

Development of an Objective Structured Clinical Examination (OSCE) to assess formulation and extemporaneous dispensing skills in MPharm undergraduates

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Abstract

Background: The use of Objective Structured Clinical Examination (OSCE) in Pharmacy has been explored; however this is the first attempt in Queen's University School of Pharmacy, Belfast to assess students via this method in a module where chemistry is the main discipline.

Aims: To devise an OSCE to assess undergraduate ability to check extemporaneously dispensed products for clinical and formulation errors. This activity also aims to consider whether it is a viable method of assessment in such a science-based class, from a staff and student perspective.

Method: Students rotated around a number of stations, performing a check of the product, corresponding prescription and formulation record sheet detailing the theory behind the formulation. They were assessed on their ability to spot intentional mistakes at each one.

Results: Of the 79 students questioned, 95% indicated that OSCE made them aware of the importance of the clinical check carried out by the pharmacist. Nearly all of the undergraduates (72 out of 79) felt that OSCE made them aware of the type of mistakes that students make in class. Most (5 out of 7) of the academic team members strongly agreed that it made students aware of 'point of dispensing' checks carried out by pharmacists, in addition to helping them to prepare for their exam.

Conclusion: OSCE assesses both scientific and formulation skills, and has increased the diversity of assessment of this module, bringing with it many additional benefits for the undergraduates since it measures their ability to exercise professional judgement in a time- constrained environment and, in this way, mirrors the conditions many pharmacists work within.

Keywords: *OSCE, undergraduate, assessment, pharmacy, chemistry, formulation*

Introduction

As part of the MPharm degree at Queen's University Belfast, (QUB) Level 2 undergraduates study the module 'Extemporaneous Formulation and Dispensing'. This is the preparation of medicinal substances in accordance with the directions of a prescriber. The pharmacist compounds the product using raw materials to include the active ingredient and necessary excipients. This requires excellent working knowledge of pharmaceutical science since the product must be stable, the ingredients must not interact in a detrimental fashion and the product must be non-toxic to users. To carry out this type of work, pharmacists must be competent at performing calculations, possess well-developed formulation skills and have an appreciation of the required scientific disciplines; chemistry in particular (Donnelly *et al.*, 2008).

Francioni *et al.* (2005) recognised how the 'medical world' and the general public expect pharmacists to possess the skills required to accurately compound a pharmaceutical product.

However Lowey and Jackson (2008) and Donnelly *et al.* (2008) reported that reasons have been voiced for regarding extemporaneous dispensing as being outside the scope of the role of the modern pharmacist. Issues such as declining requests for such products mean pharmacists lose the skills and confidence required to accurately manufacture and/or assess such a formulation. Additionally the responsibility of actually compounding the product is often delegated to technicians or pre-registration pharmacists. It is considered to be a high risk activity (Jackson & Lowey 2008), however there remain instances where suitably licensed products are absent for certain patients and pharmacists are required to compound a viable medicine. For this reason regulators such as The Quality Assurance Agency (QAA) for Higher Education in their Subject Benchmark Statement for Pharmacy (2002) has specified within "Pharmacy-related practical skills" that the student must have 'experience of preparation and presentation of medicines...including extemporaneous manufacture'. The General Pharmaceutical

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Council (GPhC) are the regulatory body for the pharmacy profession in the United Kingdom (UK) and they have stated that they 'regard science as being essential to pharmacy education' in the report Consultation on standards for the education and training of pharmacists (2010). Specifically, the GPhC have stated Learning Outcomes that must be achieved during the training of pharmacists. One of these is that students can 'apply pharmaceutical principles to the formulation, preparation and packaging of products'. This demonstrates why this subject is an integral part of the MPharm degree (GPhC 2010). Accordingly, students must develop in this area as part of their training and have their aptitude evaluated in an effective manner.

This teaching activity is significant, since it is delivered by qualified pharmacists and, as a result, certain elements of professionalism are conveyed to the students. Ashcroft *et al.* (2010) have alluded to the role of healthcare professionals in promoting professionalism amongst pharmacy undergraduates at the University of Manchester. Within the Extemporaneous Formulation and Dispensing class at Queen's, knowledge is gained on a selection of formulations to reflect the variety of products that are dispensed in community practice currently. Two weeks are assigned to each type of product – liquid medicines (solutions and suspensions), suppositories, creams and ointments, pastes and gels.

The students are presented with a doctor's prescription and are expected to 'screen' the prescription. This includes performing a clinical check on the product, referring to the indications stated in reference sources such as the British National Formulary (BNF). It is examined to verify that it is suitable for the patient on the prescription; including the strength and the dosage instructions; a task that is synonymous with the actual role of the pharmacist. The class is the first occasion that the students view a prescription as a legal document. They must also assess the legality of the prescription, assuring themselves that it contains all of the necessary particulars, as specified within the Medicines Act (1968). If there are either clinical or legal issues with the prescription, students can consult with the 'prescriber'. The team responsible for the delivery of the module take on this role and make any required amendments to the prescription as specified by the student. Following this, students deduce a suitable formulation for the product from reference texts, manufacture and label it. This dispensed product is assessed by staff.

Jesson *et al.* (2006) reported that some of the undergraduates who were questioned from across nine UK Schools of Pharmacy thought that their MPharm courses contained too much science in the initial years. Some indicated an opinion that the science aspects of the degree pathway are non-contextualised, particularly in the earlier years of the course. Students did not understand why they are undertaking so much laboratory work when they have selected a Pharmacy degree with a career pathway of a clinical nature and felt it led to some disillusionment amongst undergraduates. With the use of prescriptions and a patient-centred context, Extemporaneous Formulation and Dispensing may help to ensure the science aspects of the degree remain, whilst introducing a clinical aspect to the teaching in Level 2 (Rutter, 2001). OSCE has been introduced at various other points within the MPharm degree at QUB, but not within a

science-based class such as Extemporaneous Formulation and Dispensing. The OSCE is an opportunity to assess the students via a method that reflects the clear expectation from the GPhC that despite learning outcomes that are clinical by description, students of Pharmacy should be taught the scientific disciplines that underpin the role of the profession. OSCE is a valid means of assessment in this subject where the ultimate indicator of validity of an assessment method is described by Wass *et al.* (2001) as a situation where the student carries out processes that would actually be done in the workplace. This is the case with the OSCE stations developed as part of this experiment and staff and student comments have supported the notion that it is a representation of the role of the pharmacist.

Many studies have focused on the use of OSCE in a clinical context. Awaisu *et al.* (2010) reported on perceptions of OSCE by pharmacy students and found that many examinees felt that OSCE should be introduced earlier in the Pharmacy curriculum. Within the QUB MPharm degree, students are assessed via OSCE in Levels 3 and 4. This study is also unique in that it introduces this type of assessment in a class taught to Level 2 students. It is an opportunity to assess not only scientific and formulation skills, but also the ability of the students to exercise professional judgment as discussed by Austin *et al.* (2005). The examination setting provides an environment where there are time constraints and, in this way, mirrors the conditions many pharmacists work within in practice.

Current assessment methods

The coursework component for Extemporaneous Dispensing class comprises a number of approaches to assessment. Firstly, the formulation of products is marked each week according to a defined mark scheme. Two weeks are assigned for each product category, but only the second week's products are assessed and contribute to the coursework mark for the class. This allows students to learn from any initial mistakes made during the compounding of that particular product type. The reports, with feedback are returned the following week. Feedback takes the form of written comments on each student's product, label, calculations and methodology and so this is given individually to each student. Additionally, feedback is collated from staff on a weekly basis and posted on the university intranet system, which the students can access at any point. This advice is more general and tends to focus on the most common mistakes students made on a particular week. To give feedback in a timely fashion enhances the student experience, a point highlighted by Gibbs and Simpson (2004). Secondly, the students perform two calculations tests to assess numeracy skills, since previously the ability of pharmacy students to perform calculations was known to be poor (Batchelor, 2004). Thirdly, a theory test is undertaken to reinforce the main principles underpinning the compounding of each product type. This is a paper-based test comprising a series of statements with true or false answers. It is a closed book exercise and examines each student's understanding of the basic chemistry of each type of product by making statements, for example 'A drug with a carboxylic acid (COOH) group in its chemical structure is compatible with cationic emulsifying agents' and the students indicate whether the statement is true or false. The OSCE was set during week 10 of the semester,

with feedback on the stations given during class on week 11. This meant it was ideally placed as a revision exercise for the students as part of their preparation for the final examination.

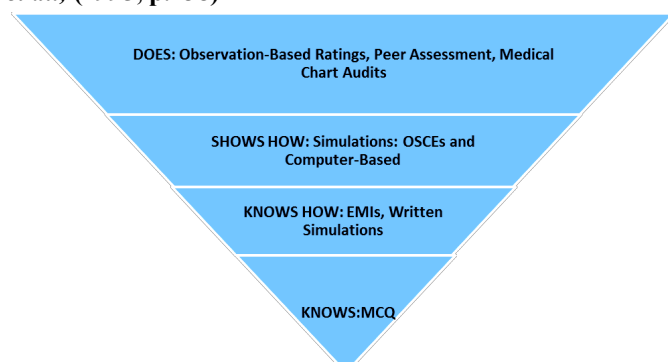
The examination is carried out during the final week of the semester. It is a four hour test and takes the same format as every other assessed week, where the student is required to formulate and compound three products; each is a different type of formulation from the selection studied throughout the semester (liquid medicines (solutions and suspensions), suppositories, creams and ointments, pastes and gels). In this way it is a culmination of everything learnt since the beginning of the term.

Bloxham and Boyd (2008) have alluded to the role of different forms of assessment and their function in teaching. Brown and Knight (1994) have suggested that the simplest way of improving assessment is to use a wide variety of assessment methodologies to assess multiple talents for multiple audiences. The QAA (2006) have stated that to test a wide range of Intended Learning Outcomes, diversity of assessment practice is expected. Gibbs and Simpson (2004) have reported that the greatest improvements in teaching can be produced by changing assessment more so than anything else. However change can often be difficult to implement, particularly if team members feel that in their opinion the current system is working to a satisfactory standard. There was potential for this type of issue amongst the course delivery team since the combination of assessment methods already in place was diverse.

Rationale for change in approach

Miller's Pyramid (Figure I) is used for assessment of clinical activities and depicts how a student should progress from 'knowing' information to 'knowing how' to use the acquired knowledge (e.g. to solve problems). Thereafter, the student should work towards 'showing how' they can perform a function; with the highest point described as 'does', where complex learning is integrated into routine practice (Beck *et al.*, 1995).

Figure I: The relative weighting of evaluation methods applicable to experimental learning. Adapted from Beck *et al.*, (1995, p.238)



With an emphasis being placed upon increasing the clinical contextualisation of the MPharm course in the UK and with a view to assessing students at the 'shows how' level of Miller's Pyramid, it was decided to include an Objective Structured Clinical Examination (OSCE) style method of assessing the students (GPhC 2010). OSCE is deemed to be a

suitable medium for students to 'show how' within evaluation methods, as discussed by Beck *et al.* (1995). The GPhC has described 'Shows how' as a situation, as is the case with the Extemporaneous Dispensing OSCE, whereby the student can 'demonstrate that they can perform in a stimulated environment or in real life.' GPhC (2010). Indeed, the Council state OSCE as one of the assessment methods that demonstrate students are at the 'Shows how' level of the competence and assessment hierarchy. The pyramid is used alongside the implementation of a proposed 'Spiral' curriculum in the MPharm, whereby deeper knowledge is promoted by the re-visiting of certain topics at different levels throughout the course. It is hoped that this approach will promote more in-depth learning and understanding of the subject. Prior learning should in theory be reinforced throughout the course (GPhC, 2010).

A limitation to the success of introducing OSCE, as acknowledged by Jay (2007) is that it is the first time the students have been exposed to such an assessment technique. They will be unsure of what to expect and this may impair their performance. To address this issue, the team prepared an example of an OSCE station for demonstration during the first week of teaching each of the formulation types. This meant that students had been shown four examples of OSCE stations throughout the semester, before participating in the assessment in week 10.

Method

A different product category was assigned to team members and they were asked to prepare an OSCE station. During the OSCE students will be required to rotate around four stations, and perform a check of the product at each one. An OSCE station for the purposes of this assessment consisted of a prescription, a formulation record sheet detailing the theory behind product formulation and the method used; and a product pre-prepared by staff which has been labelled as ready for a patient to use. The students were not required to formulate any of the products during the time allocated for each station. There were a number of intentional mistakes at each station and the purpose of the assessment was for the student to identify these errors and record them in their OSCE answer sheet (Appendix 1). The students were allowed twenty minutes at each workstation and were allowed to consult the same reference sources as they would be able to access at any point in the class each week. In essence, the student is assessing a completed product in the same manner that they themselves are evaluated during coursework and the final examination. This way of measuring performance should conform to the idea of constructive alignment, as described by Biggs (2002), where assessment methods 'construct meaning through relevant learning activities'.

The maximum mark awarded for each station is twenty, and this score was achieved when each student identified all of the intentional errors. To ensure that every station was challenging the students equally and to ensure that the same number of marks were available at each, we included a major error where the student immediately scored zero if they did not pick it up e.g. a component of the prescription missing that means it is illegal to dispense such as the prescriber's signature. There were also two minor errors at each station. Table I illustrates examples of both types of errors.

Table I: Types of potential errors for students to spot at OSCE stations

Type of Error	Prescription/ Records	Formulation	Product	Label
Major (-20)	No signature	Strength of product calculated incorrectly	Unusable product e.g. 'cracked' cream	Wrong patient name on label
	No record made in extemporaneous dispensing book	Wrong type of base used e.g. for suppositories or cream	Incorrect drug incorporated	Dosage incorrect on label
Minor (-1 to -5)	Not endorsed for payment	Missing batch number	No spoon/ syringe supplied with oral liquid	Storage instructions absent
	Not stamped using pharmacy stamper	Minor problems with recording of method	Minor constituent e.g. colour not added	Missing BNF warning

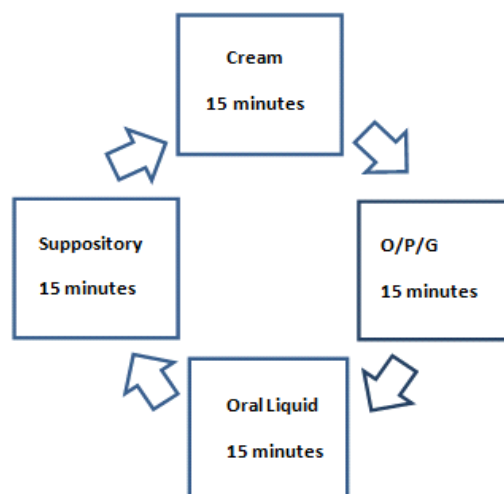
A matrix system was designed to ensure that all of the products did not contain the same errors. Since there were three classes, the stations had to change so that students did not pass information to others who had not yet undertaken the exercise. The errors were rotated as described in Table II.

Table II: Example of method to allocate errors to products

		Wednesday AM	Thursday AM	Thursday PM
Oral liquid	Major	Prescription	Label	Product
	Minor	Formulation/ prescription	Prescription/ formulation	Label/ prescription
Suppository	Major	Formulation	Prescription	Label
	Minor	Product/label	Formulation/ label	Prescription/ label
Cream	Major	Product	Formulation	Prescription
	Minor	Label/ prescription	Product/ prescription	Formulation/ label
Ointment/ paste/gel	Major	Label	Product	Formulation
	Minor	Prescription/ product	Label/ formulation	Product/ formulation

Each class contained approximately 48 students and was divided into two sessions, Group 1 & 2, with 24 students in each. Group 1 did the OSCE first, followed by group 2. The two sets of students did not have an opportunity to

communicate and so the same material was used twice. Each student was issued with a guidance sheet before the OSCE in order to have time to read before the event (Appendix 2). They were also issued with a list of batch numbers and expiry dates for all drugs and excipients used so that the actual containers for each of these did not clutter the workstation. Each station was replicated six times so there were enough for each undergraduate. A time interval of twenty minutes was allowed to evaluate each product, timed by a stopwatch with a buzzer to indicate when it was time to move. At this point, each student moved in a clockwise direction to the next position, as illustrated in Figure 2, and the timer was set once more. No rest station was included within the rotation since the allocated time of twenty minutes per station was considered generous enough to allow students a chance to 'catch their breath' before moving to the next station. Additionally, the entire assessment lasted eighty minutes, which is quite short compared to some of their Level two examinations which last three hours or more. Marks were only awarded for identifying the errors. However there is sometimes a tendency among students to document perceived errors. These were penalised to prevent the OSCE from becoming a 'guessing' exercise, where students perform well by chance. Marks were deducted according to the same criteria used if they made the errors in class; so if they incorrectly claimed that the product was labelled with the wrong strength, five marks were deducted in the same as if the product had in fact been labelled with the wrong strength. The comments were considered on an individual basis during the marking process. Some examples are: if a student stated that 'For External Use Only' was missing from the label for a cream (the Medicines Ethics and Practice document does not state that it is legal requirement) then the academic staff would not deduct marks, but make a comment discussing the error. However if they made a mistake such as stating that a preservative was missing from a formulation when it is not required (e.g. suspension based on Keltrol) then one mark was deducted.

Figure 2: Diagram to illustrate movement of undergraduates around OSCE stations

Feedback was given to the students on their performance in the OSCE so that it would be a formative exercise. Each class was taken through a presentation on the stations they had

completed, highlighting the errors for them. Undergraduates had the opportunity to ask questions and discuss where they went wrong if applicable.

Results

To gauge the Queen's University student's impressions of the OSCE as an evaluation method, scrutiny of the technique was included within the module review. The question that referred specifically to the OSCE and the number of students responding within each of the five options is provided in

Table III. There were 148 students in the year and 79 of these completed the survey.

From Table III, 89% of the students either agreed or strongly agreed that the practical was beneficial, while nearly all of the students (72 out of 79) reported that OSCE made them aware of the type of mistakes that students make in class. Of the students questioned, 95% indicated that OSCE made them aware of the importance of the clinical check carried out by the pharmacist and 72% stated that the exercise helped them to prepare for the module examination.

Table III: Undergraduate responses to the OSCE questionnaire (79 respondents out of 148 students)

	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree	Total no. of students
The practical was beneficial	30 (38%)	40 (51%)	5 (6%)	4 (5%)	0	79
Time allowed at each station was sufficient	24 (30%)	46 (58%)	2 (3%)	7 (9%)	0	79
OSCE made you aware of the types of mistakes that students can make in Extemporaneous Dispensing classes	37 (47%)	35 (44%)	6 (8%)	1 (1%)	0	79
OSCE made you aware of the importance of 'Point of dispensing checks' in the course of a pharmacist's professional practice	34 (43%)	41 (52%)	3 (4%)	1 (1%)	0	79
Quality of feedback on the OSCE was good	24 (30%)	41 (51%)	10 (13%)	2 (3%)	2 (3%)	79
OSCE helped you to prepare for the Extemporaneous Dispensing Exam	23 (29%)	34 (43%)	14 (18%)	8 (10%)	0	79

Table IV: Staff responses (Divided to indicate responses from Academic team and technical staff members) to questionnaire on the use of OSCE in Extemporaneous Dispensing) of OSCE as part of the Extemporaneous Dispensing assessment process.

		Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
Time allowed at each station was sufficient	Academic staff	5	1	1		
	Technical staff	1	1			
OSCE made students aware of the types of mistakes that students can make in Extemporaneous Dispensing classes	Academic staff	6	1			
	Technical staff	1	1			
OSCE made staff aware of the types of mistakes that students can make in Extemporaneous Dispensing classes	Academic staff	5			2	
	Technical staff	1			1	
OSCE made students aware of the importance of 'Point of dispensing checks' in the course of a pharmacist's professional practice	Academic staff	5	2			
	Technical staff		2			
OSCE helped students to prepare for the Extemporaneous Dispensing Exam	Academic staff	4	2	1		
	Technical staff			2		
The time investment required to prepare the OSCE was worthwhile in relation to the outcomes it produced	Academic staff	5	1	1		
	Technical staff		1		1	
Overall the practical was beneficial for students	Academic staff	5	1	1		
	Technical staff	1	1			
Overall the practical was beneficial for future development of the class	Academic staff	4	3			
	Technical staff	1		1		
OSCE should be included as an assessment method in Extemporaneous Dispensing from now on	Academic staff	6	1			
	Technical staff	1		1		

The team involved in delivery of the module to the Level 2 groups, like the students, were asked to complete a questionnaire on how they viewed the OSCE as an assessment tool. The responses are displayed in Table IV, categorized as academic team members (who are all Pharmacists) and responses by technical support staff. Eight of the nine team members agreed or strongly agreed that the practical was beneficial for the students and that it should be included as a method of assessment for future groups of undergraduates. All team members agreed or strongly agreed that the OSCE made students aware of the types of mistakes that are typically made during extemporaneous dispensing class.

There were two members of the academic team who did not agree with the statement that the OSCE helped staff to be more aware of the mistakes that students can make during extemporaneous dispensing classes.

The majority of undergraduates (80%) and staff (89%) reported that the time allocated for each OSCE station was sufficient, while 78% of the staff felt that the time investment required to prepare the OSCE was worth it in terms of outcomes achieved.

Discussion

The OSCE as an assessment method was developed in the 1970s by Harden (1975) as a means of monitoring clinical competence. It has been integrated into the training for many healthcare disciplines to monitor performance since it can be manipulated effectively to represent life-like situations. Indeed, it has been adopted by healthcare regulatory bodies as a means of entry into the profession and validation of ability to practice; with examples including the Canadian Pharmacist Qualifying Exam and the United States Medical Licensing Examination. Jay (2007) stated that the student perceptions of OSCE in a school of midwifery were that it promotes deep learning and an increased confidence in applying skills that have been acquired. This can be applied to the pharmacy situation whereby students can use knowledge accrued on formulation of medicines and use this to assess the method of preparation of a product carried out by another. Munoz *et al.*, (2005) identified OSCE as a pivotal means of assessment to complement existing written examinations as part of the licensure process of the Pharmacy Examining Board in Canada. They also deemed it to have the 'reliability, validity and generalisability' necessary to use as an entry-to-practice for pharmacy. Grady *et al.* (2000) studied attitudes of staff and students to a P-OSCE (Pharmacy-OSCE). The authors purported that the general consensus was that the procedure was a positive learning experiment and that students commented on how it felt it reflected 'real-life' situations and was a platform from which students could identify their own strengths and weaknesses. The context was different in this case since the assessment was a patient-centred task using standardised participants to respond to questions posed by the students.

The results show that the majority of students consulted were positive in their opinion of the OSCE as an assessment method as part of the Extemporaneous Dispensing and Formulation class. Of the students responding to the survey, 89% reported that the exercise was beneficial and 95%

indicated that OSCE made them aware of the importance of the clinical check or screening carried out by the pharmacist. Ashcroft *et al.* (2010) discussed how professionalism can be learnt in more science-based classes via an emphasis on the accuracy of work.

Comments of the staff regarding the OSCE were positive, suggesting that this approach to assessment is needed in order to respond to the demand that Pharmacy education become more competency-based. 'It allows students to begin to learn key skills, such as making professional decisions in a time-constrained environment; a reflection of the working environment of the pharmacist across all sectors including hospital and community pharmacy settings.' This would complement the shift from a more didactic teaching technique to a participatory approach, where students are aware of their own strengths and weaknesses.

Other remarks included that it made the student more aware of the '*day-to-day role of the pharmacist*' and '*...with an increasing emphasis on competency-based learning and demonstration of key competencies, this is exactly the sort of approach that should be employed.*'

'In theory, the idea of OSCE in Extemporaneous Dispensing class is good and we (as staff) certainly found out where there was a lack of knowledge.'

'OSCE is a great addition to the course. It makes students more aware of what a pharmacist does in day to day practice i.e. checking somebody else's work rather than their own.'

'The OSCE exercise concentrated on the perpetual mistakes that the students make. It also reinforced our marking scheme and what constitutes a zero mark.'

It has been acknowledged that points of difficulty or lack of understanding are individual to any particular student and to cover every eventuality is impossible. The OSCE was a beneficial exercise, since it helps students to identify their own weaknesses whilst there is still time to address them. Black and Mills (2009) discussed the need for 'self-directed learning' (SDL). This technique encourages pharmacy students to reflect on what they don't know and identify gaps in their knowledge. A syllabus that develops knowledge by requiring students to apply the theory they have been taught and put it into practice makes for better motivation to learn and enables reflection upon learning needs (Fitzgerald and Reid, 2010). With previous cohorts of students, pointers of a general nature were given to the class as part of a feedback session during the final week before the exam. There was an opportunity for students to request assistance during this time and to ask questions about anything of which they were unsure. It may be pertinent to perform the OSCE in addition to the revision session in future years (rather than instead of it) and monitor the impact on results. One member of staff commented that whilst they believed the OSCE can help students to prepare for the exam, this may depend on how the students approach it on an individual basis.

The team were not unanimous in their response to whether or not the OSCE helped to make them aware of the types of errors students make. One train of thought was that marking the work every week seemed to have raised any student learning issues and most types of mistakes made by students had been encountered already whilst undertaking this task i.e.

before the OSCE was performed. Both staff and students generally reported that the OSCE was beneficial in helping students to prepare for the final exam.

Strupe (2010) has identified barriers to carrying out OSCE in the form of cost constraints and workload associated with devising the examination. The time-consuming nature of OSCE preparation was acknowledged by some team members but overall the time investment was deemed to be worthwhile in terms of the outcomes achieved. It is predicted that subsequent years may require less time to construct the OSCE as familiarity with the necessary planning increases.

Conclusion

OSCE has been identified as a means to assess students in a manner whereby they demonstrate knowledge gained - to 'show how'. This can be used alongside other means of assessment such as written examinations where responses are cued from factual knowledge with candidates scoring highly on their ability to memorise and reproduce information i.e. students 'know' and 'know how'. It also has the potential to make students more self-aware, and encourages them to identify their strengths and weaknesses. It provided an assessment medium whereby all learning thus far in the course was examinable; in keeping with the aspiration from the regulatory body of the profession and Pharmacy education that we move toward a 'Spiral' curriculum, where prior knowledge is revisited. An advantage of the assessment was that it examined the students' knowledge gained over an entire semester in an efficient manner; with an assessment time of less than 90 minutes. This activity aimed to consider whether it is a viable method of assessment in such a science-based class, from both a staff and student perspective. The results indicate that it was-for example helping the students to be more aware of the types of mistake that they commonly make.

The use of OSCE as a means of assessing the clinical aspects of the profession have been explored; however this is the first such attempt in Queen's University School of Pharmacy to introduce the concept into a module where chemistry is the main discipline. Since this subject is taught to the Level 2 students, it is hoped that the OSCE will also increase the clinical contextualisation of this subject, the lack of which has been identified as a source of disillusionment amongst Pharmacy undergraduates in the initial years of the course at another UK university. Fitzgerald and Reid (2010) have stated that 'assessment tasks that confront students with activities they will encounter in professional practice and assess these in realistic environments' are needed for assessment to be authentic. In the present study, students have responded that the OSCE helped them understand the role of the pharmacist when carrying out a clinical check. The staff referred to the realistic time frame used and how this is comparable to the importance of time management in pharmacy practice.

The time-consuming nature of preparation for such an assessment has been recognised but the potential for this time commitment to be reduced in subsequent semesters has been acknowledged by those involved. Now that the individual OSCE stations have been developed, they will require only some modification annually for each group of students.

The introduction of OSCE has increased the diversity of assessment of this module, bringing with it many additional benefits for the undergraduates that both the students themselves and the team responsible for teaching it have acknowledged. The scope for further development of the assessment to encompass other skills, for example communication, has also been acknowledged. Introducing a station where a clinical or legal query is to be discussed with a healthcare professional could be one such option for future cohorts of students.

One of the uncertainties surrounding use of OSCE as identified by the literature is the use of real-life patients, simulated patients or pharmacist assessors who act as patients or other healthcare professionals where necessary. Munoz *et al.* (2005) advocate the use of real-life patients, whereas Awaisu & Mohamed (2010) included both type of patient in their OSCEs. The OSCE developed in QUB has the advantage of requiring neither, since it was able to assess ability without the need to include patient interaction. In this way, it should have increased reliability and consistency compared to other patient-based OSCEs an opinion expressed by Wass *et al.* (2001).

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Appendix 1: OSCE Answer Sheet

<p>Workstation number:</p> <p>Patient's name:</p> <p>Comments on prescription (e.g. legality, accuracy of information, endorsement, coding etc):</p> <p>Comments on dispensed item (e.g. product and label):</p>

Appendix 2: OSCE Student Guidance Sheet

<p style="text-align: center;">PMY2006 Pharmaceutical Technology</p> <p style="text-align: center;">LEVEL 2 EXTEMPORANEOUS DISPENSING</p> <p style="text-align: center;">OSCE</p> <p style="text-align: center;">(OBJECTIVE STRUCTURED CLINICAL EXAMINATION)</p> <p style="text-align: center;"><u>GUIDANCE NOTES</u></p> <p>You will be required to check four prescriptions, which have been prepared by your Pharmacy Technician. You will need to assess each prescription, formulated product and associated paperwork. You only need to record the problems/mistakes – it is not necessary to record everything that is correct.</p> <p>It is best to approach an OSCE in a systematic way, as you do when dispensing products each week in the practical class. For example, you should start by legally and clinically assessing the prescription. Next, consider how the product should be formulated and check calculations. To accuracy-check the label, always do this against the original prescription and think about other requirements, such as expiry dates, warnings and storage conditions. In addition to assessing the quality of the products, consider if your Technician has included other necessary items, such as a spoon, syringe or suppository leaflet.</p> <p>You will be allocated Twenty minutes per prescription. A buzzer will sound indicating when you must move on to the next workstation, as directed by staff.</p> <p>Do not remove any items or write on prescriptions or any of the associated paperwork.</p> <p>The OSCE is an Open Book exam. Therefore, you can use your reference sources. You will also be provided with relevant reference pages from appropriate texts, e.g. BNF, BP etc. at each workstation. However, you are advised to print out the page, attached, from the BNF-C, listing guidance weights for children in advance of this examination.</p> <p>Students are reminded that the OSCE is to be done under examination conditions.</p> <p style="text-align: center;"><u>Specific Guidance</u></p> <ul style="list-style-type: none"> ● When assessing the legality of the prescriptions, you can assume that none of the items are CD Benz POMs. ● All volumes and weights of the dispensed products will be ok. ● You will need to assess the quality of the products – use the excess provided for creams etc. to judge this. ● Liquids will be poured out of their bottles into a measuring cylinder for you. ● Ensure you consider the complete dispensing process – from presentation of the prescription to supply of the dispensed product to the patient. ● Move from one workstation to the next in a clockwise direction. ● It is vitally important that you write your name on all answer pages. ● You must also bring to class a copy of excipient batch numbers and expiry dates, as provided. Drug pots will be provided for the active ingredients in each case. ● You do not need to determine the legal category of the products. All expiry dates have been calculated on the date of dispensing in each case and not from the date of your class. Take extra care here.
