BRIEF

Use of objective structured clinical examination to assess competency acquired during an Introductory Pharmacy Practice Experience (IPPE)

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ABSTRACT

OBJECTIVE. To describe and evaluate the use of objective structured clinical examinations (OSCE) to assess clinical competency acquired during an off-campus Introductory Pharmacy Practice Experience (IPPE)

METHODS. Third year pharmacy students completed an IPPE in transitions-of-care and completed 24 experiential contact hours at one of seventeen practice sites. Students were assessed during two OSCEs, the first occurring prior to an off-site IPPE (pre-experience OSCE) and the second occurring upon completion of the off-site IPPE (post-experience OSCE). Each OSCE consisted of ten stations and five graded competency domains. The primary outcome was the degree of change in student performance
from the pre-experience OSCE to the post-experience OSCE. Secondary outcomes included changes in each graded domain, OSCE pass rate, and failure conversion rate.

**RESULTS.** 109/111 students completed both the pre- and post-experience OSCE. Statistically significant improvements were observed in overall score and cohort pass rate. Overall scores improved from 80 (CI\(_{95}\) 77.6-81.7) for the pre-experience OSCE to 87 (CI\(_{95}\) 85.5-88.4) for the post-experience OSCE. OSCE pass rate also improved from 47% (51/109) to 84% (91/109).

**CONCLUSION.** Although preceptor evaluations have traditionally served as the primary summative assessment for IPPE and APPE, this study indicates that OSCE may be a reliable alternative to assess clinical competency acquired from off-site practice experiences.

**Keywords:** IPPE, experiential education, OSCE, competency assessment, clinical competency, objective structured clinical examination, introductory pharmacy practice experience

**INTRODUCTION**

Evaluation of student performance on introductory and advanced pharmacy practice experiences (IPPE and APPE) continues to be a controversial topic. In particular, preceptor ratings of student performance have been criticized for a lack of consistency and accuracy.\(^1\)\(^3\) Nevertheless, a majority of pharmacy schools continue to utilize preceptor evaluations as the primary source for grade determination in both IPPE and APPE.\(^4\)

One alternative to the traditional preceptor evaluation is the objective structured clinical examination (OSCE). OSCE was first introduced by Harden and colleagues as a novel method of assessing clinical competence for medical students and has since been adapted to doctor of pharmacy curricula, among numerous other health professional programs.\(^5\)\(^6\) OSCE is advantageous in evaluating competency in difficult-to-assess areas, such as communication, problem solving, and sound decision-making.\(^7\)\(^8\) Compared to other assessments, OSCE has relatively high reliability, validity, and objectivity. Considering that key drivers of preceptor rater error include leniency, deficits in preceptor knowledge and
skills, and the halo effect of a students’ prior performance, OSCE lends itself as a more objective and unbiased alternative.¹

Use of OSCE in pharmacy curricula is common, but varies greatly in structure and purpose.⁶ Schools of pharmacy have implemented OSCE as formative and summative assessments for both individual courses and program level performance, and most recently to assess APPE-readiness.⁶-⁷,⁹-¹²

Furthermore, because OSCE is capable of assessing clinical competency, communication, and professionalism, there is significant potential to leverage OSCE as the primary assessment for experiential courses and some authors have indicated its potential to assess APPE.⁵,⁷,⁸,¹³,¹⁴ Nevertheless, the use of OSCE in experiential courses has yet to be described in pharmacy education literature. A review of other health professions yielded a few articles examining the use of OSCE in medical clerkships, but literature in examining its use in experiential programs in other professions was lacking.¹³,¹⁵,¹⁶

The purpose of this study was to describe and evaluate the use of OSCE administered before and after an IPPE to assess competency acquired during the course.

METHODS

During the third professional year (P3) at University of North Texas System College of Pharmacy, students completed a required IPPE in transitions-of-care. The course consisted of 24 hours at a pharmacy practice site (hospital, ambulatory, or hospital-based community pharmacy). Students completed transition-of-care activities (ie, medication reconciliation and patient education), identified medication-related problems, and made clinical recommendations to their preceptor. Preceptors were provided with a 1-hour mandatory online training and guidance documents specific to this course that covered course structure, required activities, preceptor and student expectations, and use of OSCE to assess student competency. In addition, preceptors receive more generalized preceptor development from the college, including teaching strategies and effective feedback.

Two OSCEs were administered. The first OSCE was administered prior to the off-site experience and was used as a formative assessment (pre-experience OSCE). Students that failed the pre-experience
OSCE were required to attend a debrief session, but were not required to remediate. The second OSCE was administered as a summative assessment at the conclusion of the IPPE (post-experience OSCE). Students were required to pass the post-experience OSCE to receive a passing grade for the course. In case of failure for the post-experience OSCE, students were allowed a single remediation attempt.

The structure, resources, and assessments were identical for both OSCEs. The only difference between the two OSCEs was case content. Each OSCE consisted of ten 15-minute stations (Table 1). Stations 0 through 6 simulated a hospital admission utilizing a progressive case that started in the emergency department and concluded after the patient was admitted to the intensive care unit (ICU). Station 7 through 9 simulated a discharge encounter for a new patient. Skills tested throughout the OSCE, such as medication history interview skills and patient counseling, had previously been taught and assessed separately during the first year (P1) skills lab course.

Cases were initially developed by IPPE course faculty and internally validated by content experts for accuracy, completeness, and standardization, particularly in terms of difficulty. Clinical case content was derived from second year (P2) pharmacotherapy courses. Consequently, P2 pharmacotherapy course faculty served as content experts for each case as appropriate. To prevent loss of confidentiality, new cases were developed for each cohort.

Cases progressed in compressed time and included common healthcare challenges, such as unreliable patients, limited physician accessibility, and incomplete records. Information was revealed to students progressively via a standardized paper-based medical record that included progress notes, orders, laboratory results, and previous encounters. Students interacted with three standardized clients (patients, family members, and physicians) during the OSCE. Patients and family members were portrayed by actors from our standardized patient pool. Physicians were portrayed by faculty. Standardized client interactions were assessed by live graders that were recruited from our pharmacist grader pool. Standardized clients were provided a script, including specific and general responses. Both standardized clients and graders received a 1-hour training immediately prior to the OSCE.
The OSCE was assessed on a 100-point scale, with five individually graded competency domains. Each domain accounted for 20 points and included: medication history interview skills (station 2), accuracy of the medication history (station 2), accuracy of medication reconciliation (station 4), presentation and accuracy of therapeutic recommendations to the patient’s provider (station 6), and discharge counseling skills (station 9). Interview skills and counseling skills were assessed by a concealed grader using a global rating scale in which the grader rated students’ performance as: clear pass (20), borderline pass (15), borderline fail (10), or clear fail (5). Accuracy of the medication history and medication reconciliation were assessed by the experiential course director using a standardized rubric that evaluated five components on a four-point rating scale, including identification of current medications, medication order completeness, indication, penmanship, and recording other key data such as allergies and non-prescription products. Satisfactory competency (i.e. pass) was defined as obtaining an overall score of 75 or higher and a minimum score of 15 out of 20 for each of the five domains. Students that did not achieve a minimum score of 15 in any domain received a grade of ‘fail’ for the entire OSCE. Rubrics, rating scales, and thresholds were developed by the course team and internally validated with other faculty experienced in OSCE.

The primary outcome was change in student performance from the pre-experience OSCE to the post-experience OSCE. Secondary outcomes included change in overall pass rate, pass rate in each domain, and the failure conversion rate, which was defined as the percentage of students that failed the competency in the pre-experience OSCE, but later demonstrated competency during the post-experience OSCE. Student performance during remediation was not included in the analysis.

Student perceptions of the OSCEs were assessed using a standardized and validated institutional student course evaluation, specifically students’ responses to the statement: “The exams were representative of materials and objectives presented in the course.” Students were allowed to rank this statement on a five-point scale with anchors of “strongly agree (5)” and “strongly disagree (1).” The survey, which was voluntary and de-identified, was administered upon completion of the course, but before grades were released.
Statistical analyses were conducted using IBM SPSS Statistics 24. The primary outcome was analyzed using paired t-test and secondary outcomes were analyzed using McNemar chi square. Student course evaluation data were analyzed using descriptive statistics.

RESULTS

Of the 111 students enrolled in the course for the 2017-2018 academic year, 109 students completed both OSCEs. Students’ mean age was 26.9 (SD +/- 4.65) and 55% of students reported as female. The primary outcome, student performance as represented by mean OSCE score, demonstrated improvement from 80 (CI95 77.6-81.7) for the pre-experience OSCE to 87 (CI95 85.5-88.4) for the post-experience OSCE (p < .001). In addition, first-attempt OSCE pass rate increased from 47% (51/109) to 84% (91/109), with a two-sided p < .001. Conversion rate of students that failed the pre-experience OSCE was 86% (50/58).

Statistically significant improvements in pass rate were observed for four out of five domains (Table 2) and numerical scores increased significantly for three of the five domains (Table 3). The greatest observed improvement was for presentation and accuracy of therapeutic recommendations, in which numerical scores increased from 15 (CI95 14.1-15.8) to 17 (CI95 16.7-17.8; p < .001) and pass rate increased from 69% to 92% (p < .001). Significant improvements were also observed in the medication reconciliation competency, with an absolute increase in pass rate of 14% (p = .001) and a numerical score increase from 16 (CI95 15.5-16.7) to 18 (CI95 17.5-18.3). Performance improvements were less obvious in collecting an accurate medication history, admission interview skills, and discharge counseling skills. These three areas demonstrated statistically significant improvements in either numerical score or overall pass rate, but not both.

In terms of student perceptions, 41% (45/111) of students rated the statement “The exams were representative of materials and objectives presented in the course.” Of these 45 respondents, 25 (56%) selected “strongly agree,” 18 (40%) selected “agree,” and two (4%) selected “neutral,” indicating that
almost all respondents felt the OSCEs were representative of the clinical experiences acquired during the IPPE.

**DISCUSSION**

This study describes the use of OSCE to assess competency acquired during an IPPE as an alternative to preceptor evaluations. Use of OSCE allowed the authors to detect improvements in overall competency and in specific competency domains. The greatest magnitude of improvement was detected in domains that required critical thinking, clinical reasoning, and communication. This result is consistent with both medical education literature and experiential learning theory in terms of competencies typically acquired from such experiences.\(^{15,17,18}\)

Although consistent with the authors’ expectations, these results highlight important advantages in using OSCE to evaluate student competency acquired from off-campus experiences. OSCE provides a mechanism to standardize summative assessment across diverse practice sites and compare student performance across a single cohort.\(^1\) In addition, these results can inform experiential office efforts concerning course design and preceptor development. Although alternatives, such as preceptor observation checklists, have been explored in the literature, these have produced a similar pattern of grade inflation seen with preceptor evaluations.\(^{19}\)

Furthermore, use of a pre-experience OSCE added significant value to the course. In addition to serving as a baseline assessment to which the final OSCE could be compared, the pre-experience OSCE served as a teaching tool. By identifying and communicating gaps in students’ knowledge and skills at the beginning of the IPPE, individuals could focus on specific competency areas that needed further development. Additionally, the pre-experience OSCE helped set student expectations for both the off-site learning experience ahead and the final assessment for the course.

To successfully implement a similar approach at other institutions, realism and fidelity of the OSCE should be given careful consideration. OSCE in pharmacy curricula vary greatly from discrete skill-based assessments to whole case scenarios that include standardized patients and physicians.\(^9,19\) In
In this study, the OSCE included a whole case scenario, standardized clients, and factors to enhance the reality of the scenario; all of which improve validity and efficacy of the OSCE.\textsuperscript{20-24} In addition to depicting real practice, the OSCE must maintain fidelity to the off-campus experience and vice versa to avoid adversely impacting student performance. Consequently, use of experienced and dedicated preceptors, as well as identifying adequate practice sites becomes crucial.

In terms of limitations, this study is challenged by its small sample size and conduct at a single institution during a single academic year. In addition, student performance may have been affected by non-cognitive confounders, such as performance anxiety, exam familiarity, and unintended patient variance.\textsuperscript{8,25,26} Although addressed by our validation strategy, differences in case content may have also influenced student performance.

Despite these limitations, there are many future directions for OSCE use in experiential courses. Based upon our findings, schools of pharmacy should consider addition of OSCE to select IPPE and APPE that may benefit from more robust assessment techniques than are currently used. As a reliable quantitative method for measuring improvements in clinical competencies across a cohort of off-campus learners, use of pre- and post-experiential OSCE may also be valuable in conducting educational research.

CONCLUSION

Although preceptor evaluations have traditionally served as the primary assessment for IPPE and APPE, this study indicates OSCE may be a reliable alternative to assess clinical competency acquired from off-site IPPE.

REFERENCES

<table>
<thead>
<tr>
<th>Case scenario</th>
<th>Station #</th>
<th>Station title</th>
<th>Description of activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital admission</td>
<td>0</td>
<td>Staging</td>
<td>Student receives instructions and awaits the next station with a proctor. Outside of the examination room, the student is allowed to review the medical record for a patient being admitted to the hospital. The student may use electronic resources to check drug interactions, dosing, indications, etc.</td>
<td>15 min</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Chart review</td>
<td></td>
<td>15 min</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Patient interview</td>
<td>In the examination room, the student acquires a best possible medication history with a patient’s family member and answers the family's questions.</td>
<td>15 min</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Break /Transit</td>
<td>The student is escorted to the next station by a proctor.</td>
<td>15 min</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Medication reconciliation</td>
<td>The student reconciles the patient's home medications with newly written hospital admission orders.</td>
<td>15 min</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>SBAR preparation</td>
<td>The student prepares to meet with the patient's physician to make recommendations for care. The student should structure their recommendations in an SBAR format.</td>
<td>15 min</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>SBAR with provider</td>
<td>The student meets with a physician and presents their recommendations for care in an SBAR format.</td>
<td>3 min</td>
</tr>
<tr>
<td>Hospital discharge</td>
<td>7</td>
<td>Break/Transit</td>
<td>The student is escorted to the next station by a proctor.</td>
<td>15 min</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Chart review</td>
<td>Outside of the examination room, the student is allowed to review the medical record for a patient being discharged from the hospital. The student may use electronic resources to check drug interactions, dosing, etc.</td>
<td>15 min</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Discharge education</td>
<td>In the examination room, the student provides medication counseling for a patient being discharged from the hospital.</td>
<td>15 min</td>
</tr>
</tbody>
</table>
### Table 2. Student Success Rate for Each Competency Area Assessed (excludes remediation)

<table>
<thead>
<tr>
<th>Competency area</th>
<th>Pre-experience OSCE</th>
<th>Post-experience OSCE</th>
<th>Failure conversion rate</th>
<th>( p ) value (two-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission interview skills</td>
<td>87% (93/109)</td>
<td>98% (107/109)</td>
<td>100%</td>
<td>.004</td>
</tr>
<tr>
<td>Medication history accuracy</td>
<td>92% (100/109)</td>
<td>98% (107/109)</td>
<td>100%</td>
<td>.065</td>
</tr>
<tr>
<td>Medication reconciliation accuracy</td>
<td>84% (91/109)</td>
<td>97% (106/109)</td>
<td>94%</td>
<td>.001</td>
</tr>
<tr>
<td>Presentation and accuracy of therapeutic recommendations</td>
<td>69% (75/109)</td>
<td>92% (100/109)</td>
<td>82%</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Discharge counseling accuracy</td>
<td>84% (91/109)</td>
<td>95% (104/109)</td>
<td>78%</td>
<td>.001</td>
</tr>
<tr>
<td>Overall</td>
<td>47% (51/109)</td>
<td>84% (91/109)</td>
<td>86%</td>
<td>.001</td>
</tr>
</tbody>
</table>

*Failure conversion rate = percentage of students that failed the competency in the pre-experience OSCE who successfully completed the competency during the post-experience OSCE remediation.

### Table 3. Mean Numerical Student Scores for Each Competency Area Assessed (excludes remediation)

<table>
<thead>
<tr>
<th>Competency area</th>
<th>Pre-experience OSCE (CI&lt;sub&gt;95&lt;/sub&gt;)</th>
<th>Post-experience OSCE (CI&lt;sub&gt;95&lt;/sub&gt;)</th>
<th>( p ) value (two-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission interview skills</td>
<td>16 (15.6-17.1)</td>
<td>17 (16.5-17.7)</td>
<td>.116</td>
</tr>
<tr>
<td>Medication history accuracy</td>
<td>16 (15.7-16.8)</td>
<td>18 (17.5-18.3)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Medication reconciliation accuracy</td>
<td>16 (15.5-16.7)</td>
<td>18 (17.5-18.3)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Presentation and accuracy of therapeutic recommendations</td>
<td>15 (14.1-15.8)</td>
<td>17 (16.7-17.8)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Discharge counseling accuracy</td>
<td>16 (15.2-16.7)</td>
<td>17 (16-17.6)</td>
<td>.092</td>
</tr>
<tr>
<td>Overall</td>
<td>80 (77.6-81.6)</td>
<td>87 (85.5-88.4)</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>