating excellent content validity.[32] Similarly, Huang et al. reported CVI values between 0.85 and 1.0 for their OSCE composed of eight stations.[33] The CVI results of the present study are consistent with those reported in the literature.

In some OSCE studies, inter-rater agreement has been analysed as part of reliability assessments.[29,30,33,34] In our study, inter-rater reliability was not examined because a single evaluator was responsible for student assessments and evaluations were conducted jointly with the guide nurses. Instead, Cronbach's alpha coefficients were used to assess internal consistency. According to the reliability analysis results, the checklists demonstrated reliability levels above the acceptable threshold, ranging from good to excellent. In OSCE studies examining reliability, reported Cronbach's alpha values have ranged from 0.65 to 0.88.[1,12,32,35] The results of our study are in line with the literature. This may be attributed to the fact that the OSCE checklists were developed based on information presented in previous studies.

There are limited number of studies that examine the relationship between OSCE grades and other exams. In the study conducted by Özden et al. the relationship between students' OSCE scores and their clinical practice and midterm exam results was examined. The findings revealed a weak but statistically significant correlation between the scores. It was also noted that OSCE scores were higher than midterm exam scores but lower than clinical practice scores on average.[1] In the study by Lee et al. the relationship between OSCE scores and nursing graduation exam results was investigated. It was found that those who passed the graduation exam had higher OSCE scores. The same study also highlighted that nurses who had resigned from their jobs had lower OSCE scores.[12] The OSCE is an assessment method used to evaluate clinical knowledge and skills, and it is widely accepted and implemented across various disciplines internationally.[2,11] Couto et al. in their study of 312 medical students, reported that the OSCE scores of the students were lower when compared to the oral assessments and higher when compared to progress tests. In addition, a positive significant correlation was found between all semester grades and the OSCE grades.[19] Graham et al. reported that the preclinical OSCE was a valid and reliable tool with 145 dental students, and they found a moderately significant correlation between the practice grades and OSCE grades.[40] Terry et al. evaluated the compatibility of grades in OSCE, written exams, seminar presentations, and clinical practice of 118 physiotherapist entry-level doctoral students respectively. In this study, a positive, low-level significant correlation was found in written exams and seminar presentations.[22] It is seen that in many studies conducted across various fields, there is a relationship between OSCE performance and other theoretical and practical exams administered during the aca-

demic term, and that they may be predictors for assessments administered after the OSCE. In the present study, the relatively weak to moderate level of correlation between the exams may be attributed to several factors: the OSCE included only one care-related and one treatment-related skill, whereas other theoretical and practical exams allowed for the assessment of multiple skills and provided opportunities to evaluate knowledge through verbal or written responses.

In the OSCE exam, students were evaluated on only 2 of the more than 20 practices. Thus, in fact, it was expected that the 2 skills would represent the assessment of all skills. In the final exam, questions were asked about the procedural steps of all skills, the reasons for the skills (reasons for their implementation), complications related to skills, and pathophysiological mechanisms.[41] The students answered the question from many different fields, from the level of knowledge to the level of assessment according to Bloom's taxonomy.[41] For this reason, the final grades and the OSCE exam are similar, although they do not have a direct and a high relationship. During clinical practice, students were evaluated on other important topics such as communication skills, ethical principles, as well as basic nursing skills. Clinical practice does not consist of the implementation of only a few skills, as in the case of the OSCE. Students get the opportunity to experience more difficult and complex skills such as suctioning and tracheostomy care in a real patient in clinics with skills that are simpler and have fewer procedural steps, such as measuring blood glucose levels.[42,43] Thus, skill learning is consolidated.[43] The reason why the students' OSCE grades are lower compared to clinical practice may be due to the inability to practice enough before the OSCE and the multifaceted evaluation during clinical practice.

Students often make mistakes during the OSCE by performing procedures such as wound care, tracheostomy stoma care, Foley catheter care, and oral care without adequately observing the practice area. During procedures such as wound care and tracheostomy stoma care, students often fail to adhere to the principles of surgical asepsis, while in Foley catheter care, they violate the principles of medical asepsis. Additionally, they frequently neglect to wear disposable gloves and fail to wash their hands after completing the procedure.

A limited number of studies examining practice errors related to the procedural steps have been accessed. In the study of Gürol Arslan et al. the steps of administering drugs from the central venous catheter at different treatment hours of intensive care nurses were examined.[44] It has been reported that all nurses (100%) applied material preparation and 93.3% applied glove-wearing steps at a high rate before the drug administration procedure, but hand washing skills after the procedure were performed at very low rates (13.3-23.3% at different treatment hours). In the study conducted by Özden et al. subcutaneous injection, intramuscular injection, medication administration through a peripheral catheter, and blood sampling procedures were examined. Among these procedures, the most accurately performed steps were material selection, providing information to the patient before the procedure, and wearing gloves. The most frequently reported errors involved checking materials, assessing the injection site, and procedure-specific skill steps. Additionally, handwashing could not be observed in this study, as it was already included in the scenario provided to the students.[1]

In our study, there is no data on whether the students wash their hands before the procedure because the statement that they perform the hand washing procedure is included in the OSCE scenarios given to the students. The fact that all students fully realize the material preparation is in accordance with the literature. It is observed that students do not comply with the procedural steps such as providing and maintaining asepsis principles during wound care, tracheostomy care and foley catheter care at a high rate. As for the skills that must be followed by the rules of medical asepsis, it was found that hand washing was not performed at a high rate after the procedure. The results of the study are similar to the literature.

After the exam, it was seen that the students started the procedure sterile, especially in wound and tracheostomy care, and then contaminated their hands during the practice. Possible anxiety of students may

also have caused a violation of asepsis. Although anxiety levels were not examined in the study, it was stated by lecturers during the post-exam meeting and noted in students' written feedback that they were anxious and nervous during the exam, which may have been due to the fear of making mistakes and the uncertainty about which skill would be assessed. Skills that require sterile techniques and multiple procedural steps during skill learning are difficult to learn and cause anxiety for fear of making mistakes in the student.[43] Reasons such as the fact that the OSCE exam was administered before the clinic, there was not enough practice, and exam excitement may have increased anxiety in the student, eventually lowered their score. In studies where students were asked to provide feedback after the OSCE, it was found that 71% of the students considered the OSCE to be stressful, and they rated their OSCE-related stress as 8 out of 10.[13,30] It was also reported that students experienced stress due to time pressure during the exam.[1] Although the OSCE was described as educational and helpful in reinforcing a sense of confidence, it was also found to cause fear and anxiety.[24] Additionally, some students stated that they did not want to be reassessed through OSCE.[13] In our study, it is thought that the stress experienced by students during the OSCE may have stemmed from not knowing which skill they would be assessed on. Although sample OSCE videos, written, and verbal explanations provided at least 1 week before the exam could help eliminate uncertainty regarding the exam in general, they could not remove the uncertainty about which specific skill would be evaluated. Therefore, students' fear of making mistakes may have turned into a concern about grades, contributing to their stress and potentially leading to errors during the exam.

LIMITATIONS

The few numbers of students per exam station, each student taking an exam from only 1 maintenance skill practice, the fact that students experienced each skill in only 1 laboratory day before OSCE may have affected the OSCE grades. The fact that most of the common skills items (providing information, preparing materials, inspecting, infection control, waste management, registration of the procedure) in the OSCE checklists were made by students is considered to be a factor in the low Cronbach's alpha values. Skill checklists will be evaluated with repeated analyses in the upcoming OSCE exams and the necessary revisions will be applied. The pilot study could not be conducted due to the nature of the study. Due to the insufficient number of teaching staff, the students took an exam on the care and treatment practices. It is possible that some aspects of the students' performance may not have been visible to the 2 evaluators during the exam. Moreover, since different evaluators were present in each room, full standardization among instructors may not have been achieved.

CONCLUSION

The study concluded that the OSCE, applied with various skills, demonstrated validity and reliability, though it may serve as a low-level predictor for future exams. The CVC and peripheral intravenous catheter care (PICC) care checklists were revised, and further validity and reliability analyses are planned. Sharing OSCE scores and checklists with students may help reinforce skills and correct mistakes. Increasing the number of stations could improve the exam's ability to reflect a broader range of clinical competencies.

To enhance the effectiveness and sustainability of OSCE, integrating it into other courses and better preparing students is recommended. Objective assessment could be supported by having 2 faculty members conduct simultaneous evaluations and by recording the process. Updating skill steps, developing new scenarios and checklists, using moulage for realism, and keeping the lab open for independent practice are also suggested. Replacing clinical nurse mentors with faculty members and recording the assessments could help ensure standardization and improve reliability in future evaluations.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

***Idea/Concept:** İlkin Yılmaz, Gülşah Gürol Arslan, Sevda Sönmez, Dilek Özden; **Design:** İlkin Yılmaz, Gülşah Gürol Arslan, Sevda Sönmez, Dilek Özden; **Control/Supervision:** İlkin Yılmaz, Gülşah Gürol Arslan; **Data Collection and/or Processing:** İlkin Yılmaz, Gülşah Gürol Arslan, Sevda Sönmez; **Analysis and/or Interpretation:** İlkin Yılmaz, Sevda Sönmez; **Literature Review:** İlkin Yılmaz, Gülşah Gürol Arslan, Sevda Sönmez, Dilek Özden; **Writing the Article:** İlkin Yılmaz, Gülşah Gürol Arslan, Sevda Sönmez, Dilek Özden; **Critical Review:** İlkin Yılmaz, Gülşah Gürol Arslan, Sevda Sönmez, Dilek Özden; **References and Fundings:** İlkin Yılmaz, Gülşah Gürol Arslan, Sevda Sönmez, Dilek Özden.*

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