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Quality Improvement (Case Report)

Overcoming pitfalls: Results from a mandatory peer review process for written examinations

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ABSTRACT

Problem description: Written assessments are essential components of higher education practices. However, faculty members encounter common pitfalls when designing questions intended to evaluate student-learning outcomes. The objective of this project was to determine the impact of a mandatory examination peer review process on question accuracy, alignment with learning objectives, use of best practices in question design, and language/grammar.

Quality improvement methods: A mandatory peer review process was implemented for all midterm (before phase) and final (after phase) examinations. Peer review occurred by two reviewers and followed a pre-defined guidance document. Non-punitive feedback given to faculty members served as the intervention. Frequencies of flagged questions according to guidance categories were compared between phases.

Results of CQI inquiry: A total of 21 midterm and 21 final exam reviews were included in the analysis. A total of 637 questions were reviewed across all midterms and 1003 questions were reviewed across all finals. Few questions were flagged for accuracy and alignment with learning outcomes. The median total proportion of questions flagged for best practices was significantly lower for final exams versus midterm exams (15.8 vs. 6.45%, $p = 0.014$). The intervention did not influence language and grammar errors (9.68 vs. 10.0% of questions flagged before and after, respectively, $p = 0.305$).

Conclusions: A non-punitive peer review process for written examinations can overcome pitfalls in exam creation and improve best practices in question writing. The peer-review process had a substantial effect at flagging language/grammar errors but error rate did not differ between midterm and final exams.

Problem description

Assessments are essential education tools tasked to pharmacy faculty members to measure student progress towards achieving learning outcomes, as well as evaluating the effectiveness of the program.¹ As such, assessments should be able to identify gaps between educational objectives and an individual's degree of learning.² Many different types of assessments exist. Written examinations (including multiple-choice questions), remain a cornerstone for most pharmacy programs. This may be due to the ability of these assessments to encompass various content and the convenience of their administration and grading.³ When designed and implemented correctly, written examinations can effectively assess intended student competence with adequate discrimination between differing performance capabilities. However, written exam questions are prone to common pitfalls that may threaten the

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overall validity of an exam and impede student success if not addressed prior to implementation.⁴

There is currently a heightened interest for English-based health sciences programs to seek international accreditation or certification.^{5,6} Accreditation agencies mandate having valid and reliable assessment methods for pharmacy programs to report students' achievement of educational outcomes.⁷ The ability of these programs to implement and maintain high quality assessment methods in line with best-known practices is unknown. Previous studies have demonstrated that flaws in exam creation within these settings can negatively affect student achievement.^{4,8} Therefore, continuous monitoring and evaluation must occur to ensure intended standards are achieved.⁹

To date, limited information exists regarding the most effective ways to develop faculty member's abilities with respect to exam creation. A systematic review found that one of the key features of effective faculty development included the provision of feedback, rather than simply providing workshops or seminars.¹⁰ Two other studies also demonstrated that an external or peer review process could improve validity of exams, especially when matched with content expertise.^{11,12} Notably, these studies focused on summative assessments. Although evidence exists for peer review methodology, there is still a major gap in the literature regarding how a process could be implemented and what outcomes could be achieved.

The objective of this study was to determine the impact of a mandatory examination peer review process at Qatar University College of Pharmacy on the following components: 1) alignment of questions with program and course learning outcomes, 2) accuracy of questions, 3) language and grammar errors, and 4) adherence to best practices of question writing.

Quality improvement methods

This was a retrospective before and after study that was conducted in the College of Pharmacy at Qatar University. Data were collected as part of normal educational procedures and analyzed after all procedures were complete; therefore, no interaction with human subjects occurred for study purposes and ethical review was not required. However, permission was obtained from the college administration for publication of these results.

Qatar is a small affluent country bordering Saudi Arabia and the Arabic Gulf. The population is diverse, with local Qataris comprising only approximately 20% of the people residing in Qatar.¹³ Expatriates comprise the majority of the population and come from all world regions, primarily South Asia, Philippines, Middle East, North Africa, and Western countries. Healthcare and education sectors display similar ethnic diversity of working professionals. As part of a national vision, these sectors are undergoing major reforms to be in line with North American and European models and standards. The setting is representative of a region with high ethnic diversity. Qatar University has opened in 2007 the first and the only college of pharmacy in Qatar.⁶ The college currently maintains two programs accredited by the Canadian Council for Accreditation of Pharmacy Programs (CCAPP): the baccalaureate of science in pharmacy (BSc Pharm) and post-graduate doctor of pharmacy (PharmD) degrees.¹⁴

An exam review process was implemented and occurred over two periods: midterm and final exams. All midterm examinations were identified for all undergraduate pharmacy (BSc Pharm) courses between September and December 2016. All written exams were eligible for review for all courses. Performance-based exams (skills or laboratory exams) were not included. Two peer faculty members independently reviewed each exam. One reviewer (assessment coordinator) reviewed all exams. A second reviewer was recruited based on overlapping expertise with the subject matter. Eight full-time faculty members at Qatar University College of Pharmacy served as secondary reviewers. Reviews were conducted according to a pre-defined guide (Table 1). The guide was developed according to best practice of writing exam questions.¹⁵⁻¹⁷ All peer reviewers were provided with training on the guide and were given the opportunity to clarify any unclear points with the assessment coordinator. Training consisted of written instructions, as well as a one-on-one session with the assessment coordinator to standardize the approach to exam review. The assessment coordinator was available by email or in person to answer any questions from second reviewers and also reviewed all second reviewer activity. An electronic copy of the exam was sent to the assessment coordinator at least five working days before the scheduled examination date. From this point, reviewers had 48 hours to complete the review process and provide their review to course coordinators. Course coordinators could then implement suggestions prior to administering the midterm exam or consider for future exams. This stage of the study served as the "before" component, with the feedback provided to course coordinators serving as the intervention.

The process outlined above was repeated for final examinations occurring in January 2017 (semester begins in September and

Table 1
Checklist components for exam peer reviewers.

Question	Response (list question numbers)
Did you identify any questions that should be reviewed for accuracy?	
Did you identify any questions that should be reviewed for language / grammar?	
Are questions in line with best known practices?	
<ul style="list-style-type: none"> ● Four independent answers for multiple-choice questions ● Lack of negative questions stems ● Lack of K-type questions ● Lack of true-false questions ● Answer choices of equal length 	
Did you identify any question that should be reviewed for alignment with course or program learning outcomes?	

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