

# Assessment of Pharmacy Students' Clinical Skills using Objective Structured Clinical Examination (OSCE): A Literature Review

Susi Ari Kristina<sup>1,\*</sup>, Yosef Wijoyo<sup>2</sup>

<sup>1</sup>Department of Pharmaceutics, Faculty of Pharmacy, Universitas Gadjah Mada, Yogyakarta, INDONESIA.

<sup>2</sup>Faculty of Pharmacy, Sanata Dharma University, Yogyakarta, INDONESIA.

## ABSTRACT

A systematic review of clinical pharmacy assessment articles published from 2003 to 2016 was conducted. The electronic databases used to identify relevant studies were PUBMED, Science Direct, Cochrane Database of Systematic Reviews and Google Scholar. Search terms used were "Pharmacy student\*" [MeSH] AND "assessment" [MeSH] AND "Clinical skills" [MeSH]. The variables coded included characteristics of the assessment (e.g. aim, level, duration, learning and teaching methods), methods and outcomes. The electronic database search retrieved 122 articles while only 14 studies fulfilled the eligibility criteria. According to the review, it was indicated that methods of student clinical skills evaluation using OSCE has been implemented widely in pharmacy schools. OSCE has been used to evaluate the outcome of pharmacy courses and entry to practice examination, served as primary assessment tool in pharmacy education. Regarding the validation of the OSCE methods, the OSCE was valid, reliable and acceptable to be implemented. Pharmacy students felt that they learned clinical patient care better when using OSCE and many of them indicated

the need for more exposure and additional class to improve skills. OSCE are formally involved in clinical skills assessment and as an important part of the educational life cycle for pharmacists. OSCE can play an important role in the pharmacy curriculum and providing students with a real-world context for understanding complex patient care needs.

**Key words:** OSCE, Pharmacy Students, Clinical Skills, Assessment.

## Correspondence:

**Dr. Susi Ari Kristina**

Faculty of Pharmacy, Sekip Utara Yogyakarta 55281, INDONESIA.

Phone no: +62274543120

E-mail id: susiari\_k@ugm.ac.id

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## INTRODUCTION

Pharmacists role has expanded beyond compounding and dispensing drugs.<sup>1</sup> An evolution in performance-based teaching and assessment is occurring in the health professions include pharmacists. Assessment of pharmacy students' performance traditionally using multiple-choice test.<sup>2</sup> However, these methods of assessment may not adequately evaluate essential skills in clinical settings and inconsistency was found.<sup>3</sup> Performance-based teaching and assessment are terms used to describe methods that allow educators to focus on clinical skills rather than simply clinical knowledge. Performance-based methods provide an opportunity to test the knowledge, skills and attitudes that are integral to health professionals' work.<sup>4,5</sup>

A new methods in the use of performance-based assessment, such as the objective structured clinical examination (OSCE),<sup>6</sup> been used in evaluating clinical competence in health professions education around the world.<sup>7-9</sup> Because more emphasis is being placed on the experiential aspect of training, more emphasis placed on effective and accurate evaluation of students' performance in practice settings.<sup>10</sup>

The Objective Structured Clinical Examination (OSCE), one form of performance-based assessment, has become the gold standard the world over as a tool for evaluating the clinical competency of medical<sup>5,11-12</sup> and pharmacy undergraduate students.<sup>13-15</sup> In fact, the OSCE has been proven and rated as the most reliable and valid tool for assessing clinical competency.<sup>4,13,16-17</sup> Although a well-constructed and implemented OSCE, is a valid and reliable method of evaluating clinical competence, there is overwhelming evidence from the literature to support that it is not without limitations.<sup>4,18</sup>

Furthermore, our systematic review explored the implementation of OSCE, validity and reliability of OSCE methods and to describe and discuss the evaluation of the OSCE assessment.

## MATERIALS AND METHODS

A systematic review was undertaken to identify all relevant studies.

### Study identification

Three electronic databases (PUBMED, Science Direct, Cochrane Database of Systematic Reviews) and Google Scholar were initially searched in January 2017. Search terms used were "Pharmacy student" [MeSH] AND "assessment" [MeSH] AND "Clinical skills" [MeSH]. Additional articles were identified through reference tracking.

### Eligibility criteria

The titles and abstracts of the publications identified were assessed by two independent reviewers. If the abstracts seemed to be relevant, full text articles were then retrieved. Disagreement on the eligible articles was resolved by discussion until consensus was reached.

Two quality scores were allocated to each study to aid the selection of well-designed and clearly reported studies. We distinguished between 'quality of the study' and 'quality of the information provided'. The quality of study score reflected the design and execution of the study. The quality of information score reflected the statement of a clear rationale for the OSCE and its evaluation, good contextual information, sufficient information on sampling, ethics and possible bias and an analysis described in sufficient detail. Each quality score had an ascending five-point scale and only studies attaining at least four on both dimensions were eligible for inclusion in this review.

### Data extraction

Data were independently extracted by 2 independent researchers. Data extraction form that included details of study, target and context of OSCE, number of students involved, implementation process and evaluation of OSCE in terms of students and examiner perception. Non-agreement on the extracted data was resolved by discussion among the authors.

## RESULTS AND DISCUSSION

### Search results

A diagram depicts steps of searching followed PRISMA diagram is presented in Figure 1. As shown in the Figure 1, electronic databases produced a total of 122 articles (67 articles from PUBMED, 25 articles from Science Direct, 19 articles from Cochrane Database of Systematic Review and 11 articles from Google Scholar). Title and abstracts of the 114 identified articles were independently assessed by the two authors, of which, 101 were excluded. One additional article was retrieved from the reference tracking of the included articles. Finally, 14 articles are included in the review. Study quality assessment was performed by the same two authors based on Grading quality of evidence and strength of recommendation.<sup>19</sup> Five studies<sup>20-24</sup> were in grade B2, as experimental or intervention studies, while nine studies<sup>3-4,9,14,25-28</sup> were in grade B3, as individual non-experimental studies.

### Studies characteristics

As shown in Table 1, included studies were conducted in 4 countries (US, Canada, UK and Malaysia). Eight studies were conducted in US<sup>14,22-24,27-30</sup> while three studies were conducted in Canada.<sup>18,25,31</sup> Two other studies were conducted in Malaysia<sup>21,26</sup> and one from UK.<sup>20</sup> Most of individual studies used the same pattern of OSCE method, which were developed based on expert panel group discussion and focus group discussion with experienced pharmacists as well as faculty members. Some of studies performed pilot testing of the OSCE and revisions were conducted if necessary.

### OSCE development

Austin *et al.* developed and validated an OSCE to the entry level practicing pharmacists in Canada using several steps include focus group, delphi method, and piloting the instruments of assessment.<sup>18</sup> While studies in US used extensive consultation with faculty members and preceptors in order to develop a blueprint outlining competencies to be assessed.<sup>23-24</sup> Validation of multiple OSCE stations with tasks linked to the blueprint was performed in five studies.<sup>18,20-21,29-30</sup> In addition, field testing of stations were also conducted in Canada,<sup>18</sup> UK<sup>20</sup> and US.<sup>22-23,27</sup>

As part of consistency testing, comparing of pharmacy students' self-assessment with weighted average assessments of examiners, peers and standardized patients was used by Austin 2007<sup>25</sup> and Kimberlin 2006.<sup>30</sup> Mackellar *et al.* employed focus group discussion and Delphi survey with 35 professionals to determine the importance and reliability of each criterion.<sup>27</sup> Crisholm 2010 conducted construct validity test which 6 factors (subscales) were identified and reliability estimates ranged from 0.72 to 0.85 for the 6 factors.<sup>29</sup> Kimberlin *et al.* developed behavioral assessment forms and key faculty members were interviewed. Forms were analyzed to determine skills most commonly assessed in communication with simulated patients.<sup>30</sup> OSCE model have been produced that is reliable enough, defensible and feasible, but concerns were expressed regarding objectivity in assessment and individual grading.

### OSCE implementation

Awaisu *et al.* employed OSCE to assess clinical skills among students. A13-station OSCE (7 active, 3 preparatory and 3 rest stations, with 15 min each station) was designed and implemented as part of the assessment methods for the Clinical Pharmacy III course.<sup>21</sup> The examinees were required to perform specific functions to complete the task or address the problem in each station.<sup>21,26</sup> Fernandez 2007 employed clinical skill assessment as part of the patient care laboratory. Students participated in a simulated case of an acutely ill patient with a hypertensive emergency.<sup>22</sup> Crisholm 2010 implemented pharmacy professionalism survey instrument and then administered to all first-year pharmacy students and to recent pharmacy graduates. One hundred thirty first-year pharmacy students and 101 pharmacy graduates participated in the survey. Over 98% of students successfully passed the OSCE component of the licensing examination.<sup>29</sup>

In other hand, Sturpe observed that OSCE program were varied among US pharmacy school. Eleven pharmacy schools consistently administered OSCE examinations. Of the 55 programs not using OSCEs, approximately half were interested in using the technique. Common barriers to OSCE implementation or expansion were cost and faculty members' workloads.<sup>14</sup>

There is wide interest in using OSCEs within pharmacy education. However, still few colleges and schools of pharmacy conduct OSCEs in an optimal manner and most do not adhere to best practices in OSCE construction and administration.

### OSCE evaluation

Quantitative and qualitative approach was used to evaluate OSCE examination process. Awaisu conducted a cross sectional survey using 46-item questionnaire to evaluating the OSCE stations in terms of ease of understanding the written instructions, difficulty of the tasks and perceived degree of learning gained.<sup>21</sup> Most of the students rated the OSCE as a difficult form of assessment, yet about 81% perceived that they have learned a lot from it. Furthermore, students indicated that OSCEs was the methods results the highest degree of learning. In addition, over 70% of the examinees agreed that OSCE and clerkship ratings should be used much more.<sup>21</sup>

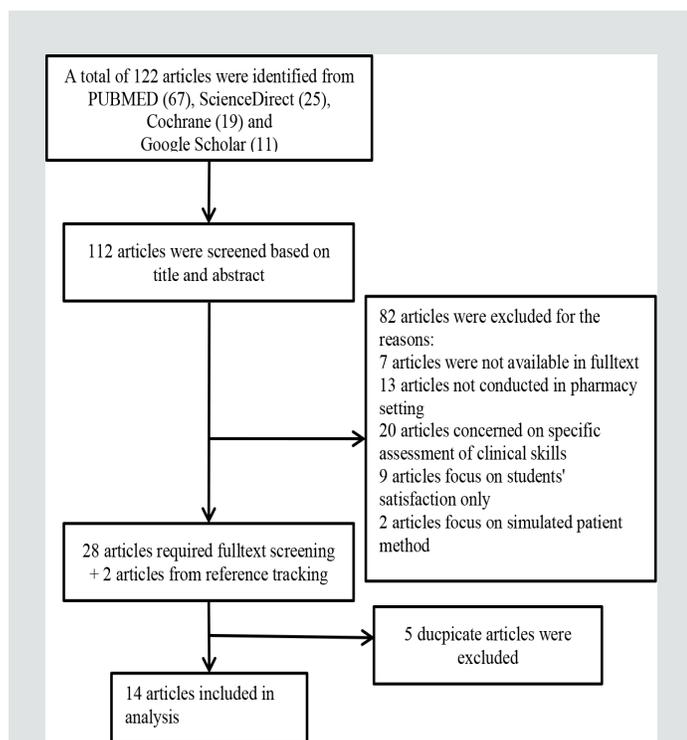


Figure 1: PRISMA diagram of retrieved studies.

**Table 1:** Characteristics of included studies.

Author, Year, Country	Learner	Aim	Context	Steps in developing/ implementing OSCE	Outcome
Kirton 2011, UK	Pharmacy students	to compare objective structured clinical examinations (OSCEs) and traditional assessment methods	Medicines and Pharmacy Practice course Cohort of 39 students	Individual student performance in OSCEs was compared with performance on traditional examinations at the same level of program study	A moderate correlation was found between individual attainment in OSCE examinations and on traditional pharmacy practice examinations at the same level.
Awaisu 2010, Malaysia	Pharmacy students	To implement and determine the effectiveness of an objective structured clinical examination (OSCE) to assess fourth-year pharmacy students' skills	Clinical pharmacy course	A 13-station OSCE was designed and implemented  The competencies tested in the OSCE: patient counseling and communication, clinical pharmacokinetics (CPK), identification and resolution of drug-related problems (DRPs), and literature evaluation/drug information provision.	Students felt that a higher degree of learning was needed to accomplish the tasks at the DRP stations and CPK stations. CPK station was difficult to understand. Students rated OSCE as a difficult assessment.
Sturpe 2010, UK	Pharmacy students	To describe current OSCE practices in the United States Pharmacy Schools	OSCE implementation 88 faculty members	Structured interviews were conducted with faculty members to collect information about awareness of and interest in OSCE, current OSCE practices, and barriers to OSCEs.	32 pharmacy schools reported using OSCEs; however, practices within these programs varied. 11 of the programs consistently administered examinations of 3 or more stations, required all students to complete the same scenario(s) and had processes in place to ensure consistency of standardized patients Common barriers to OSCE implementation or expansion were cost and faculty members' workloads.
Austin 2007, Canada	Pharmacy students	Validation of assessment	Professional practice laboratory course  Eighty students participated in the study.	Compared pharmacy students' Self-assessment with assessments of peers, standardized patients and pharmacist instructors.	Differences between self-assessment and external assessments were found. These differences were marked in the areas of empathy and logic/focus/coherence of interviewing
Awaisu 2007, Malaysia	pharmacy students	To assess bachelor of pharmacy students' perception and acceptance of an OSCE and to explore its strengths and weaknesses.	Clinical Pharmacy Course 42 pharmacy students	Validated 49-item questionnaire using open-ended follow-up questions to generate qualitative data.  The questionnaire comprised of questions to evaluate the content and structure of the examination, perception of OSCE validity and reliability.	Over 80% students found the OSCE able to highlight areas of weaknesses in clinical competencies. 78% students agreed that it was comprehensive and fair. They felt that the 15 min allocated per station was inadequate, but agreed that the OSCE provided a useful and practical learning experience.
Fernandez 2007, US	Pharmacy students	To determine the effectiveness and student acceptance of using a human patient simulation (HPS) training module focused on interdisciplinary teamwork skills	Principles of Pharmacotherapy 4: cardiovascular Diseases and Patient Care Lab IV	Students participated in a simulated case of an acutely ill patient with a hypertensive emergency.  Students performed a history and physical examination and made treatment recommendations to the nurse and physician.  Following the exercise, a facilitated debriefing session was conducted.	Over 98% of students agreed or strongly agreed that they learned material relevant to their current studies.  When compared to student lectures, 90% of students felt that they learned clinical  Patient care better when using a HPS mannequin in simulated patient scenarios.

Continued...

**Table 1:** Cont'd.

Mackelar 2007, UK	Teaching staff members	To identify assessment criteria communication skills of pharmacy students	Communication skills 38 academic staffs	Potential assessment criteria were generated from teaching staffs and patients.	Consensus ratings identified 7 criteria that were important measures of pharmacy students' communication skills and could be reliably assessed by patients.
Ried 2007, US	Pharmacy students	To describe the development and preliminary outcomes of the SUCCESS for preceptors To assess students' clinical performance in advanced pharmacy practice experiences (APPEs).	students' clinical performance in advanced pharmacy practice experiences (APPEs). Six faculty members.	An Internet-based APPE assessment tool was developed by faculty members from colleges of pharmacy in Florida and implemented.	Numeric scores and grades derived from the SUCCESS algorithm were similar to preceptors' comparison grades. The average SUCCESS GPA was slightly higher compared to preceptors' scores (0.02 grade points).
Seybert 2007, US	Pharmacy students	To design and implement a simulated patient for critical care pharmacotherapeutic education and to evaluate student Satisfaction with the simulation.	Critical Care course 98 pharmacy students	During the second year of the doctor of pharmacy program, all students were required to complete Critical Care course. This course consisted of didactic education, written patientcase sessions and an interactive patient simulation session. Students were surveyed post-simulation to determine the effectiveness of the learning experience.	The majority of students (88%) were extremely satisfied with the experience. The facilitator was considered to be extremely useful in 75% of responses.
Austin 2006, Canada	Pharmacy students	To contrast the value and application of "standardized patient" and "simulated patient"	Pharmacy practice course	Interviewed with cohort of 14 students to evaluate long-term impact of the course (3 years).	Value in teaching clinical and pharmaceutical care skills were recognized. Objectivity in assessment and individual grading. 80% of students passed the OSCE as the licensing examination.
Chrisholm 2006, US	Pharmacy students and graduates	To develop and validate an instrument that measures professionalism among pharmacy students and recent graduates	Pharmacy licensure examination One hundred thirty first-year pharmacy students and 101 pharmacy graduates participated in the survey	A survey instrument developed by a focus group was pretested and then administered to all first-year pharmacy students and to recent pharmacy graduates. A 32 items were asked using a 5-point Likert scale.	Six factors (subscales) were identified, which were named excellence, respect for others, altruism, duty, accountability and honor/integrity. Item to total correlations ranged from 0.25 to 0.57 on the 6 factors (subscales) and reliability estimates ranged from 0.72 to 0.85 for the 6 factors and total scale.
Kimberlin 2006, US	Pharmacy school	To describe current practices in assessing patient communication skills in US colleges and schools of pharmacy.	Communication skill course. 50 pharmacy schools were observed. Individuals from 47 schools were interviewed.	Syllabi and behavioral assessment forms were solicited and key faculty members were interviewed. Forms were analyzed to determine skills most commonly assessed in communication with simulated or role-playing patients.	Colleges were found to vary in the way communication skills were assessed. Assessment forms focused more on dispensing a new prescription than monitoring ongoing therapy. Providing information was emphasized more than promoting adherence. Common faculty concerns were lack of continuity and congruence of assessment across the curriculum.

Continued...

**Table 1:** Cont'd.

Seybert 2006, US	Pharmacy students	To assess the effect of simulation-based learning on ability to perform accurate blood pressure assessments  To measure student satisfaction with this novel teaching method.	Clinical skills: blood pressure assessments  95 students	Didactic lectures on blood pressure assessment were combined with practical sessions using a high-fidelity computerized patient simulator.  Before and after the simulation sessions, students completed a written objective examination to assess knowledge and completed a survey instrument.  To determine their attitudes regarding the learning experience. Individual clinical skills were assessed using the patient simulator.	Significant improvement was seen in students' knowledge and their ability to accurately determine blood pressure following simulation sessions.  Survey responses indicated that students felt confident that simulation-based learning would improve their ability to perform accurate blood pressure assessments.
Austin 2003, Canada	Practicing pharmacists	To develop and validate an OSCE to the entry-to-practice examination for pharmacists	Entry-to-practice exam	Consultation process, blueprint development, validation of stations, development of assessment instruments, field testing, standard-setting procedures and protocols.	OSCE model have been produced that is reliable with valid outcomes, defensible and feasible

A cohort study to evaluate long-term impact of the course was conducted by Austin 2006, students were assessed on 3 years after graduation and licensure.<sup>31</sup> Students responded positively to the shift from “standardized” patients to “simulated” patients, recognizing their value in teaching clinical and pharmaceutical care skills.

Based on qualitative data collection, several themes were identified. The OSCE has exposed students to what seemed like “real life” cases and accurately measured their knowledge and skills. Other themes that emerged included: the OSCE highlighted areas of weaknesses in clinical skills and knowledge, the OSCE enhanced communication skills, the OSCE was a true reflection of the skills learned from the curriculum. Students obtained additional experience and learned a lot from the OSCE. Most of the students felt that the 15 min limit allocated for each was inadequate. Students indicated that the OSCE caused them to be nervous. Moreover, six students indicated that the OSCE was an anxiety and stress-inducing examination.<sup>21,22,26</sup> Examinees were also asked to rate the OSCE in relation to other assessment methods on the strengths and weaknesses of the examination and students' recommendations for improvement. Examinees recommended that the time allocated at each station be increased for future OSCEs. Other suggestions for improvement were that the OSCE be introduced earlier in the pharmacy curriculum. Examinees also suggested that competencies receive broader coverage in the pharmacy curriculum and more emphasis be placed on experiential training.<sup>21</sup>

Similar to the study among medical students and nurses, we found that pharmacy education currently adopted the OSCE method to evaluate students' performance. The faculty member saw the OSCE as an unprecedented opportunity to encounter real-life scenarios. The finding that a high proportion of the students admitted that the OSCE provided a useful and practical learning experience was consistent with similar studies reported previously.

Newble and Swanson suggested that low reliabilities of OSCEs are more likely attributed to the variability among stations due to the unique nature of the individual competency being assessed rather than to poor interrater reliability.<sup>4</sup> As a result, longer OSCE instruments, comprised of more stations, may be required to obtain more acceptable (ie, higher) dependability coefficients and lower standard errors of measurement.<sup>13</sup>

Despite, all the concerns raised, the OSCE has received considerable support from faculty. A substantial proportion of the students agreed

that they gained a high degree of knowledge in all the stations of the OSCE, but felt that the OSCE format should be introduced earlier in the curriculum. In essence, OSCEs allow students to integrate pharmacotherapeutic knowledge,<sup>2,32</sup> problem-solving skills, and communication and interpersonal skills into each exercise.

The use of OSCE is thought to be more objective, more valid and more reliable than most other assessment methods. In order to evaluate the validity of an OSCE to assess clinical competence, evidence concerning construct validity should be gathered as described widely in the medical literature. Content evidence, clarity of instructions, station developer expertise and adequacy of OSCE content in relation to curriculum objectives should be critically examined by an appropriate panel of experts.

Our summary should be interpreted in the light of major limitation. There is no data generated to support the sufficiency of ensuring the validity and reliability of the OSCE examination. In the future study, an OSCE's validity and reliability should be tested by using procedures such as internal structure evaluation (interrater reliability assessment).

## CONCLUSION

This study provides important insight regarding use and quality of OSCEs. OSCE can play an important role in the pharmacy curriculum and providing students with a real-world context for understanding complex patient care needs. Many schools of pharmacy adopted OSCEs to measure clinical competence accurately, but barriers to OSCE implementation and expansion relate to cost and manpower issues.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## ABBREVIATIONS

OSCE: Objective Structured Clinical Examination.

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