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A questionnaire study investigating undergraduate pharmacy students' opinions on assessment methods and an integrated five-year pharmacy degree

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Title Page

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Title: A questionnaire study investigating undergraduate pharmacy students' opinions on assessment methods and an integrated five-year pharmacy degree.

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Abstract

Introduction

This research aimed to establish pharmacy students' views on assessment and an integrated five-year degree.

Methods

Following ethical approval and piloting, final year Queen's University Belfast (QUB) pharmacy students (n=119) were invited (at a compulsory class) to complete a paper-based questionnaire. Descriptive statistics and non-parametric tests were done; $p < 0.05$ was set as significant *a priori*.

Results

Response rate was 99.2% (118/119). Most [90.7% (107/118)] considered formative assessment improved academic performance. Many [77.1% (91/118)] thought continuous assessments were fairer when judging academic performance than one-off exams. Proprietary dispensing exam was the top ranked method; objective structured clinical examinations (OSCEs) were the least preferred. An integrated five-year degree was welcomed by 60.2% (71/118) due to greater support, standardisation and enhanced integration of learning.

Discussion

This is useful for stakeholders and course developers. These students appear to appreciate integration and assessments that emulate real-life practice but work is required to ensure OSCEs are viewed favourably.

Keywords

assessment, integrated 5-year degree, pharmacy students, questionnaire

Introduction

Assessment is a core component of education; the Quality Assurance Agency (QAA) for Higher Education defines it as “any processes that appraise an individual's knowledge, understanding, abilities or skills” (Quality Assurance Agency, 2012). There are two main sub-types of assessment, namely, formative and summative (Quality Assurance Agency, 2012). Formative assessment centres on the provision of constructive feedback to help improve performance. It is a key part of the learning process i.e. it is assessment for learning, but does not contribute to the final ‘module’ mark (grade) (Quality Assurance Agency, 2012). Examples of formative assessment within the Master of Pharmacy (MPharm) degree programme at Queen’s University Belfast (QUB) include: four weeks of active learning about the dispensing process and how best to counsel patients within the Pharmacy Practice Dispensing module, handing in draft work to a research project supervisor, and doing a mock examination. Conversely, summative assessment measures the extent of a learner's success in meeting the assessment criteria (i.e. it is assessment of learning) and involves the award of credits or equivalent which can then lead to a qualification (Quality Assurance Agency, 2012). Examples of summative assessment within the MPharm degree programme include: written and practical examinations and coursework components such as laboratory reports, posters and ethical debates.

QUB Regulations for Undergraduate Programmes outlines the modular system that is used for undergraduate programmes within the University (QUB, 2016a). Each module typically consists of formative and summative assessments; the student’s module grade may be derived from both continuous assessment (coursework) and stand-alone written examinations (QUB, 2016a). To safeguard academic standards, diverse, high-quality assessment formats are necessary. Indeed, the QAA for Higher Education considers that higher education institutions

should ensure that summative assessment is conducted with “rigour, probity and fairness...” and that such assessments “are explicit, valid and reliable” (Quality Assurance Agency, 2012). Also, the amount of summative assessment in a particular programme needs to be reasonable. A ‘module’ is a name for a part of the degree programme (an element/aspect/unit) that equates to a defined amount of learning or credit and normally has some type of assessment associated with it. The QAA for Higher Education considers that a typical 20-credit module (20 CATS points) equates to 200 hours of student learning time and encompasses teaching activities, private study, and all aspects of preparing for, and completing, the assessment (Quality Assurance Agency, 2012). Additionally, timing of assessments is important as there needs to be adequate time allowed for students to prepare for, and complete, each assessment.

With specific reference to pharmacy, the shift towards patient-centred practice several years ago has necessitated a transformation in pharmacy education, in terms of both the teaching approaches that are utilised and the types of assessment that are employed. The MPharm accrediting body for United Kingdom (UK) Schools of Pharmacy [the General Pharmaceutical Council, (GPhC)] places great emphasis on outcomes and competencies, and also on integrated learning (General Pharmaceutical Council, 2011). This is analogous to PharmD requirements in the United States of America (USA) where, through integrated learning, core skills that should be developed include: effective communication, problem-solving, critical thinking, autonomous learning and teamwork (American Association of Colleges of Pharmacy Center for the Advancement of Pharmaceutical Education, 2004; Accreditation Council for Pharmacy Education, 2011). Ultimately, pharmacy schools and departments across the globe must be assured that their graduates are competent healthcare professionals who possess the ability to practise safety and effectively.

From a healthcare educational perspective, one model used to assess clinical skills, competence and performance is ‘Miller’s triangle’ (Miller, 1990). In this model, there are four categories, namely, ‘knows’ (lowest level), ‘knows how’, ‘shows how’ and ‘does’ (highest level). This model is referred to in the UK MPharm accreditation standards (General Pharmaceutical Council, 2011) with the maximum level required for the MPharm degree program typically being ‘shows how’. Where written exam questions might test knowledge (knows) or application of knowledge (knows how), role-plays and objective structured clinical examinations (OSCEs) are all considered to be at the ‘shows how’ level. Indeed, OSCEs are widely utilised as an assessment tool in nursing, medical and pharmacy education (Carraccio and Englander, 2000; Rutter, 2002; Corbo *et al.*, 2006; Rushforth, 2007; Awaisu and Mohamed, 2010; Salih *et al.*, 2010; Evans *et al.*, 2011; Kirton and Kravitz, 2011; Zayyan, 2011; Salinitri *et al.*, 2012; Branch, 2014; McDonough *et al.*, 2015).

To date, there has been no research conducted to ascertain students’ opinions on the range of assessment methods used within the MPharm degree programme at QUB (or within other pharmacy degree courses to the best of our knowledge). Previous work has centred on individual elements of the course such as the entrepreneurial workshop Lavery *et al.*, 2015) ethical debates (Hanna *et al.*, 2014) interprofessional workshops (Barry *et al.*, 2015) and OSCEs (Hughes *et al.*, 2013) rather than seeking to acquire a more holistic overview. Furthermore, this study is timely for two reasons. Firstly, the University is moving towards a “more innovative learning and assessment environment for students” (QUB, 2016b) by having fewer written examinations and introducing a progressive continuous assessment model (QUB, 2016b). Secondly, in the future, pharmacy schools and departments across the UK may have to change their MPharm degree structure (which was historically a four year course followed by a discrete pre-registration placement year and professional exam *after* graduation from

university) to integrate the pre-registration year within the degree programme (Pharmaceutical Journal, 2016). Indeed, an integrated degree was recently tabled for discussion in Scotland (NHS Education for Scotland, 2016). If and when these proposals come to fruition, QUB School of Pharmacy will have to make changes to course content, learning outcomes and corresponding assessments. It was therefore valuable to gain students opinions on the various assessment methods currently employed, as these findings were anticipated to be useful to inform future stakeholder discussions.

Aim and objectives

The aim of the study was to establish QUB Level 4 pharmacy students' views on the assessment methods employed within the MPharm degree programme and ascertain their opinions on an integrated five-year MPharm degree.

The objectives were to:

- investigate students' opinions on formative assessment;
- ascertain students' views on summative assessment (both generally and more specifically about the individual types currently employed within the MPharm degree course);
- explore students views on the two proposals (i.e. the changes to the University academic year structure and the integrated five-year MPharm degree encompassing the pre-registration year);
- To determine whether certain parameters (failing components of the degree programme and also gender) affected opinions.

Method

Ethical approval for this study was obtained from QUB School of Pharmacy Ethics Committee (Ref 021PMY2015).

Study participants

All currently enrolled pharmacy students in Level 4 (the final year) of the QUB MPharm degree were invited to participate in the study (n=119; excluding the research student). Level 4 were chosen because they were the only year group to have experienced all of the different types of assessment utilised in the MPharm degree programme at the time of data collection i.e. exposure to all of the different types of assessments was complete by the end of Level 3 (June 2015) and data collection for this study was done in the first semester of Level 4 (December 2015).

Data collection

Data were collected by means of a paper-based self-completed (also known as self-administered) questionnaire. Questionnaires are used to measure people's knowledge, attitudes and opinions (Oppenheim, 2000) and are often the method of choice for gathering data from various groups of people such as patients and healthcare professionals (McColl *et al.*, 2001) and students (Trotter, 2006).

Questionnaire development

The questionnaire (available from the corresponding author on request) was developed with reference to the wider literature (for example: Carraccio and Englander, 2000; Rutter, 2002; Corbo *et al.*, 2006; Trotter, 2006; Awaisu *et al.*, 2007; Rushforth, 2007; Evans *et al.*, 2011; Kirton and Kravitz, 2011; Zayyan, 2011; Quality Assurance Agency, 2012; Higher Education Academy, 2015; McDonough *et al.*, 2015; QUB 2016b). The questionnaire (13 discrete questions with many of the questions consisting of several parts) consisted of four sections with mainly closed-question responses measured using a 5-point Likert scale (Strongly Agree,

Agree, Neither Agree nor Disagree, Disagree, Strongly Disagree) or a 3-point scale (for assessing difficulty, fairness and preference). There was one ranking question (about ranking types of exams in order of preference) and several ‘yes’, ‘no’ and ‘unsure’ categorical type-questions. Furthermore, some parts of the questionnaire enabled a free (open) response to be provided. Section A (2 questions) related to formative assessment, Section B (6 questions) focussed on summative assessment and asked whether students had failed any module in the MPharm degree programme on a first attempt. If students answered yes to this initial question, they were instructed to complete a table, indicating the number of module(s) failed on a first attempt in each level of the MPharm programme. Section C (2 questions) related to future changes to assessments (i.e. the proposed changes to the University academic year structure and the integrated MPharm degree encompassing the pre-registration year) Finally, Section D (3 questions) gathered demographic information about gender, age, and country where they received their education prior to enrolling at QUB (but no identifiable information). A cover sheet outlined the purpose of the research, that participation was voluntary, gave a predicted completion time and included an explanation of the terms ‘formative’ and ‘summative’ assessment. To maximise response rates, the questionnaire was relatively short (around 10 minutes completion time) and the questions were largely in a closed-question format (Dillman, 2011).

Questionnaire piloting

The questionnaire was piloted with ten pharmacist postgraduate students in the School. As a result, minor amendments were made to Section B (a statement within this section which related to compulsory questions on written examination papers was reworded to use the word ‘**questions**’ rather than ‘**components**’ and another part was clarified in relation to failing

modules **on a first attempt**) and Section C (more information on the proposed University academic year structure changes was provided).

Questionnaire distribution

All Level 4 MPharm students except the research student (SD) were invited to complete the paper-based, self-administered, questionnaire in December 2015 at a compulsory class. Each student was only able to complete the questionnaire once.

Data analysis

On receipt of completed questionnaires, quantitative data were coded and entered into a customised database for statistical analysis [IBM Statistical Package for the Social Sciences (SPSS) Statistics for Windows, Version 22.0. Armonk, NY]. The analysis of the data largely took the form of descriptive statistics i.e. number, frequency or percentage as appropriate. Comparisons were done for male versus female responses [previous work on assessment revealed differences in opinions (Furnham *et al.*, 2013)] and also for those failing modules versus not failing modules. Appropriate statistical tests were conducted i.e. Mann-Whitney U test for the ordinal variables and Chi-Square Test for nominal (categorical) variables, with significance set *a priori* at $P < 0.05$. The open response-questions generated qualitative data which were analysed via thematic analysis (Green and Thorogood, 2014).

Results

The response rate was 99.2% (118/119). While most of the respondents completed the questionnaire in its entirety (n=111), seven students only partially completed it, i.e. data were missing from 7 of the 118 returned questionnaires. The number of respondents providing a response has been provided in addition to the %. For example, stating “110/118 ‘strongly agreed’ or ‘agreed’...” means that 118 provided a response to the statement and of those, 110 ‘strongly agreed’ or ‘agreed’ with it. Additionally, P values <0.05 are reported throughout. As previously stated, Mann-Whitney U test was used for the ordinal variables and Chi-Square Test for nominal (categorical) variables,

Demographic information (Section D of the questionnaire)

The sample was made up of 29.9% male and 70.1% female students (NB one respondent did not provide gender details). The mean age was 21.75 years. These demographic factors closely mirrored the population (since the response rate was almost 100%). Additionally, 58.5% students reported never failing any MPharm modules; 41.5% reported failing ≥ 1 module.

Formative assessment (Section A of the questionnaire)

This question asked students to consider various statements about formative assessment (about it enabling students to: determine their expertise of the subject, improve academic performance, motivate and improve confidence) and whether the amount was satisfactory. Table I provides the statements and responses.

Students who had not failed any modules were significantly more likely to “strongly agree” or “agree” that formative assessment improved confidence in their own ability compared with students who had failed ≥ 1 module [85.5% (59/69) versus 69.4% (34/49); P=0.0451].

Insert Table I here please.

The open response part revealed that students found formative assessment to be helpful for identifying knowledge gaps and providing insight into what the summative assessment would entail. However, a few students considered that the formative assessment needed to closely mirror the summative assessment to be of value (which wasn't currently always the case). One student stated that he/she wasn't motivated to prepare for a formative assessment, since it did not count towards the module mark.

Summative assessment (Section B of the questionnaire)

This part of the questionnaire consisted of various rating and ranking questions. Table II outlines some generic statements about summative assessment (about the amount of summative assessment, one-off written examinations, continuous assessment, 'question-spotting' as a revision strategy and negative marking) and the associated responses. These are all attributes and terms that our students were familiar with from being on the MPharm degree programme. For readers unfamiliar with the term 'question-spotting', this is an attempt by students to predict the content of exams often as a means to reduce the effort required for exam preparation. Therefore, if academic staff reuse questions and do not vary these significantly from year to year, it is easy to predict what will be asked.

Insert Table II here please.

Students who had not failed any modules (compared with those who had previously failed ≥ 1 module) were more adamant they did not 'question-spot' as a revision strategy [42.0% (29/69) versus 8.2% (4/49) 'Strongly Disagreed' that their main strategy when preparing for written

examinations was to 'question-spot'; $P=0.0032$]. Students who had previously failed ≥ 1 module (compared with those who had not failed any) were significantly more likely to think module marks were too heavily weighted towards one-off written examinations [71.4% (35/49) 'Strongly Agreed' or 'Agreed' versus 53.6% (37/69); $P=0.0142$].

Students were also asked to rank four types of exams [written examinations, lab-based examination (extemporaneous dispensing), practical examination (proprietary dispensing) and OSCEs] in order of preference, giving '1' for their most preferred through to '4' for your least preferred option. Overall, proprietary dispensing was ranked as the top (most preferred) method. Indeed, females were more likely than males to rank this as first preference [62.2% (51/82) versus 28.6% (10/35); $P<0.001$]. For readers who are unfamiliar with the term 'proprietary dispensing', this means dispensing 'proprietary' products (i.e. medicines that are prepared by manufacturers in a form typically ready for administration), rather than extemporaneous dispensing where pharmacists will formulate medicines from first principles. Students reported that it was directly relevant to practice with an authentic assessment (role-plays with healthcare professionals/patients, proprietary medicines and counselling in a mock pharmacy). Conversely, over 60% [62.7% (74/118)] of respondents ranked the OSCE as their least preferred type of examination. Reasons centred on not having enough time at each station, difficulty preparing adequately in advance, too heavily weighted (penalty of not progressing/completing the year if all of the required competencies were not passed/met). Moreover, some reported that the stress they experienced in relation to the OSCE was overwhelming and prevented them from performing to the required standard on the day. Additional statements about OSCEs are discussed later (there was a separate question specifically focussing on this).

Another aspect focussed on the content of written examinations i.e. negatively marked multiple choice questions, short-answer questions, long answer questions, having a choice of questions, and all questions in the examination paper being compulsory. Students were asked to rate these in terms of difficulty ('easy', 'neither' or 'difficult') fairness ('fair', 'neither' or 'unfair') and preference ('like', 'neither' or 'dislike'). Negatively marked MCQ examinations were deemed difficult by 75.4% (89/118). Many [79.7% (94/118)] thought the short-answer questions were a fair assessment method and similarly, 77.1% (91/118) thought that long-answer questions were fair. The majority [92.2% (106/115)] considered that 'all questions being compulsory' was a difficult assessment type and 86.3% (101/117) disliked them. Students who failed ≥ 1 module were significantly more likely to dislike compulsory question papers than students who had not failed any modules [97.9% (47/48) versus 78.3% (54/69); $P=0.0024$].

The last question in this section asked students to consider various other statements relating to OSCEs, including whether they thought OSCEs were: a fair way to assess clinical competence and integrated knowledge, a true measure of clinical skills, intimidating, less stressful than other assessment types and subjective. See Table III for statements and subsequent responses.

Insert Table III here please

Students who failed ≥ 1 module were more likely to 'Strongly Disagree' or 'Disagree' that the outcome of the OSCE (pass/fail) was a true measure of the student's clinical skills compared with students who had not failed any [73.5% (36/49) versus 55.1% (38/69); $P=0.0292$].

Moreover, females were more likely than males to consider it difficult to adequately prepare for OSCEs [75/82 (91.5%) 'Strongly Agreed' or 'Agreed' versus 25/35 (71.4%); $P=0.008$].

Females were also less likely to be confident about passing on a first attempt [11/82 (13.4%) 'Strongly Agreed' or 'Agreed' versus 15/35 (42.9%); $P < 0.001$].

Future changes to assessments (Section C of the questionnaire)

The proposed idea of a single set of written examinations at the end of the second semester (with fewer written exams in total for the academic year) and the introduction of a more progressive continuous assessment model across both semesters was presented to the students. Students were provided with an explanation about what this meant in the questionnaire which was taken from the University website i.e. that there would be less one-off written examinations at the end of the semester and the focus will shift to continuous assessment occurring during the semesters. Students at QUB are also aware that the MPharm accrediting body requires assessments to increase in complexity (testing lower to higher level skills) as they progress through the course.

Students were then asked whether they agreed with the proposal; 51.7% (61/118) selected 'yes'; 26.3% (31/118) 'no' and 22.0% (26/118) 'unsure'.

Students who selected 'yes', justified their choice by stating that they would have more time to revise for fewer examinations (and reduced stress which was previously linked to learning a large volume of material in a short timeframe), improved pace of learning and more likely to learn overall more because they were being continuously assessed. Some reported that continuous assessment was a fairer method (as you could have an 'off day' in a one-off examination) and that it emulated the learning style of a healthcare professional (continuous lifelong learning and development is a professional requirement). Students who selected 'no' or 'unsure' stated that continuous assessment could be more intense and stressful (students would have to think about their academic performance for the whole semester, rather than

specific key periods within the semester) and that the current academic year structure and assessment was established and fit for purpose (so why change it).

Secondly, the option of an integrated five-year MPharm degree was outlined to the students and their views on this proposal ascertained; 60.2% (71/118) selected 'yes', 17.8% (21/118) selected 'no' and 22.0% (26/118) chose 'unsure'.

Reasons for supporting the proposal included greater standardisation and quality of training if linked to a university, potentially enhanced integrated learning opportunities if there was some time in university followed by a period of time in practice; visa and work permit problems reduced for international students and less stress for the student if the university was involved in placement allocation. Explanations as to why some students were dubious about the proposal (i.e. from those who selected 'unsure' or 'no') included: four years was long enough to be a student, restrictions on placement location if it was linked to a specific university/degree programme, potentially greater expense and student fees and some students wanted the option of obtaining a MPharm degree after four years (not five) in case a change in career pathway is required.

Discussion

This study has revealed interesting findings about pharmacy students' views on assessment methods and future changes. Formative assessment was perceived to be beneficial for enhancing academic performance, self-assessment, motivation and confidence. In comparison to continuous assessment, one-off end of semester written examinations were associated with too much learning material and a less fair way to judge academic performance. Moreover, students could see value and relevance of summative assessments that related to authentic pharmacy practice tasks such as proprietary dispensing and patient counselling. While three-quarters of students considered OSCEs to be a fair way to test clinical competency, they were the least preferred assessment method and associated with anxiety. The proposal of an integrated five-year degree was received positively by many.

The general consensus among students about formative assessment was positive, with the majority (about 90%) in agreement that it could improve their academic performance and also enable them to self-assess their expertise of the subject area. Although it was potentially deemed more useful by students who had never failed modules compared with those who had, suggesting differing levels of engagement with this type of assessment. Around three-quarters of the student respondents also perceived that it improved self-confidence and motivation to study. Similar findings and opinions have been reported in the wider literature (Bennett, 2011; DiVall et al., 2014; Higher Education Academy, 2015). About a quarter of student respondents considered that the current amount was unsatisfactory and that more was needed within the MPharm degree pathway. To date, formative assessment tends to be done within compulsory classes rather than in lectures and the amount differs depending on the module. It is most prevalent where competencies and higher level skills are being developed (for example, formulation, statistics, numeracy, communication, problem-solving and research skills). We

don't usually have any issues with attendance in such classes because of standard operating procedures and code of conduct. Several also commented that it was only useful if it aligned with the summative assessment. However, in many instances in QUB, formative assessment has to be constrained due to timetabling restrictions, the amount of time allocated to the subject area, and the finiteness of academic staff time and resources. Additional self-study exercises could be prepared in accordance with an assessment framework (Higher Education Academy, 2015) and teaching staff could check that formative assessments employed are closely reflective of the summative assessment (without compromising on quality assurance processes, significantly adding to staff's workload, or impacting on a teaching timetable that is already at capacity). However, it is noted that if we add more remote formative assessments, we will need a robust way to track whether students are doing it.

In terms of summative assessment, nearly three-quarters of student respondents considered that the volume of material required to be learnt for written examinations was unreasonable which partially explains why students were also in favour of introducing more continuous assessment rather than written examinations. Indeed, students' expectations to have more formative and continuous summative assessment could be related to their secondary education experience, where such an approach is widely adopted in the UK (Gov.UK, 2016). Students who had not previously failed any modules were less likely to 'question spot' than students who had failed modules, suggesting differences in learning characteristics and preparedness for assessments. Other higher education experts have reported similar concerns about question-spotting and a lack of deep learning by students, with males being more inclined to adopt this strategy (Van Staden and Henrico, 2016). Indeed, our previous research conducted on pharmacy students about goal orientations and academic performance revealed that male students were more likely to be work avoiders than female students. (Hall *et al.*, 2015). Therefore, from a quality

assurance viewpoint, it is encouraging that there is a link between question-spotting as a revision technique and failing modules. It should not be the case that students only learn a fraction of the required material (through correct prediction of what questions will be on the paper), yet successfully pass the assessment. It would be interesting to conduct further research on students who fail modules to investigate what factors caused them to fail in the first instance and then to subsequently change their attitude and behaviour in response to this.

There was a high level of agreement that MCQ examinations were difficult. This may be related to the negative marking utilised in MCQs throughout the course which two-thirds of respondents did not agree with. Currently in the UK, the assessments that determine professional membership are largely MCQ-based, except for the calculation part of the Great British paper, (General Pharmaceutical Council, 2016; Pharmaceutical Society of Northern Ireland, 2016) so students need to be competent and confident with this type of assessment. There is some debate about the fairness of MCQs as an assessment tool (McCoubrie, 2004) and whether negatively marked MCQs could be associated with gender bias, given the existing literature on risk-taking behaviour being more prevalent in males (Harris *et al.*, 2006); the rationale for using it is that it potentially deters students from guessing answers to questions (since this is not a desirable attribute of a future healthcare professional). The type of MCQs employed at QUB in addition to negative marking may require further evaluation using an evidence-based approach (McCoubrie, 2004) to ensure best practice is employed. In tandem, investigating student learning styles may help explain engagement, academic success and assessment preference. For example, a study conducted in India (n=100 medical students) found that female students were significantly more likely to prefer the auditory mode of learning whereas males were significantly more likely to prefer the kinaesthetic mode (Kharb *et al.*, 2013). If a diverse range of appropriate learning styles and assessment methods are not

employed, particular types of learners could be disadvantaged.

The preferred summative assessment by the majority was the practical examination, proprietary dispensing. Reasons for this included that it had direct relevance to a pharmacy practice activity and the assessment was authentic to what was done in real life practice (legally and clinically evaluating prescriptions, dispensing medicines, and counselling patients on the safe and effective use of their medicines). This is a positive finding given the evolving patient-facing role of the pharmacist, future pharmacists must be competent at applying clinical knowledge and communicating effectively with patients.

Overall, OSCEs were ranked as the least preferred option. Reasons included the high-stakes nature of the assessment, insufficient time at the station and lack of adequate preparation. Moreover, the majority (86%) found them to be an intimidating assessment method and three-quarters were in disagreement that they were less stressful than other examinations. However, OSCEs are considered to be a valid and reliable tool for testing clinical competency in a variety of healthcare disciplines including pharmacy, medicine, and nursing, although they are not without problems (Rushforth, 2007; Turner and Dankoski, 2008; Zayyan, 2011) but do reinforce the clinical contextualisation of the MPharm degree programme. For example, our OSCE stations will assess students' ability to interpret test results and laboratory data, prescribe using an evidence-based approach, diagnose and effectively communicate information to patient actors. The stations will be prepared with input from community, hospital and industrial pharmacists. While many of our students considered them to be a fair way to assess clinical competence and good for assessing integrated knowledge, more work needs to be done at QUB so that students (particularly females) view OSCEs more favourably without the associated anxiety. Additionally, it must be noted that just because students don't particularly like OSCEs,

does not mean that they aren't a valuable assessment tool. The nature of this particular assessment can leave students feeling exposed and vulnerable, yet this is something that they will need to get accustomed to. Having nowhere to hide and making high-stakes decisions will be more evident and relevant in practice and is therefore something that future pharmacists must become accustomed to during their foundational training years. Indeed, it is not unreasonable to consider that they could form part of the UK pharmacy registration assessment, given that this has already been implemented in other countries such as Canada (Austin *et al.*, 2003; Munoz *et al.*, 2005) and New Zealand (Lillis *et al.*, 2012).

In terms of future changes, around half of the students agreed to the proposed change in assessment structure. Students who viewed this proposal favourably reported benefits such as improved pace of learning, a fairer method of assessment than one-off end of semester examinations and analogous to the continuous development approach required of a healthcare professional. Moreover, this proposal which shifts the assessment focus towards a more continuous model, has the potential to reduce the number of students failing modules. Some students in this current study were sceptical about the proposal in that it would mean they would have to be organised and focused at all times throughout the semester. A recent literature review conducted by Richardson on coursework versus end-of-module assessments outlined benefits of continuous assessment but also how collusion, plagiarism and impersonation (such as 'contract cheating') are potential problems (Richardson, 2015). However, he concluded that the increased use of assessment by coursework has generally been accepted, with only a few expressing concerns about compromises in standards and quality (Richardson, 2015). Likewise, more than half of the student respondents (60.2%) in this current study agreed with the second proposal of an integrated five-year MPharm degree. Interestingly, the students had received no formal guidance or information on the integrated degree yet identified essentially the same

benefits and barriers as the working group within the School and beyond (NHS Education for Scotland, 2016; Pharmaceutical Journal, 2016).

Regarding strengths and weaknesses, firstly this was the first study to explore final year students' views on assessment methods within the MPharm in a holistic manner whilst also ascertaining opinions on important future changes. It was a timely due to the absence of research in this area, the important of appropriate assessment within higher education (Quality Assurance Agency, 2012; Higher Education Academy, 2015) and the ongoing discussions in the UK about integration of the pre-registration year within the MPharm degree (NHS Education for Scotland, 2016). Moreover, investigating differences in responses due to various factors (gender and a student's history of failing modules) provided some thought-provoking findings. Secondly, non-response bias was not an issue, given a response rate of almost 100%. QUB will use these findings to inform stakeholder discussions and the questionnaire could be readily utilised by other schools of pharmacy and healthcare disciplines. However, the opinions were captured at one point in time and were self-reported. Furthermore, the timing of the questionnaire distribution could have influenced results; perhaps if it had been conducted around the time of OSCE results (where in reality only about 10% of Level 4 students failed on first attempt), opinions would have been more positive. Only Level 4 students' opinions were sought but this was a deliberate choice since they were the only year group to have experienced all assessment types employed on the MPharm.

Conclusions

This baseline data adds to the field and provides an opportunity to ascertain students' opinions and reflect on the current assessment methods employed on the QUB Pharmacy degree programme. It helps enable academic staff to make evidence-based, timely changes to practice.

There are assessment methods that students clearly like and dislike, but the rationale for their preference is not always educationally sound (or in the best interest of patient safety) and therefore may need to be viewed with caution. This issue will be similar across the globe, in all levels and types of education, causing student satisfaction and academic rigour to be juxtaposed. Future research should focus on a deeper exploration of students' views and evaluate the impact of specific assessment methods on students' academic performance (grades) and satisfaction.

Recommendations and future research

- To allow students to demonstrate a wide range of skills, abilities and knowledge, there should be sufficient diversity in the methods of assessment used. Changes in *how* and *when* learning outcomes are measured via contemporary assessments have the potential to enhance the learning experience and employability of students which should be a key goal for educators. However, educators and key stakeholders must work together to ensure that any changes to assessment or degree structure do not compromise the quality of future pharmacists, particularly with regard to patient safety.
- While it is important to ascertain which assessment methods students (and staff) like and dislike, it is also crucial to objectively and critically appraise why this is the case. The rationale may not be educationally robust. It could be deemed unethical and irresponsible of educators not to include rigorous, challenging assessments on a degree programme.
- Students may desire more formative assessment but work should be done to establish how this can be implemented in courses effectively, and to students' satisfaction, whilst recognising the limitations on staff time and resources.

- While this quantitative work has revealed interesting findings and significant differences in student opinions relating to assessment, some of our approaches and findings are unique to the UK and therefore we invite readers to contextualise these to your own health system and/or pharmacy degree programmes.
- Qualitative research could be utilised to investigate students' perceptions and explore their views on assessment in a deeper and richer way. Moreover, this work would have been enhanced if students' academic performance (grades) from a variety of assessment methods had been investigated, rather than just obtaining students' views.

Conflicts of interest

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Tables

Table I Students' opinions (n=118) on formative assessment

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. Formative assessment has allowed me to determine my expertise of the subject	0 (0.0%)	5 (4.2%)	6 (5.1%)	78 (66.1%)	29 (24.6%)
b. Formative assessment has enabled me to improve my academic performance	0 (0.0%)	4 (3.4%)	7 (5.9%)	64 (54.2%)	43 (36.4%)
c. Formative assessment has motivated me to study	2 (1.7%)	16 (13.6%)	15 (12.7%)	56 (47.5%)	29 (24.6%)
d. Formative assessment has improved my confidence in my own ability	0 (0.0%)	6 (5.1%)	19 (16.1%)	66 (55.9%)	27 (22.9%)
e. The amount of formative assessment within the degree programme is satisfactory	1 (0.8%)	26 (22.0%)	13 (11.0%)	68 (57.6%)	10 (8.5%)
f. There should be formative assessment methods employed within EVERY module	4 (3.4%)	18 (15.3%)	19 (16.1%)	46 (39.0%)	31 (26.3%)

Table II Students' attitudes (n=118) towards summative assessment

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. There are too many summative assessments within the degree programme	4 (3.4%)	52 (44.1%)	38 (32.2%)	17 (14.4%)	7 (5.9%)
b. Being continuously assessed, rather than a one-off examination, is a fairer way to judge academic performance	1 (0.8%)	16 (13.6%)	10 (8.5%)	64 (54.2%)	27 (22.9%)
c. Module marks are typically too heavily weighted towards one-off written examinations	1 (0.8%)	27 (22.9%)	18 (15.3%)	51 (43.2%)	21 (17.8%)
d. The volume of material required to be learnt for written examinations is unreasonable	3 (2.5%)	7 (5.9%)	22 (18.6%)	47 (39.8%)	39 (33.1%)
e. My main strategy when preparing for written examinations is to 'question-spot'	33 (28.0%)	46 (39.0%)	20 (16.9%)	17 (14.4%)	2 (1.7%)
f. It is unfair to employ negative marking within multiple choice questions (MCQs)	6 (5.1%)	16 (13.6%)	18 (15.3%)	33 (28.0%)	45 (38.1%)

Table III Students' views (n=118) on Objective Structured Clinical Examinations (OSCEs)

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. The OSCEs employed within the MPharm degree programme are a fair way to assess clinical competence	5 (4.2%)	19 (16.1%)	14 (11.9%)	62 (52.5%)	18 (15.3%)
b. The OSCEs employed within the MPharm degree programme are a good way to assess that knowledge across individual modules is integrated	5 (4.2%)	15 (12.7%)	21 (17.8%)	61 (51.7%)	16 (13.6%)
c. I would like to have more OSCE-type assessments within the MPharm degree programme	26 (22.0%)	46 (39.0%)	22 (18.6%)	19 (16.1%)	5 (4.2%)
d. The time allocated for each OSCE station was adequate	18 (15.3%)	43 (36.4%)	17 (14.4%)	37 (31.4%)	3 (2.5%)
e. It is unreasonable to have the requirement that every OSCE station must be passed	3 (2.5%)	27 (22.9%)	27 (22.9%)	33 (28.0%)	28 (23.7%)
f. Passing or failing the OSCE is a true measure of a student's clinical skills	28 (23.7%)	46 (39.0%)	16 (13.6%)	25 (21.2%)	3 (2.5%)
g. It is difficult to adequately prepare for the OSCEs	0 (0.0%)	5 (4.2%)	12 (10.2%)	61 (51.7%)	40 (33.9%)
h. Scoring of the OSCE depends on the student's characteristics (such as personality, ethnicity and gender)	23 (19.5%)	34 (28.8%)	27 (22.9%)	29 (24.6%)	5 (4.2%)
i. Scoring of the OSCE depends on the assessor's characteristics (such as personality, ethnicity and gender)	20 (16.9%)	49 (41.5%)	26 (22.0%)	19 (16.1%)	4 (3.4%)
j. OSCEs are an intimidating assessment method	0 (0.0%)	3 (2.5%)	13 (11.0%)	47 (39.8%)	55 (46.6%)
k. OSCEs are less stressful than other exam types	44 (37.3%)	46 (39.0%)	15 (12.7%)	7 (5.9%)	6 (5.1%)
l. I am confident that I will pass the Level 4 OSCE on a first attempt	13 (11.0%)	41 (34.7%)	37 (31.4%)	17 (14.4%)	10 (8.5%)