Author Queries

JOB NUMBER: MS 152820

JOURNAL: GPHE

Q1 Kindly provide the recevied, revised and accepted dates for this article.

Q2 Kindly check the inserted additional keyword.

GPHE 152820—23/12/2005—MADHAVANS—196062

Pharmacy Education, 2006; 6(1): 1–6

Evaluating clinical skills of undergraduate pharmacy students using objective structured clinical examinations (OSCEs)

M. CORBO[1], J.P. PATEL[2], R. ABDEL TAWAB[2] & J.G. DAVIES[2]

[1]*Division of Pharmacokinetics and Drug Therapy, Department of Pharmaceutical Biosciences, Uppsala University, Box 591, 751 24 Uppsala, Sweden, and* [2]*School of Pharmacy and Biomolecular Sciences, University of Brighton, Lewes Road, Brighton BN2 4GJ, UK*

Abstract

Introduction: The objective structured clinical examination (OSCE) has been used for the competency assessment of clinical skills within the 4th year MPharm programme at the University of Brighton since 1999.

Aim: To evaluate the clinical performance of 4th year MPharm students, through two academic years.

Methods: Final year pharmacy undergraduate students were divided into 16 groups and completed an OSCE exam following a 1 week placement in a hospital. Each OSCE exam comprised of six workstations.

Results: Significant differences were found between the students' performances at the individual OSCE stations (Chi-square = 40.7; df = 5; $p < 0.01$). Students performed best on patient counselling stations and least on calculation and problem identification and resolution type stations.

Conclusion: This study demonstrates that final year pharmacy undergraduates perform poorly in activities which demand an element of clinical problem identification and resolution or when performing a clinical calculation. These results suggest that a lack of clinical exposure may be, in part, responsible for the students' perceived inability to deal with "real life" situations which involve clinical problem solving.

Keywords: *Objective structured clinical examination (OSCE), undergraduate students, clinical skills assessment, multiple choice question*

Introduction

Over the last 15 years pharmacists have begun to undertake many extended roles. These roles include medication usage review, pharmacist-led clinics, supplementary prescribing and attendance on medical ward rounds (Bellingham, 2004).

In order for pharmacists to be able to meet these new demands the undergraduate pharmacy curriculum was reviewed to accommodate these new aspects, so that since 1997 all Schools of Pharmacy in the United Kingdom have offered a 4 year Master of Pharmacy degree programme (Rutter, 2001). The 4 year course has allowed students to gain more exposure to clinical and professional pharmacy earlier. More time can also be devoted to helping students develop communication, presentation and problem-solving skills, which are all key assets of a successful pharmacist (Adcock, 2001).

Assessment of these clinical skills is important when determining the level of competence of pharmacy undergraduate students. Different ways of assessing students are illustrated by Miller's pyramid of competence (Figure 1). The first and second levels of the pyramid ("knows" and "knows how") represent traditional ways of assessment such as a written test, multiple choice questions (MCQ) and oral examination. This, however, is not enough, when trying to assess the ability of pharmacy students to perform the roles of qualified pharmacists, as passing a test assessing "knows" and "knows how" does not mean the student will function as a competent pharmacist.

Correspondence: J. G. Davies, School of Pharmacy and Biomolecular Sciences, University of Brighton, Lewes Road, Brighton BN2 4GJ, UK. Tel: 44 1273 642044. Fax: 44 1273 679333. E-mail: j.g.davies@brighton.ac.uk

ISSN 1560-2214 print/ISSN 1477-2701 online © 2006 Taylor & Francis
DOI: 10.1080/15602210500528372

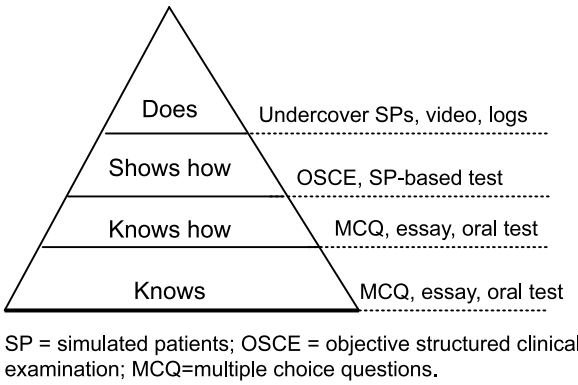

Figure 1. Miller's pyramid of competence. SP = simulated patients; OSCE = objective structured clinical examination; MCQ = multiple choice questions.

Thus, when assessing clinical competence the third level of the pyramid ("shows how") must be incorporated into a skills based assessment (Wass,van der Vleuten, Shatzer & Jones, 2001). Skill based assessments are designed to measure the knowledge, skills, and judgment needed to demonstrate competence in a specific area.

The ideal clinical examination should fulfil three criteria: validity, reliability and practicality (Harden & Gleeson, 1979). Validity is defined as the degree to which a result reflects the construct it is supposed to measure. An assessment should measure what is intended (face validity) and include the assessment of relevant areas and skills representative of practice (content validity) (Crossley, Humphris & Jolly, 2002). A reliable assessment should also be objective thereby removing patient and assessor variability (Harden & Gleeson, 1979). Sources of assessor bias can result in differences in the rating given by the same assessor (intra-rater reliability) or differences in rating between assessors (inter-rater reliability). If there are differences in the way individuals rate a performance then this could result in students being unfairly assessed (Tamblyn, Klass, Schnabl & Kopelow, 1991). One format where the majority of the above factors are achieved is the objective structured clinical examination (OSCE). This format was introduced in late 70s by Harden and Gleeson (1979), as an organisational framework that could be adopted to suit the needs and purposes of the clinical examination for medical students (Newble, 2004).

An OSCE is an objective method of assessment best suited to test clinical, technical and practical skills (Newble, 2004) and its validity has been proven in the medical literature (Martin & Jolly, 2002, Hodges & McIlroy, 2003). It is a flexible examination format, consisting of a series of work stations through which students rotate on a timed basis. Time spent at each station is usually short, between 5–10 min, but the time and number of stations can vary with different OSCE designs (Harden & Gleeson, 1979, Newble, 2004). At each station students are asked to undertake a well-defined task, e.g. in a pharmacy consulting with a patient or calculating the appropriate concentration of drug to be administered to a patient. Stations may be manned or unmanned, with the former involving a simulated patient or a simulated doctor playing a specific scenario, while unmanned stations typically are stations where a written response to a task is required, for example a drug dosage calculation (Newble, 2004).

Student performance is evaluated using a checklist of objective criteria, for each station, agreed before the examination takes place. These checklists can be completed either by examiners, or by patients trained to score the performance. The use of task specific checklists demonstrates a higher level of agreement among observers than rating scales (Newble et al., 1994) and it also increases the objectivity and reliability of the assessment. The assessment made during an OSCE using the checklist, ultimately results in a pass/fail mark for every student. A pass mark is awarded when the essential criteria, defined prior to the OSCE, are met. The examination can also be adapted so that a percentage score can be awarded, but an OSCE is particularly suited, and mostly used, for making pass/fail decisions i.e. the student is either competent or not (Harden & Gleeson, 1979).

The main advantage of the OSCE is that it is a reliable and valid examination where examiners can control what is to be tested and the complexity of that test. A wide range of skills can be examined for a large number of students and the pass criteria can be specified in advance (Harden & Gleeson, 1979, Newble, 2004).

In a study at Portsmouth University, the introduction of an OSCE style assessment to the MPharm undergraduate curriculum was well received by the students. It was also thought to be helpful in allowing students to practice the duties required of them during the pre-registration year (Rutter & Brown, 2002). Another study of pre-registration trainees in South Thames region showed the OSCE to be valid, reliable and well accepted way of assessing the competence of pre-registration trainees (McRobbie & Davies, 1996).

At the University of Brighton, School of Pharmacy, the OSCE has been used for over 10 years to test the competency of postgraduate clinical pharmacists and in 1999, the OSCE was introduced to the MPharm programme as a way of assessing the clinical skills of final year undergraduate students. The OSCE contributes 70% to the mark awarded for student performance in a double module (called Professional Development). The remaining 30% is allocated to a range of coursework activities.

Table I. Station categories used in the Brighton OSCE.

Workstation categories	Description
Problem identification and solution	Unmanned station assessing problem solving and data interpretation skills
Patient-counselling	Assessing students interaction with patients and conveying technical information
Patient-problem identification and resolution	Assessing drug related problem identification and resolution
Doctor-advise-giving	Assessing advising medical staff in pharmaceutical questions
Doctor-problem identification and resolution	Assessing interaction with doctors and identification and resolution of pharmaceutical problems
Calculation	Unmanned station assessing solution of drug related calculation

Aims and objectives

The aim of this study was to evaluate the clinical performance of 4th year pharmacy students at the School of Pharmacy, University of Brighton.

The objectives were to:

i) Compare overall student performance for the two academic years 2002–2003 and 2003–2004.
ii) Compare, by workstation category, student performance for the academic year 2003–2004.
iii) Describe the relationship between students' OSCE scores and final degree mark.
iv) Describe the students' satisfaction with the OSCE as an assessment method.

Methods

During the academic years 2002–2003 and 2003–2004, sixteen OSCEs (eight during each year), were run for final year pharmacy students at Brighton. For each OSCE, a group of between 9–15 students were assessed. The OSCE was composed of six (four manned and two unmanned) 10 min stations, and adopted the same general structure and content for all the stations used during these two academic years. Each OSCE used one station drawn from each of the six pharmaceutical problem categories presented in Table I. Each category assessed the different skills that students were expected to possess in their final year, having recently completed a 1 week clinical placement in a hospital.

Simulated patients and doctors were used in those stations involving a level of human interaction, although they did not take part in the assessment process.

Student performance was observed and scored, using the detailed checklist, by an examiner, present in each of the four manned stations. Each examiner was also asked to make an overall rating of each student's performance for the individual station using the criteria listed in Table II. This generated a percentage mark for the student performance at that station. The two unmanned stations were assessed by an examiner at the end of the OSCE, using a similar checklist and criteria as used for manned stations. At the end of the OSCE, each student received a percentage mark from each of the 6 stations, which led to an overall mean mark, to yield the final OSCE mark.

On completion of the six stations, students were asked to anonymously complete an acceptability questionnaire about their OSCE experience. The scale used for the questionnaire was the osgood's semantic differential scale (OSDS), containing 11 bipolar adjectives, using a seven point rating scale, where seven represented the positive pole.

The overall percentage mark for each station along with the mean OSCE score for every student was

Table II. Assessment criteria table.

1. No attempt	0
2. Very poor performance with hardly any merit	1–10
3. Poor performance with major weakness in key areas	11–20
4. Sub-standard performance with weaknesses in key areas but with some evidence of understanding and ability	21–30
5. Performance represented some evidence of understanding and ability but insufficient to merit pass	31–39
6. Demonstrates basic understanding and ability. Meets essential criteria	40–49
7. A satisfactory performance but week in structure and uneven in quality	50–59
8. A good performance with a thorough understanding and clear ability to perform the task	60–69
9. An excellent performance demonstrating a full understanding and clear ability to complete the task. Some criteria not met	70–79
10. An outstanding performance as described in (9) but all criteria met.	80–100

Scores are given as a percentage (0–100%)

entered on a SPSS database (Statistical Package for Social Sciences Versions 12), for analysis.

Results

One hundred and ninety four final year MPharm students completed the OSCEs during the course of the two academic years (101 for year 2002–2003 and 93 for year 2003–2004). The population consisted of 151 (77.8%) females, with an age range (mean ± SD) from 21 to 51years (24.5 ± 4.7 years).

The mean overall OSCE score for all students in both academic years was 54.7 (±10.2).

Students graduating in 2004 scored significantly higher OSCE scores (56.7 ± 9.8) than students graduating in 2003 (52.9 ± 10.3: $t = -2.61$, $p < 0.05$). However, there was no statistically significant difference in OSCE scores for the 16 different groups of students tested over the 2 year period ($F(15,178) = 1.68$, $p = 0.058$). Figure 2 (a) and (b) shows the mean (95%CI) OSCE scores for the 16 groups of students, by year of study.

Figure 3 shows the overall mean scores for the six categories used in the OSCE for all students in the year 2003–2004. When exploring the students ability to perform the different OSCE tasks for the academic year 2003–2004, a significant difference was found in mean scores for the six categories of OSCE stations (Chi-square = 41.60, $p < 0.001$). Comparing the mean scores for each work station showed that students performed best in patient counselling (64.6 ± 13.51), problem identification and solution (61.81 ± 22.05) and doctor advice-giving (58.99 ± 19.49) stations. Patient-problem and resolution (54.57 ± 18.91), calculation (53.46 ± 24.62) and doctor-problem and resolution (46.85 ± 22.08) were the three stations students found most difficult with doctor-problem and resolution station returning the lowest marks.

When students final degree mark was plotted against their mean individual score, a weak correlation was found (Pearson correlation coefficient $r = 0.25$, $p < 0.01$) (Figure 4). This suggests that a good performance in the OSCEs will not necessarily lead to a good final degree mark.

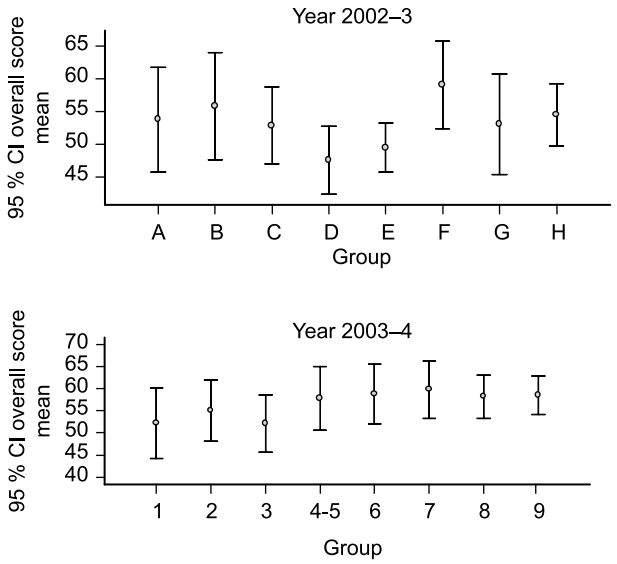

Figure 2. Mean OSCE score and a 95% confidence interval of 16 student groups for periods 2002–2003 (a) and 2003–2004 (b).

Ninety nine students (98%) completed the acceptability questionnaire during 2002–2003 and an additional 81 students (87%) during 2003–2004. The mean score returned for the OSDS was 5.22 ± 1.10 for year 2002–2003 and 5.70 ± 1.30 for year 2003–2004, illustrating that in both years, students considered the OSCE a fair, varied and useful examination. 2003–2004 students found the OSCE to be more skills oriented, interesting and less taxing then students tested the previous year. However, neither year scored the OSCE examinations highly on its practical or skills orientated merits. The acceptability results 2002–2003 and 2003–2004 are shown in Table III.

Discussion

To be able to fulfil the challenging extended role of a working pharmacist, students need to be sure that their clinical skills are adequate to meet the challenge

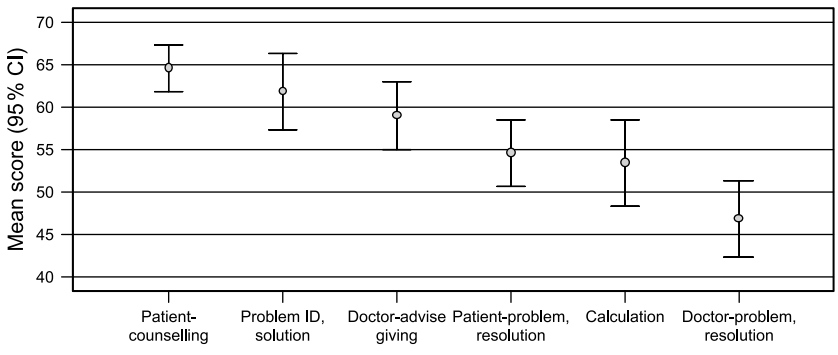

Figure 3. Mean scores and 95% confidence intervals for six OSCE categories year 2003–2004.

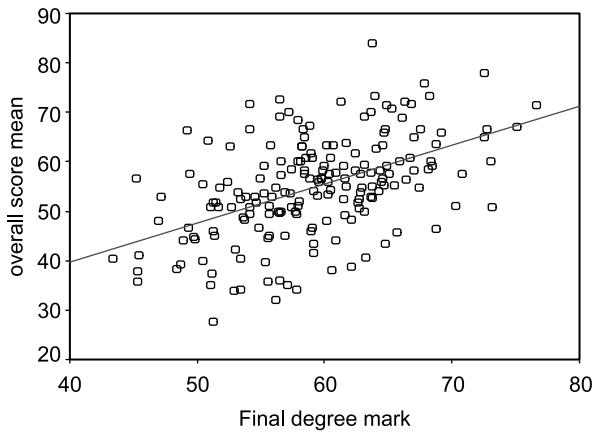

Figure 4. Scatter plot of overall student performance and their final degree mark.

(Rutter, 2001). A reliable and fair assessment of the clinical skills of fourth year MPharm students could, therefore, be used to predict a student's ability to perform these skills as pharmacists.

Results from this study showed no significant difference between mean OSCE scores for 16 groups of students tested over the 2 years. The small variation in scores suggests that the OSCE format used by the School of Pharmacy in Brighton is consistent, in terms of difficulty, and returns a true reflection of student performance. The difference found in mean scores between the 2 years, although significant, could simply reflect the difference in general student performance, and not be a facet of the OSCE design.

Although, the OSCE appears to be reliable, a big interstation variation was seen in students' scores and consequently their ability to perform the different tasks. Patient counselling was the station where students scored highest, suggesting that students' communications skills are well developed. Giving advice to doctors also requires good communication skills and it also proved to be a station where students scored well. Calculation, patient-problem and resolution and doctor-problem and resolution were three OSCE stations where student performance was poorest, with the latter being the station showing the lowest mean score for all six workstations. It could be that students find problem identification in tasks like these difficult. In addition, students might feel intimidated by doctors and the idea of questioning their prescribing. This lack of "confidence" was observed by the principal researcher with a number of students during OSCEs observed in 2004–2005, with many students finding it difficult to make decisions and take responsibility for the recommendations they make. These results suggest that a lack of clinical exposure may be, in part, responsible for the students' inability to deal with "real life" situations which involve clinical problem solving. A question relating to the validity of the examination can also be raised. Is it valid to assess skills such as doctor problem resolution, skills not taught during the 4 year undergraduate degree programme? Although, these skills are required in the pharmacy profession a valid assessment of students should be preceded by some training in the area assessed, otherwise students may have grounds to complain that the assessment is unfair. Interestingly, student feedback, using the OSDS questionnaire, suggested that the students viewed the assessment as fair, useful and effective. Although, taxing, the examination was also thought of as interesting and varied indicating that the OSCE is a format well accepted by students.

A study of undergraduate pharmacy students at Portsmouth University found the OSCE score to be an important predictor of students' final marks (Rutter, 2001). This study also reported a significant positive correlation between OSCE marks and students' final mark, although, the association was weak ($r = 0.25, p < 0.001$). This could be because the

Table III. Results from acceptability questionnaires for both years 2002–2004

	Rating							
	7	6	5	4	3	2	1	
Fair	–	O	X	–	–	–	–	Unfair
Practical	–	–	–	X O	–	–	–	Theoretical
Varied	–	–	X O	–	–	–	–	Monotonous
Active	–	O	X	–	–	–	–	Passive
Exciting	–	–	X O	–	–	–	–	Dull
Useful	–	O	X	–	–	–	–	Useless
Interesting	–	O	X	–	–	–	–	Boring
Good	–	–	X O	–	–	–	–	Bad
Taxing	–	X	O	–	–	–	–	Non–taxing
Skill oriented	–	–	O	X	–	–	–	Knowledge orientated
Effective	–	O	X	–	–	–	–	Ineffective

X year 2002–2003; O year 2003–2004

final degree mark comprises of a number of other assessments testing knowledge and recall, not just the OSCEs.

Clearly, experience will play a role in the students developing certain skills and perhaps performing well in the OSCEs. An interesting correlation to carry out would be to quantify a students experience in both hospital and community pharmacy prior to sitting the OSCE exam, and correlate this experience with their final OSCE mark.

The educational value of a clinical assessment is often overlooked. The content of the assessment will strongly influence students' learning strategies and a profile of strengths and weaknesses from a well executed assessment can be a very powerful tool for focusing the student and their further teaching and learning needs (Crossley et al., 2002). The OSCE could be adapted and used as a diagnostic tool to guide student learning. After discovering weaknesses in students' clinical knowledge and skills, an opportunity is provided to gain these skills in a clinical-practice environment. So, ideally students would receive feedback on their performance following the OSCE exam, so they have the opportunity to work on their weaknesses during their pre-registration year, which would link in well with their continuing professional development into their professional career.

Acknowledgements

We are grateful to Mrs Helen Watts for the organisation in the delivery of the OSCEs.

References

Adcock, H. (2001). Why the four-year MPharm is a success. *The Pharmaceutical Journal*, *267*, 115–116.

Bellingham, C. (2004). What the new contract has in store. *The Pharmaceutical Journal*, *273*, 385.

Crossley, J., Humphris, G., & Jolly, B. (2002). Assessing health professionals. *Medical Education*, *36*, 800–804.

Harden, R. M., & Gleeson, F. A. (1979). Assessment of clinical competence using objective structured clinical examination (OSCE). *Medical Education*, *13*, 41–54.

Hodges, B., & McIlroy, J. H. (2003). Analytic global OSCE ratings are sensitive to level of training. *Medical Education*, *37*, 1012–1016.

Martin, I. G., & Jolly, B. (2002). Predictive validity and estimates cut off score of an objective structured clinical examination (OSCE) used as an assessment of clinical skills at the end of the first clinical year. *Medical Education*, *36*, 418–425.

McRobbie, D., & Davies, G. (1996). Assessing clinical competence–a new method of evaluating hospital preregistration trainees. *The Pharmaceutical Journal*, *256*, 908–910.

Newble, D. (2004). Techniques for measuring clinical competence: Objective structured clinical examinations. *Medical Education*, *38*, 199–203.

Newble, D., Dawson, B., Dauphinee, D., Page, G., Macdonald, M., Swanson, D., Mulholland, H., Thomson, A., & van der Vleuten, C. (1994). Guidelines for assessing clinical competence. *Teaching and Learning in Medicine*, *6*, 213–220.

Rutter, P. M. (2001). The introduction of observed structured clinical examinations (OSCEs) to the M.Pharm degree pathway. *Pharmacy Education*, *1*, 173–180.

Rutter, P. M., & Brown, D. (2002). Observed structural clinical examinations: the views of preregistration trainees six month after graduating from Portsmouth University. *The International Journal of Pharmacy Practise*, *10*(suppl), R48.

Tamblyn, R. M., Klass, D. J., Schnabl, G. K., & Kopelow, M. L. (1991). Sources of unreliability and bias in standardized-patient rating. *Teaching and Learning in Medicine*, *3*, 74–85.

Wass, V., van der Vleuten, C., Shatzer, J., & Jones, R. (2001). Assessment of clinical competence. *The Lancet*, *357*, 945–949.