Pharmacy Education, June 2006; 6(2): 133–138

Evaluating skills and competencies of pre-registration pharmacists using objective structured clinical examinations (OSCEs)

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Abstract

Introduction: This paper describes data collected over a period of 4 years in the former South Thames Region, UK, where objective structured clinical examination (OSCEs) have been used to assess pre-registration pharmacists in a secondary care setting. The study aims to describe a quantitative measure of competence using OSCE style assessments of graduate, pre-registration pharmacists.

Method: All pre-registration pharmacists within the South Thames Region undertook a series of OSCEs; data were collected over a period of 4 years. Competence was assessed in each OSCE workstation using a pre-defined checklist.

Results: In total, 223 pre-registration graduates participated; two thirds (67.9%) were female and the majority (62.7%) were trained in district general hospitals. Overall, 17.2% of graduates were deemed competent at the beginning of their pre-registration year compared to 68.3% at the end. This represents a significant improvement in clinical skills performance over the year (Wilcoxon signed rank test, $Z = -12.024$; $p = 0.005$).

Discussion: The training program undertaken by pre-registration pharmacists significantly improved the clinical competence of these graduates in the areas measured, with two thirds considered competent overall at the end of the year. Of particular concern is the apparent inability of graduates to monitor prescriptions appropriately. The findings of this study have significant implications for workforce training and career planning. New graduates should not be working in isolation but should be considered as training grades and given support within the clinical team to develop their skills. Newly registered pharmacists should not be expected to undertake the range of tasks currently allocated to them, without appropriate supervision and further competency assessment.

Keywords: *Competence, objective structured clinical examination, pre-registration, training, pharmacists*

Introduction

Ensuring high quality of pharmaceutical care requires effective preparation of new pharmacists for career demands, from undergraduate education through to the pre-registration training year and beyond. In order to ensure this, effective assessment of an individual's competence, to ensure they are able to function as an independent, professional practitioner, is essential.

Assessment of competency is a complex task. As the profession develops and changes, the requirements for achieving competence needs to be changed in parallel. In addition, it is hard to find a reliable method to assess pharmaceutical competence. The Royal Pharmaceutical Society of Great Britian (RPSGB) has two mechanisms for ensuring pharmacists are fit for purpose at the point of registration: a tutor's assessment of candidate's and a registration examination consisting of multiple-choice questions (MCQs) to assess knowledge and cognitive skills linked with the published pre-registration syllabus (Royal Pharmaceutical Society of Great Britain, 2005).

Various commentators have questioned the ability of MCQs to assess competence and the objectivity of the tutors report. (Forde, 1997; Mathur, Forde, Wragg, & Hariss, 1997; Anonymous, 2000; Dajani, 2004; Longshaw, 2004). Objective structured clinical

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ISSN 1560-2214 print/ISSN 1477-2701 online © 2006 Informa UK Ltd.
DOI: 10.1080/15602210600682269

examinations (OSCEs) have been suggested as an additional assessment methodology.

The OSCE was first introduced by Harden (1975) as a tool for assessing the competence of trainee doctors. It was confirmed as a reliable assessment method that can test variety of problems and learned behaviors (Miller, 1990). The method has been shown to be a valid, reliable, feasible and acceptable way of measuring the clinical competence of pharmacy trainees at the end of their pre-registration training period (McRobbie & Davies, 1996). However, OSCEs are costly in terms of time and financial resources, making them economically inefficient if there is not acceptable evidence of the benefits (Beck, Boh, & O'Sullivan, 1995).

The aim of this study was to analyze and evaluate data collected over a period of 4 years for hospitals in the southern and south eastern areas of UK. The analysis aimed to further understanding of the usefulness of such an examination for competency assessments.

Method

All pre-registration students beginning in 1996 within the former South Thames region undertook a series of OSCEs, one in September at the start of the pre-registration training year and another in June just before their registration exam. The examination structure and content were developed by a working group of senior pharmacists and clinical pharmacy trainers, and designed to reflect the tasks newly registered pharmacist may reasonably expected to perform. Minor content changes occurred throughout the 4 years, but these did not affect the skills being assessed (McRobbie & Davies, 1996). There were five different skill categories assessed by the OSCE workstations as shown in Table AI.

The September OSCEs comprised of 6 workstations, with the exception of 1999 where there were 7 workstations, while the June OSCEs comprised 15 workstations in all years studied. Workstations selected for the September examination skills that academic colleagues validated were covered in the undergraduate curriculum. The June exam was comprised of the workstations tested in September and additional tasks. This allowed for any improvement in the pre-registration pharmacists' performance in these tasks to be measured. Additional stations were added to reflect the wide range of skills that were taught and developed during the 11 months of training. Workstations for both exams, their description and specification for time allotted for completion are shown in the Appendix.

During the examination, candidates rotated through all workstations, each being 7 minutes in duration with a 1 min transition period between stations. All candidates experienced the same conditions at each workstation which were designed to be independent of each other and hence not to influence subsequent student performance. Performance was assessed in each workstation using a predefined checklist of desirable and essential criteria. The candidates were deemed to be competent if they passed at least 4 of the 6 workstations in September, or at least 9 of the 15 workstations in June. This standard reflected a "pass mark" of 60%. The process for ensuring standardisation between assessors and workstations, and the validity and reliability of the workstations is described elsewhere (McRobbie & Davies, 1996). Data of candidate performance at the OSCEs, together with demographic information, was collected for pre-registration cohorts from years 1996 to 1999, compiled and analysed using SPSS version 9.0 (SPSS Inc., Chicago IL).

Results

Study sample characteristics

A total of 237 pre-registration graduates participated in the study, of whom 10 students took only the September OSCE exam, 4 took only the June exam, while all others ($n = 223$) undertook both the September and June OSCE. There were 76 (32.1%) males and 161 (67.9%) females. Most graduates were in the age ranges of 20–23 (64.7%) and 24–27 (21.0%). The majority (62.7%) undertook their training in a district general hospital with 37.3% in a teaching hospital. Table I compares the class of degree for the sample pre-registration students with overall UK pre-registration student statistics. The demographic distribution for each graduating year is shown in Table II.

OSCE performance

Forty of the 233(17.2%) candidates in the September exams were deemed competent. The majority of students (71.7%) passed 1, 2 or 3 workstations and median number of workstations passed was 2.

155 of the 237 canditates taking the June exams were considered competent (68.3%). The majority (59.1%) passed 8, 9, 10 or 11 stations and median number of stations passed was 9. September and June student performance for each individual workstation are shown in Table III.

Table I. Comparison of class of degree for students included in the study sample to all pre-registration students in the UK ($chi^2 = 24.65$, $p < 0.001$).

	% of students	
Class of degree	Study sample	UK
First	18.1	10.9
Upper second	53.7	45.7
Lower second	25.0	36.3
Third	3.2	7.2

Table II. Percent of students from the pre-registration sample encompassing each demographic area for years 1996–1999.

Demographic data		1996 (%)	1997 (%)	1998 (%)	1999 (%)	All years (%)
Gender	Male	30.8	26.9	37.7	31.9	32.1
	Female	69.2	73.1	62.3	68.1	67.9
Age	Range 20–23	75.0	51.0	70.9	62.5	64.7
	Range 24–27	20.8	26.5	16.4	18.1	20.1
	Range 28–30	2.1	8.2	3.6	6.9	5.4
	Range 31–40	2.2	12.2	5.3	9.7	7.6
	More than 40	None	2.0	3.6	2.8	2.2
University	Bath	9.6	None	9.8	9.7	7.6
	Brighton	19.2	23.1	13.1	23.6	19.8
	Kings	15.4	17.3	3.3	13.9	12.2
	London	17.3	15.4	13.1	15.3	15.2
	Others	38.5	44.2	60.7	37.5	45.1
Class of degree	First	15.2	10.6	22.2	21.7	18.1
	Upper Second	58.7	48.9	57.4	50.7	53.7
	Lower Second	23.9	34.0	18.5	24.6	25.0
	Third	2.2	6.4	1.9	2.9	3.2
Hospital type	Teaching hospital	31.4	36.5	37.7	41.7	37.3
	District general hospital	68.6	63.5	62.3	58.3	62.7
Experience outside university	Yes	93.8	95.9	98.2	95.8	96.0
	No	6.3	4.1	1.8	4.2	4.0
Specialisation	Clinical and hospital pharmacy	21.2	19.2	14.8	16.7	17.7
	Pharmacology	25.0	21.2	18.0	18.1	20.3
	Pharmaceutics	11.5	13.5	16.4	9.7	12.7
	Others	42.3	46.2	50.8	55.6	49.4
Project area	Clinical	19.2	25.0	13.1	21.1	19.5
	Pharmaceutics	19.3	13.5	11.5	21.2	16.5
	Pharmacology	23.1	11.5	19.7	9.9	15.7
	Chemistry	11.5	13.5	16.4	19.7	15.8
	Others	26.9	36.5	39.3	28.2	32.6
Gap years experience	Pharmacy (hospital, community, industrial)	2.1	16.3	None	None	4.0
	Academic	12.5	16.3	22.2	52.8	58.7
	Other	10.4	18.4	7.4	None	8.1
	None	75.4	49.0	70.4	47.2	59.2
Work	Degree-related	6.3	2.0	1.8	Missing data	2.3
	Degree non-related	10.4	12.2	7.3		9.9
	Industrial	25.0	18.4	20.0		21.1
	Hospital	2.1	None	None		0.7
	Community	56.3	65.3	70.9		64.5
	Non-related work	None	1.9	None		0.7

Differences between cohort samples

When OSCE results were compared between cohort years, significant differences were found for both September (Kruskal Wallis $\text{chi}^2 = 8.225$; $\text{df} = 3$; $p = 0.042$) and June OSCEs (Kruskal Wallis $\text{chi}^2 = 11.729$; $\text{df} = 3$; $p = 0.008$). The 1997 student cohort performed significantly worse on the September OSCEs than the June, this was not seen in any other year.

June OSCE results revealed that 1997 was the worst performing cohort overall, differing significantly from 1998 (Mann–Whitney $U = 1137.5$, $p = 0.036$) and from 1999 (Mann–Whitney $U = 1123.5$, $p = 0.002$), but not from 1996 in which students also performed relatively poorly.

The September results for each individual workstation differ significantly between years. However, only 11 out of 15 workstations differ between years for June OSCEs.

Improvement during the training year

The OSCE stations conducted in both September and June were compared between first and final assessment showing significant positive improvements (Wilcoxon signed rank test $Z = -12.024$; $p = 0.005$). When individual workstations for each year were examined, pre-registration students significantly improved in all of them over the training period, except for "medicine counseling" workstation in cohort years 1996 and 1997 and "drug history taking" in 1996. Overall, only 9 (4%) students passed fewer stations (as a percentage of the total number of workstations) in June than in September, and 20 (9%) students who did not show any change.

Influence of other factors on OSCE outcomes

Ten different demographic variables were analysed and significant non-confounded associations between

Table III. OSCE workstations passed in september and june ($n = 223$).

	% passed	
Workstation	September	June
Dose conversion	11.1	36.6*
Patient counselling	30.8	55.9*
Health promotion	31.1	48.5*
Therapeutic drug monitoring	25.8	64.3*
Drug history taking	23.6	65.2*
Device counselling	43.3	77.5*
Information retrieval	38.2	78.4*
Counter prescribing	48.1	87.2*
Prescription prioritisation		43.2
Formulary management		59.0
Risk management		48.5
Counselling-compliance		65.2
Drug history taking from GP		65.6
IV calculation		73.1
TTO transcription		78.9
Information query answering		78.8

* Chi^2, $p < 0.05$.

OSCE success and gender, class of degree, graduate university and degree topic specialisation were detected. Females tended to have a greater success rate than males, both in September (Mann–Whitney $U = 5033.5$, $p = 0.057$) and in June (Mann–Whitney $U = 4252.0$, $p = 0.004$). There was a significant association with OSCE success and degree class, for September (Kruskal Wallis $chi^2 = 24.82$; $df = 3$; $p = 0.0005$) and for June (Kruskal Wallis $chi^2 = 32.239$; $df = 3$; $p = 0.0005$), with students with higher degrees performing better in the OSCEs.

The relationship between gender and degree class was explored, with no significant association found in the sample. The graduating university was significantly associated with higher level of success in the September results (Kruskal Wallis $chi^2 = 7.907$; $df = 3$; $p = 0.048$) when comparing the most prevalent graduating universities in the sample. The final significantly associated factor was with degree option specialisation, again influencing the September OSCE results (Kruskal Wallis $chi^2 = 7.907$; $df = 3$; $p = 0.048$) suggesting that pre-registration students who specialised in clinical and hospital pharmacy during their degree tended to succeed better in OSCEs than others.

Pre-registration exam results compared with OSCE results

Of the students who undertook both sets of OSCE assessments ($n = 223$), 20 (9%) were not competent at the subsequent national registration exam, whereas, 68 (30.6%) were not considered competent in the final OSCE assessments. There was statistical significant association between the OSCE and the registration examination methods ($chi^2 = 6.143$, $p = 0.013$).

Students who were not competent at OSCE, were more likely to fail the registration examination compared to those who were competent at OSCEs (relative risk estimate for competent OSCE performance = 0.627, 95% CI = 0.383–1.026; relative risk estimate for not-competent OSCE performance = 1.949, 95% CI = 1.239–3.067). As all the pre-registration students who entered for the RPSGB registration examination were deemed to be competent by their workplace tutors, this implies inconsistency between OSCE style assessments and the currently used RPSGB competency assessment format.

Discussion

September OSCE performance

Students in this sample had recently completed a 3 year BSc or BPharm program that has a strong academic focus. It is, therefore, not surprising that students are least competent in September, having limited experience in clinical pharmacy settings. Graduates may be well-versed in theories of pharmaceutical care but are unable to apply them to clinical practice situations at the beginning of the pre-registration year. The new 4 year MPharm degree was introduced in 1997, with the first graduates graduating in 2001. This program format offers students more clinical placements, possibly facilitating better scores for the baseline OSCE in September. Research is currently underway to determine if this is the case. From the data collected in this study, it has not been possible to link the poor performance of the 1997 cohort with any demographic variables.

End of year performance (June OSCEs)

In this sample, two thirds of the cohort was considered competent according to the predetermined criteria. This has significant implications for workforce training and career preparation. Employers may have higher expectations of newly registered pharmacists, which may not be met in practice. It may imply that newly registered pharmacists should not be expected to undertake the range of tasks currently allocated to them without appropriate supervision.

Individual workstations

The most consistent OSCE workstation performance was in "Over the Counter (OTC) prescribing". This may be as a result of a majority (64.5%) of graduates having undertaken vacation employment in community pharmacy or the focus on this in the undergraduate curriculum.

Numerical skills were generally improving over the years, possibly due to an increasing emphasis on training in this area given by the RPSGB and other pre-registration training providers. With the exception of June 1996, graduates showed more competence in the calculation of intravenous doses than in therapeutic drug monitoring calculations.

A consistent improvement was noted in the drug history taking workstation over the four years. The importance of pharmacists taking drug histories has changed in recent years, and although not all pharmacists are actively involved in this task, it is now accepted that pharmacy staff should have this particular clinical skill. During earlier cohorts, (1996 and 1997), drug histories were not routinely taken by clinical pharmacy staff in many hospitals.

Performance in patient education skills were assessed in various workstations. While these performances have improved, common failure criterion include failing to tailor advice to patient need and use of excessive jargon. Training programs have been developed and modified to meet this need.

Less than half the candidates assessed were able to prioritise the most clinically significant intervention required when presented with two prescription charts in the "prescription monitoring" workstation. Similarly, about half were able to demonstrate the ability to effectively influence medical staffs' decisions.

As many pharmacists have a limited amount of time on the ward to review prescriptions and patients rely on them identifying clinically significant problems with prescriptions and resolve these with prescribers, the poor performance in these areas should identify training needs for junior pharmacists.

External factors

The superior performance of females to males reflects gender differences already recognized at other levels of education. Other external factors are predictable: differences between different universities may reflect the different emphasis placed on clinical skills at each institution. Longer clinical placements or undertaking a clinical elective provides valuable experience that influences candidates' performance in the September examinations. Similar experiences across the pre registration year means this is not a factor in the June assessment. The statistically significant association between OSCE success and degree class for both September and June demonstrates a positive link between higher class of degree and number of OSCE stations passed.

MCQs encompass a large portion of the RPSGB registration examination; however, they are not part of the OSCE (Royal Pharmaceutical Soceity, 1992). The format differences lead to poor prediction of performance between OSCEs and the RPSGB competency exam. Results of this study suggest the MCQ format of the RPSGB registration exam is not a sufficient test of competence for pharmacists looking to practice in clinical settings

Conclusion

OSCE scores over 4 years revealed that students' performance improved from the September to the June examination, revealing that lessons and experiences while in pre-registration placements are successful for relaying clinical practice experience. Clinical courses and experience should be encompassed into the core curriculum of pharmacy students, allowing them increased practice for the clinically driven OSCE scenarios. However, the lack of correlation between scores on the OSCE and the RPSGB registration examination reveal differences in testing format. It should be considered whether the format of the RPSGB registration exam is the most effective and valid method to test pharmacists for clinical competence.

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Appendix: Recording of workstations performed each year and descriptions of each

See Table A1.

Table AI.

Workstation	Description	'96		'97		'98		'99	
Drug history taking from GP	Student takes phone call from "GP" and is to take drug history of a mentally ill patient.	S –	J ✓	S –	J ✓	S –	J ✓	S –	J ✓
Health promotion	Student to counsel a patient and advise on lifestyle, for example, to prevent coronary heart disease.	S –	J ✓	S –	J ✓	S ✓	J ✓	S –	J ✓
Device counselling	Student must demonstrate use of device and check patient is able to use device (eye drops or inhaler).	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓
IV calculation	Students are to calculate drug doses based on, for example, surface area, IV drip rates, etc.	S –	J ✓	S –	J ✓	S –	J ✓	S –	J ✓
Patient counselling	Students provide drug related information to a patient—"straightforward advice" (drugs have been used: antihypertensives or amiodarone).	S ✓	J ✓	S ✓	J ✓	S –	J ✓	S ✓	J ✓
OTC	Students, when given an OTC drug example, are to provide appropriate advice and counseling, including CI and DD interactions.	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓
Drug history taking	Students take a drug history of patient on a ward just after admission, with a clinical/pharmaceutical problem incorporated.	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓
Formulary management	A junior Dr wishes to prescribe a non formulary medicine—the student has to give reasons why they should use a formulary drug—drugs used have been ACEI or antiemetics	S –	J ✓	S –	J ✓	S –	J ✓	S –	J ✓
Information retrieval	Students use a set of case notes to determine patients diagnosis, signs and symptoms	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓
Counseling-compliance	A patient does not want to take the prescribed medicines; for example, they are hypertensive, diuretics make them want to pee all the time which affects ability to work as lorry driver, etc. Or Steroids—worried about side effects if their child uses inhaled steroids. Students are to counsel the patient.	S –	J ✓	S –	J ✓	S –	J ✓	S –	J ✓
TDM	Students calculate loading doses, for example of an aminoglycoside. Equation provided.	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓	S ✓	J ✓
Risk management	A Consultant wishes to prescribe medicine by wrong route which if administered will kill patient. Need to advise assertively on appropriate action	S –	J ✓	S –	J ✓	S –	J ✓	S –	J ✓
Prescription prioritisation	Two prescriptions given—students are to identify 4 problems and 1 priority. The priority problem is always a life threatening one.	S –	J ✓	S –	J ✓	S –	J ✓	S –	J ✓
TTO transcription	Students are given a TTO transcription for Checking, which has 5 errors on it and needs amendments. Need to spot 3 out of 5 mistakes.	S –	J ✓	S –	J ✓	S –	J ✓	S –	J ✓
DI query	Students are required to give advice on why a patient's relative has been prescribed MST.	S –	J ✓	S –	J –	S –	J –	S –	J –
Dose conversion (prescription monitoring)	Given a prescription, students must identify problems and recommend appropriate dose of MST as opposed to 10 fold overdose prescribed on current RX.	S –	J –	S –	J ✓	S –	J ✓	S –	J ✓

S, September; J, June; ✓, performed.