

FOLIA MEDICA CRACOVIENSIA

Vol. LX, 2, 2020: 109–121

PL ISSN 0015-5616

DOI: 10.24425/fmc.2020.135017

## Perceptions of clinical teachers acting as examiners regarding the value of Objective Structured Clinical Examinations

AGATA STALMACH-PRZYGODA<sup>1</sup>, MICHAŁ NOWAKOWSKI<sup>2</sup>, ANNA KOCUREK<sup>1</sup>, IAN PERERA<sup>1</sup>,  
AGNIESZKA SKRZYPEK<sup>1</sup>, JADWIGA MIRECKA<sup>3</sup>, JOLANTA ŚWIERSZCZ<sup>1</sup>, BOGUMIŁA KOWALSKA<sup>1</sup>,  
STANISŁAW GÓRSKI<sup>1</sup>, MICHAŁ PERS<sup>1</sup>, GRZEGORZ CEBULA<sup>1</sup>, MAGDALENA SZOPA<sup>1</sup>

<sup>1</sup>Department of Medical Education, Jagiellonian University Medical College, Kraków, Poland

<sup>2</sup>Department of General Surgery, Orthopedics and Multitrauma, Jagiellonian University Medical College,  
Kraków, Poland

<sup>3</sup>Faculty of Medicine and Health Sciences, Andrzej Frycz Modrzewski University, Kraków, Poland

**Corresponding author:** Magdalena Szopa, M.D., Ph.D.

Department of Medical Education, Jagiellonian University, Medical College  
ul. Medyczna 7, 30-688 Kraków, Poland

Phone/Fax: +48 12 619 97 08; E-mail: magdalena.szopa@uj.edu.pl

**Abstract:** Objectives: The OSCE (Objective Structured Clinical Examination) is a common method of assessing clinical skills used at many universities. An important and simultaneously difficult aspect of good examination preparation is obtaining a properly trained and well-motivated group of assessors. To effectively recruit and maintain cooperation with assessors, it is worth knowing their opinion.

The aim of this study was to investigate the opinions of teacher-examiners about the OSCE and to identify the factors that could shape this opinion and influence on motivation.

**Methods:** A cross-sectional study was conducted using a questionnaire on teachers who participated as OSCE examiners. This questionnaire consisted of 21 questions about their perceptions. Answers were rated in a five-point Likert-type scale. Chi-square or Fisher's exact test was used to analyze the data.

**Results:** A total of 49 (out of 52) teachers participated in this study. Nearly 90% of examiners believed that it is fair, and more than 90% that it is transparent. Despite the fact that 67% of examiners believe that the examination is difficult to organize and 71% believe it is stressful for students; according to 72% of respondents the OSCE has a positive effect on learning. More than 91% of examiners believed that the OSCE is an appropriate test to assess students' skills. Opinions about the examination were independent of specialty, seniority, gender or having taken the OSCE as students.

**Conclusion:** Teacher-examiners viewed the OSCE as a fair and transparent examination, adequate for the assessment of skills and, despite it being difficult to organize, worth doing as it is appropriate to assess practical skills and positively influences students' motivation to learn tested skills.

**Keywords:** Objective Structured Clinical Examination (OSCE), assessment practical skills, examiners (assessors), teacher perception.

**Submitted:** 20-Nov-2019; **Accepted in the final form:** 28-Aug-2020; **Published:** 28-Sep-2020.

## Introduction

The Objective Structured Clinical Examination (OSCE) is widely used in under and postgraduate settings to assess performance in a simulated environment. It is the gold standard at the “shows how” level of Miller’s Pyramid of assessment [1], especially when it comes to performance assessment [2]. According to Khan’s definition in the AMEE Guide, the OSCE is a tool for assessment in which the most important characteristics are objectivity and standardization. In this form of examination candidates rotate through a series of timed stations and their professional performance in a simulated environment is assessed. At each station candidates are assessed and graded according to standardized scoring rubrics [3].

There is a wide range of literature on students’ perceptions of the OSCE examinations [4–6]. This exam is considered by students to be a good assessment method of practical skills [7] and a fair means of assessment [8–10], while also having a positive impact on student learning [6, 11]. The anxiety associated with this exam has been raised by students as a negative aspect of this type of assessment [5, 10, 12]. Despite the fact that the assessors’ perspective is valuable, as it is direct and objective, there are a limited number of studies showing how medical teachers (assessors of the OSCE) perceive this examination, especially when the assessors are clinicians who do not assess students using these criteria on a daily basis [13, 14]. Being aware of how examiners approach the exam is important because it indicates how motivated they are.

OSCE-format exams have been organized by the Department of Medical Education at the Faculty of Medicine at Jagiellonian University since 2000, initially to assess the skills taught during the “Laboratory Training of Clinical Skills” course. Students on this exam were assessed exclusively by medical teachers from the Department of Medical Education who were motivated to teach and assess.

Since 2015, the Department of Medical Education has coordinated a multidisciplinary skills assessment for 3rd-year medical students. This exam was designed to assess skills taught during introductory courses in internal medicine, surgery, pediatrics and gynecology. This OSCE consisted of 12 stations. Teachers from the aforementioned introductory clinical courses were invited to assess students’ performance. They had not been involved in assessment on a daily basis and were accustomed to traditional methods of assessment such as multiple-choice tests or bedside assessments. It was the first time an examination on this scale was conducted at Jagiellonian University. To the best knowledge of the authors, there has not been an OSCE exam conducted on such a large scale in Poland and there are no such studies about the OSCE in Poland. In countries that do not have a rich OSCE tradition, researching the perspective of teachers/examiners are important and can give useful information especially in the implementation period. The purpose of this study was to evaluate the opinions of the examiners on this exam.

## Materials and Methods

### *Study participants and setting*

A cross-sectional study was conducted from a sample ( $n = 52$ ) of teachers who participated as OSCE examiners during an integrated multidisciplinary OSCE exam in the Department of Medical Education. Examiners consisted of teachers of introductory courses of internal medicine, pediatrics, surgery and the course "Laboratory Training of Clinical Skills". They were asked to fill in a questionnaire just after assessing this exam.

### *Instrument and procedure*

Data were collected in January 2016 directly after the second multidisciplinary OSCE conducted in the Department of Medical Education, using a questionnaire (see annex), which was designed based on literature [4, 15]. Questionnaires were partly distributed on paper and partly completed using the Google Forms online platform. In both versions the survey was voluntary and anonymous (the examiners were informed to fill out the questionnaire only once). The questionnaire consisted on 6 initial questions regarding length of experience as a teacher, gender, primary place of employment/medical specialization, role during the exam, whether the examiner had taken part in the university didactic course and whether the examiner as a student had taken the OSCE exam. In the main part of the questionnaire, the respondents were asked about six aspects of the OSCE exam in a 5-point Likert scale (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree). The evaluated aspects were: fairness, transparency, transparent adequacy for assessing skills, stressfulness for students, positive effect on students' learning (whether they are more willing to learn skills) and organizational difficulty. The next part was devoted to evaluating the opinions of the examiners concerning the OSCE in the 3-point Likert scale (no, hard to say, yes). The aspects evaluated in this part were related to scoring at the stations; whether it adequately reflected the skills being assessed, the proportion between technical and communication skills checked at individual stations and whether standardized patients could rate students. The questionnaire ended up with two open questions: What aspect of the OSCE exam do you consider to be the most valuable? What aspects of OSCE examinations need improvement?

### *Statistical analysis*

The comparison of the values of qualitative variables in the groups was made using either the chi-square (with Yates correction for  $2 \times 2$  tables) or Fisher's exact test in

tables where low expected frequencies appeared. The significance level of 0.05 was assumed in the analysis, all p-values below 0.05 interpreted as evidence of significant dependencies. The analysis was carried out in the R program for Windows, version 3.4.1.

## Results

The questionnaires were completed by 49 out of 52 teachers, resulting in a 94% response rate; 65% (n = 32) of the participants were female and 35% (n = 17) were male. 33% (n = 16) of the respondents had teaching experience of less than 2 years, 25% (n = 12) had experience between 3 and 5 years, and 42% (n = 20) had been teaching for more than 5 years (6 teachers had between 11–20 years of teaching experience, and 5 had more than 20 years of experience but due to statistical reasons (too small of a group size) they were added to the group “5 and more”).

59.2% (n = 29) of respondents listed the Department of Internal Medicine as their main medical specialization/place of employment, while 26.5% (n = 13) reported the Department of Medical Education and 14.3% (n = 7) reported the Department of Surgery. 47% (n = 23) of the responders had taken the OSCE as an examinee in the past as a student, while the rest 53% (n = 26) did not have such an experience (Table 1).

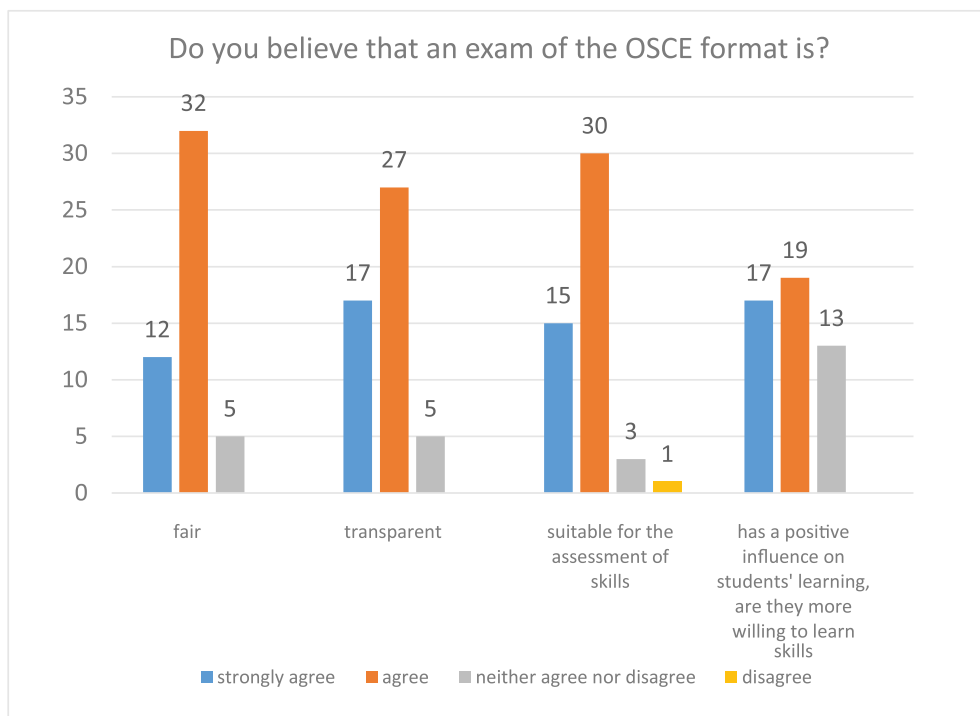
Almost 90% of respondents agreed with the statement that the OSCE exams were fair (89.8%, n = 49). Similarly the vast majority of study participants believed that the OSCE was also transparent (89.8%, n = 49). More than 90% of examiners who filled in questionnaire claimed that the OSCE is suitable for assessing practical skills (91.84%, n = 45) and almost two-thirds of examiners believed that the OSCE had a positive impact on students' learning and encouraged them to learn practical skills (73.47%, n = 36) (Fig. 1).

**Table 1.** Demographic data.

Teaching experience	0–2 years	3–5 years	>5 years
	16 (33%)	12 (25%)	20 (40%)
Gender/sex	Female	Male	
	32 (65%)	17 (35%)	
Main medical specialization/ place of employment	Internal Medicine	DME	Surgery
	29 (59%)	13 (26%)	7 (14%)
Prior participation in the OSCE as an examinee as a student	Yes	No	
	23 (47%)	26 (53%)	

**Table 2.** Answer to the question “Do you believe that OSCE is stressful for students?” depending on the length of work as a teacher.

Length of work as a teacher		0–2 years (n = 16)		3–5 years (n = 12)		>5 years (n = 20)		p *
		n	%	n	%	n	%	
Do you believe that an exam of the OSCE format is stressful for students?	strongly agree	6	37.50	4	33.33	3	15.00	0.091
	agree	6	37.50	5	41.67	11	55.00	
	hard to say	0	0.00	3	25.00	1	5.00	
	disagree	4	25.00	0	0.00	5	25.00	
	strongly disagree	0	0.00	0	0.00	0	0.00	



**Fig. 1.** Examiners opinion on OSCE (positive aspects).

Examiners also noticed the disadvantages of this exam. 67% thought that it was difficult to organize (67.35%, n = 33) and 73% claimed that it was stressful for students (73.47%, n = 36) (Fig. 2).

It was then analyzed whether the perception of the exam depended on the length of experience as a teacher.

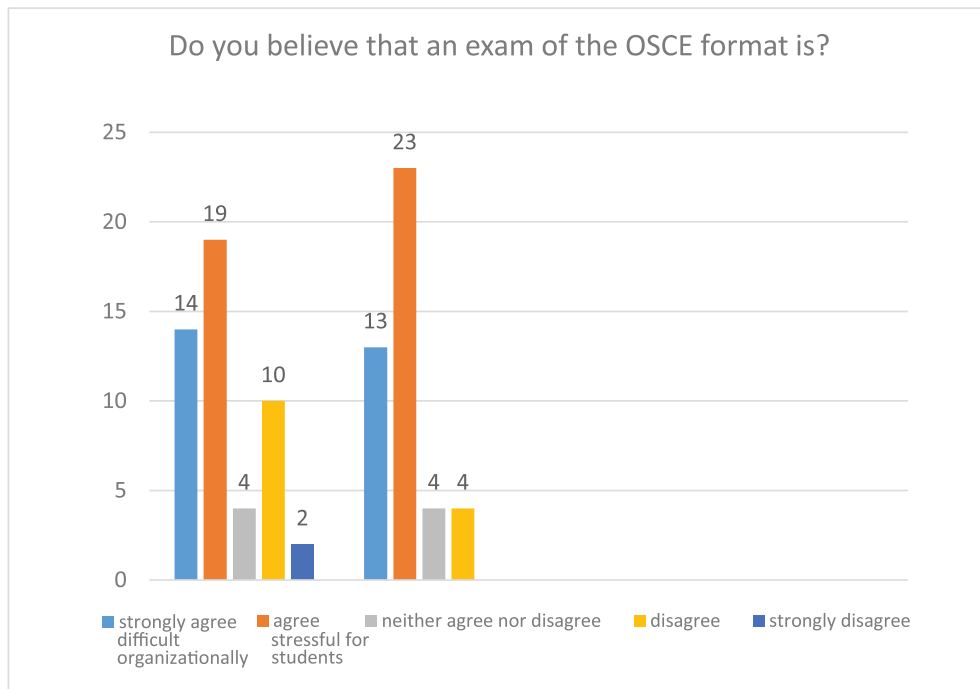


Fig. 2. Examiners opinion on OSCE (negative aspects).

In the analysis of answers to all questions — (Do you believe that an exam of the OSCE structure to be fair, clear, suitable for the assessment of skills, stressful for students, has a positive influence on students learning, organizationally difficult), the p-value was respectively 0.22, 0.92, 0.99, 0.09, 0.52, and 0.94.

Although all p-values were above 0.05 which means that statistically the length of educational experience does not affect the perception of the OSCE, the authors' attention was attracted by the tendency ( $p = 0.09$ ) that more junior examiners (with experience of less than 2 years and between 2–5 years) strongly agreed with the statement that the exam is stressful for students.

When analyzing whether the examiner's gender affected the perception of the OSCE, no statistically significant results were obtained, with all p-values being higher than 0.05.

Analysis on whether the primary place of employment influenced the perception of the OSCE revealed a statistically significant difference in answering the question on whether the OSCE exam is suitable for the assessment of skills.

The examiners who reported the Department of Medical Education as their primary place of employment statistically more often than examiners from surgery or internal medicine departments agreed with the statement that the OSCE exam is

**Table 3.** Answer to the question “Do you believe that OSCE is suitable for the assessment of skills?” depending on a) the main work place b) taking OSCE exam as being a student.

a)

The main work place		DME (n = 13)		Clinic of internal medicine (n = 29)		Surgery clinic (n = 7)		p *
		n	%	N	%	n	%	
Do you believe that an exam of the OSCE format is suitable for the assessment of skills?	strongly agree	11	84.62	3	10.34	1	14.29	<0.001
	agree	2	15.38	23	79.31	5	71.43	
	hard to say	0	0.00	2	6.90	1	14.29	
	disagree	0	0.00	1	3.45	0	0.00	
	strongly disagree	0	0.00	0	0.00	0	0.00	

b)

Taking OSCE exam being student		Yes (n = 18)		No (n = 31)		p *
		n	%	n	%	
Do you believe that exam of the OSCE format is suitable for the assessment of skills?	strongly agree	2	11.11	13	41.94	0.062
	agree	15	83.33	15	48.39	
	hard to say	1	5.56	2	6.45	
	disagree	0	0.00	1	3.23	
	strongly disagree	0	0.00	0	0.00	

suitable for the assessment of skills ( $p < 0.001$ ) (Table 3a). In other aspects of OSCE perception, the primary place of employment/specialty did not affect perception.

When analyzing whether the fact that examiners had taken OSCE exams as a student or not had any influence on their perception of OSCE, no statistically significant results were obtained (Table 3b). However, a tendency was noticed that examiners who had not taken the exam as students more often strongly agreed with the statement that the exam was suitable for the assessment of clinical skills. This opinion could be influenced by the fact that their skills during their studies were assessed by other methods and therefore.

In the section where we obtained answers to open question (“What aspect of the OSCE exam do you consider to be the most valuable?” “What aspects of OSCE examinations need improvement?”) most of the respondents emphasized that this examination is fair, some of them pointed it out especially in comparison to their examination from the past. Respondents showed organizational changes as a space for improvement.

## Discussion

Being aware of how examiners approach the exam is important because it indicates how motivated they are to work as examiners, and indirectly, how motivated they would be to teach (particularly the skills which are taught during their courses) and, as shown in the Rahayu study, how the introduction of the OSCE may affect teaching [16].

As our study demonstrated, teachers acting as examiners noted that the exam is fair, and that even though the exam is difficult to organize, it is worth doing so because, according to them, it is a good means to assess clinical skills. In addition, examiners noticed that it positively influences the motivation of students to learn said clinical skills. As the study was conducted one year after the introduction of a multidisciplinary OSCE, teachers were able to see the difference in students' motivation.

The perception of the exam by examiners (as well as students) also shows the direction of the development of the exam. Becoming familiar with this perception is especially important at the beginning when a new type of examination is being introduced [13, 17–19]. There are some examples in the literature that show how the understanding and acceptance of a new method by a teacher in a new role of examiner (teachers accustomed to other methods of assessing the skill, e.g. through long cases) influences their engagement. In a qualitative study conducted by Sola *et al.*, teachers — OSCE examiners — noticed that the OSCE, though difficult to implement, enables assessment of students' competencies with objective criteria, which is difficult with other instruments [13]. In the Department of Obstetrics and Gynecology at Kuwait University, after cases were replaced by the OSCE, the students', doctor-trainees' and doctor/assessors' perception were checked and acceptance of this form of examination was found to be very high in all three groups [19]. Similarly, in another study conducted in Patna, India, soon after the OSCE was introduced, students and teachers of the Department of General Medicine perceptions were studied and both groups agreed that the OSCE exam was better compared to conventional means of evaluation, in terms of fairness and evaluation of various knowledge domains [17]. In the stomatology setting, when the OSCE with elements of self and peer-assessment were introduced, most students and teachers claimed that the exam was a useful tool in the assessment of skills with educational benefits and had influenced the learning of students [18].

### *Fairness and transparency of OSCE*

The vast majority of examiners for the OSCE at the Jagiellonian University claimed that assessment of the OSCE type is fair and transparent, which is concurrent with what is described in the literature [4, 15, 17].

The examiners believe that mainly due to use of checklists the OSCE is fair which removes variability between examiners [17].



### *Appropriateness for assessing practical skills*

An important aspect of the OSCE is whether it appropriately assesses what it is supposed to assess, namely clinical skills (namely whether it has a proper construct validity). It is proven that a well-designed OSCE has a high level of validity [20] but it is important whether or not such an approach to this exam is presented by teachers/ assessors. While such approaches can motivate them to organize and perform this exam, it is also difficult to organize. Our respondents perceived this exam as suitable for assessing clinical skills, which made them eager to organize and take part in it. Additionally, in other studies it was also shown that the OSCE is considered to be appropriate to assess clinical competence as reported by 97% of examiners agreeing with this sentiment and 44% of examinees [16].

In the study of Skrzypek *et al.* where students' perception of the OSCE were also examined, students that this exam helped identify clinical skills which needed to be improved upon [4].

### *Positive impact on students learning*

According to OSCE examiners from Jagiellonian University Medical College, the OSCE has a positive effect on how students learn and motivates them to learn practical skills. It was also demonstrated by Kumar *et al.* that 66% of teachers agreed that the OSCE compelled students to study different procedures in detail [17]. Similarly, examiners of multidisciplinary assessments at Suez Canal University noticed the positive motivational learning impact of the OSCE (83% of examiners agree with it) [21]. Nearly 100% of examiners following the national OSCE in Indonesia perceived the OSCE as having stimulated examinees to learn clinical competence. In addition, they not only think that it affects how students learn, but that the format of exam also stimulates an improvement in teaching [16].

Students similarly believe that the exam has an educational impact in a study of over 1,000 students from 32 German medical schools, where students indicated that OSCE improved their learning. As the authors concluded, the OSCE could strengthen the development of skills and behaviors required for clinical practice [6]. Also, 65% of more than 2,500 students in the Rahayu study believe that the OSCE stimulates learning clinical skills [16]. In another study, 66% of students perceived the OSCE as having a positive impact on students [11]. Also compared to other types of exams, the OSCE is considered to have a greater impact on learning than for instance, multiple choice question tests, essays or oral examinations [10].

### *Disadvantage of OSCE*

The OSCE is considered to be one of the most stressful, anxiety-provoking type of exams [22, 23]. This was also noticed by examiners in our study (73% examiners agree with the statement that OSCE is a stressful exam for students) and in other studies where examiners also notice that it is stressful [14]. Similarly other exams such as written examinations and preclinical preparation tests [10, 12, 23] can cause students to be nervous [9, 15].

There are also some studies where stressfulness was diminished; in Pramodes study, students claimed that during the OSCE (OSPE), the degree of physical and emotional stress was less than traditional practical examinations [24]. Similarly in the study of Nasir, where different examination formats were compared for degree of difficulty, 61.6% students noted that the MCQs were the most difficult examination format and OSCE the least difficult, 9.6% [9].

Teachers-examiners in our study, both those who participated in the preparation of the exam and those who only examined, noted that the exam is difficult to organize (67% of examiners agree with the statement that it is difficult to organize). Similarly in the literature, this exam is considered to be very resource extensive and costly [16, 25]. The implementation of the OSCE is initially difficult and resource-consuming; however, later on, costs involved decrease.

### **Conclusions**

Especially when introducing a new exam format for new courses, it is worth getting to know the opinions of potential examiners.

In the opinion of the teachers who sat as examiners, the OSCE is fair and transparent. Examiners noticed that the exam is difficult to organize but perceive the exam as adequate for the assessment of skills, and believe that it is worth doing. Moreover, in the opinion of examiners in our study it positively influences students' motivation to learn practical, clinical skills.

It is worth emphasizing that when teachers perceive the exam as good, they are eager to get involved and participate in training to prepare them for the exam.

Some teachers may be uncertain about using the OSCE as an assessment tool and may be discouraged due to its complexity, associated costs and staff time required. Despite associated costs, an OSCE may be advisable due to its unique educational benefits for students and the curriculum.

## Acknowledgments

The authors would like to thank all OSCE examiners who agreed to take part in this study.

## Contributions

A.S.P, M.N., A.K. — designing of study, data analysis; A.S., B.K., S.G. — designing of study; J.Ś., M.P., M.S. — data analysis; I.P. — data analysis, proofreading; M.S., G.C., J.M. — designing of study, mentorship. All authors have participated in the writing of this manuscript.

## Funding and disclosures

The study was conducted without funding. There is no potential conflict of interest.

## References

1. Khan K.Z., 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* [Internet]. 2013 Sep 22 [cited 2018 Dec 20]; 35 (9): e1437–46. Available from: <http://www.tandfonline.com/doi/full/10.3109/0142159X.2013.818634>.
2. Norman G.: Research in medical education: three decades of progress. *BMJ* [Internet]. 2002 Jun 29. [cited 2018 Dec 29]; 324 (7353): 1560–1562. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/12089095>.
3. Khan K.Z., Gaunt K., Ramachandran S., Pushkar P.: The Objective Structured Clinical Examination (OSCE): AMEE Guide No. 81. Part II: organisation & administration. *Med Teach* [Internet]. 2013; 35 (9): e1447–63. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23968324>.
4. Skrzypek A., Szeliga M., Stalmach-Przygoda A., Górski S., Kowalska B., Kocurek A., et al.: The Objective Structured Clinical Examination (OSCE) from the perspective of 3rd year's medical students — a pilot study. *Folia Med Cracov* [Internet]. 2017 [cited 2018 Dec 20]; 57 (3): 67–75. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29263456>.
5. Fidment S.: The Objective Structured Clinical Exam (OSCE): A Qualitative Study Exploring the Healthcare Student's Experience. *Student Engagem Exp J* [Internet]. 2012 Jan 26.
6. Müller S., Settmacher U., Koch I., Dahmen U.: A pilot survey of student perceptions on the benefit of the OSCE and MCQ modalities. *GMS J Med Educ* [Internet]. 2018. [cited 2018 Dec 22]; 1 (1). Available from: <http://research.shu.ac.uk/SEEJ/index.php/seej/article/view/37>.

7. *Gelan E.A., Essayas R., Gebressilase K.*: Perception of final year medical students about objective structured clinical examination in the department of general surgery. *Ethiop Med J* [Internet]. 2015 Oct [cited 2018 Dec 20]; 53 (4): 183–189. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27182584>.
8. *Elfaki O.A., Al-Humayed S.*: Medical Students' Perception of OSCE at the Department of Internal Medicine, College of Medicine, King Khalid University, Abha, KSA. *J Coll Physicians Surg Pak* [Internet]. 2016 Feb [cited 2018 Dec 20]; 26 (2): 158–159. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26876409>.
9. *Nasir A.A., Yusuf A.S., Abdur-Rahman L.O., Babalola O.M., Adeyeye A.A., Popoola A.A., et al.*: Medical Students' Perception of Objective Structured Clinical Examination: A Feedback for Process Improvement. *J Surg Educ* [Internet]. 2014 Sep [cited 2018 Dec 20]; 71 (5): 701–706. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25012605>.
10. *Sadia Shamsunnisa S.S.*: OSCE as an Assessment Tool: Perceptions of Undergraduate Medical Students. *Anaesthesia, Pain Intensive Care* [Internet]. 2009 [cited 2018 Dec 20]; Available from: <http://www.apicareonline.com/original-article-osce-as-an-assessment-tool-perceptions-of-undergraduate-medical-students/>.
11. *Raheel H., Naeem N.*: Assessing the Objective Structured Clinical Examination: Saudi family medicine undergraduate medical students' perceptions of the tool. *J Pak Med Assoc* [Internet]. 2013 Oct [cited 2018 Dec 20]; 63 (10): 1281–1284. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24392561>.
12. *Furlong E., Fox P., Lavin M., Collins R.*: Oncology nursing students' views of a modified OSCE. *Eur J Oncol Nurs* [Internet]. 2005 Dec [cited 2018 Dec 29]; 9 (4): 351–359. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16027036>.
13. *Solà M., Pulpón A.M., Morin V., Sancho R., Clèries X., Fabrellas N.*: Towards the implementation of OSCE in undergraduate nursing curriculum: A qualitative study. *Nurse Educ Today* [Internet]. 2017 Feb [cited 2018 Dec 20]; 49: 163–167. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27978445>.
14. *Bouchoucha S., Wikander L., Wilkin C.*: Nurse academics perceptions of the efficacy of the OSCA tool. *Collegian* [Internet]. 2013 [cited 2018 Dec 20]; 20 (2): 95–100. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27978445>.
15. *Pierre R.B., Wierenga A., Barton M., Branday J.M., Christie C.D.*: Student evaluation of an OSCE in paediatrics at the University of the West Indies, Jamaica. *BMC Med Educ* [Internet]. 2004 Dec 16 [cited 2018 Dec 22]; 4 (1): 22. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15488152>.
16. *Rahayu G.R., Suhoyo Y., Nurhidayah R., Hasdianda M.A., Dewi S.P., Chaniago Y., et al.*: Large-scale multi-site OSCEs for national competency examination of medical doctors in Indonesia. *Med Teach* [Internet]. 2016 Aug 2 [cited 2018 Dec 20]; 38 (8): 801–807. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26380878>.
17. *Kumar S., Ranjan A., Kumar G., Mishra A., Barat D.*: Assessment of undergraduate medical students using objective structured clinical examination in general medicine: student's and teacher's perception. *J Evol Med Dent Sci* [Internet]. 2015 [cited 2018

- Dec 22]; 4 (99): 16481–16484. Available from: [https://www.jemds.com/data\\_pdf/Sudhir-Ruks-Arv.pdf](https://www.jemds.com/data_pdf/Sudhir-Ruks-Arv.pdf).
18. *Larsen T., Jeppe-Jensen D.*: The introduction and perception of an OSCE with an element of self- and peer-assessment. *Eur J Dent Educ* [Internet]. 2008 Feb [cited 2018 Dec 20]; 12 (1): 2–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18257758>.
  19. *Omu A.E., Al-Azemi M.K., Omu F.E., Al-Harmi J., Diejomaoh M.F.E.*: Attitudes of Academic Staff and Students towards the Objective Structured Clinical Examination (OSCE) in Obstetrics and Gynaecology. *Creat Educ* [Internet]. 2016 [cited 2019 Feb 23]; 7 (6): 886–897. Available from: <http://www.scirp.org/journal/doi.aspx?DOI=10.4236/ce.2016.76093>.
  20. *Downing S.M.*: Validity: on meaningful interpretation of assessment data. *Med Educ* [Internet]. 2003 Sep [cited 2019 Jan 3]; 37 (9): 830–837. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/14506816>.
  21. *Abdelaziz A., Hany M., Atwa H., Talaat W., Hosny S.*: Development, implementation, and evaluation of an integrated multidisciplinary Objective Structured Clinical Examination (OSCE) in primary health care settings within limited resources. *Med Teach* [Internet]. 2015 Feb 19 [cited 2019 Jan 5]; 38 (3): 1–8.
  22. *Brannick M.T.*: Metacognition, OSCE performance anxiety and OSCE performance. *Med Educ* [Internet]. 2013 Jun [cited 2018 Dec 29]; 47 (6): 540–542. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23662868>.
  23. *Brand H.S., Schoonheim-Klein M.*: Is the OSCE more stressful? Examination anxiety and its consequences in different assessment methods in dental education. *Eur J Dent Educ* [Internet]. 2009 Aug [cited 2018 Dec 29]; 13 (3): 147–153. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19630933>.
  24. *Saeed A.A., Al Suwayh W.M., Alomri A.S.*: Students' perceptions and attitudes towards Objective Structured Clinical Examination (OSCE) in the College of Medicine, KSAU-HS, King Fahad Medical City, Riyadh, Saudi Arabia. *JMSCR*. 2016 March [cited 2020 Oct 8]; 4 (3): 9741–9747. Available from: <http://dx.doi.org/10.18535/jmscr/v4i3.29>.
  25. *Patrício M.F., Julião M., Fareleira F., Carneiro A.V.*: Is the OSCE a feasible tool to assess competencies in undergraduate medical education? *Med Teach* [Internet]. 2013 Jun 22 [cited 2018 Dec 22]; 35 (6): 503–514. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23521582>.