REVISE, REVIEW AND REFLECT: READYING PHARMACY GRADUATES FOR PRACTICE

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Abstract

Objective
Being conversant in core drug knowledge is essential for pharmacy graduates. Pharmacists provide up to date drug information and advice in various healthcare settings; hence practical drug knowledge is an essential part of pharmacy education. Medicinal chemistry, pharmacology, and therapeutics are often discrete building blocks in pharmacy curricula, leaving the possibility that students may pass individual subjects but not retain knowledge, or be able to apply it in a practical situation to individual patients or in particular contexts. Anecdotal reports from the pharmacy profession suggest that pharmacy graduates entering the workplace may possess inadequate core drug knowledge. The aim of this project was to implement and assess a number of student-focused educational initiatives, including speed dating as an innovative tool, to facilitate the revision of practical drug knowledge, improve self-reflection and confidence in counselling, and to prepare graduates for internship and pharmacy practice.

Method
During the final semester of the Master of Pharmacy program in 2012, students were exposed to a variety of practical drug review strategies. A list of 100 significant drugs was compiled and distributed to students, which included the 50 most commonly dispensed drugs in Australia and 50 drugs that teacher-practitioners considered important. Intermittent formative quizzes on the core drugs were delivered at the start of selected lectures, with immediate feedback provided. Speed dating workshops were developed, in which students rotated between timed stations of student peers and pharmacy academics to demonstrate drug knowledge, including drug class, indication, dosing, counselling and monitoring, on randomly selected core drugs. Finally, a module of review lectures, on cardiovascular drugs, anti-infective therapies, drugs significant in the hospital practice setting and drug counselling, were created and delivered. The initiatives were later evaluated by anonymous questionnaire distributed during a timetabled class. Students were asked to rate the degree to which they perceived each activity improved their core drug knowledge, self-reflection, confidence in medication counselling, and overall preparedness for pharmacy practice using a 5-point Likert scale (1=strongly disagree to 5=strongly agree). Students were also invited to comment on the review activities, including the speed dating workshop. University Ethics Approval was granted (PHM/04/12/HREC).

Results
Of 98 students enrolled 78% (n=76) received and completed the questionnaire. All students were exposed to the core drug list, the majority of students were exposed to the quizzes and review lectures, and 88% (n=67) of respondents attended the speed dating workshop. Overall, students agreed that the activities had positive impacts on improving drug knowledge, confidence in counselling, preparedness for practice and self-reflection. The most notable of these was the ability to self-reflect on areas requiring improvement: core drug list (mean 4.53), quizzes (mean 4.51), speed dating (mean 4.43) and review lectures (mean 4.15). End of semester exam results for drug knowledge questions was high (mean 91%) compared to total exam results (mean 72%).

Conclusion
The drug review activities engaged students and improved their drug knowledge. Students agreed they improved their counselling and preparedness, and they valued the ability to self-reflect on their knowledge gaps.

Keywords: drug knowledge, pharmacy curriculum, reflection.
1 INTRODUCTION

Pharmacists are the medicines experts; relied upon to provide up to date drug information knowledge and advice in multidisciplinary healthcare settings. [1-3] Core drug knowledge is crucial to the safe and effective practice of pharmacists and pharmacy interns. [3] Medicinal chemistry, pharmacology, and therapeutics, are often discrete building blocks in the curricula of pharmacy schools, leaving open the possibility that while students may pass individual subjects, their retention of knowledge and ability to apply it to individual patients or in particular contexts, may be lacking. Being conversant in drug knowledge is an essential attribute for pharmacy graduates, the foundation of which is teaching drug information and its application in practice settings.

Pharmacy students, like students in other disciplines and people in general, may overestimate their own abilities, due to limited capacity to self-assess. [4, 5] There is also a demonstrated correlation between self-assessment and self-reflection in pharmacy students. [6] In the health professions self-reflection and the adoption of self-reflective practice are considered to be important, as highlighted in the literature. [7-10]

Anecdotal reports from the pharmacy profession suggest that pharmacy graduates may be perceived as having inadequate core drug knowledge as they enter the workplace. Guided by the scholarly literature, we aimed to implement and evaluate a range of teaching and learning activities, to provide a variety of approaches to engage the students [10, 11] and improve their core drug knowledge, confidence in counselling, self-reflection [6, 8] and preparedness for intern practice upon graduation.

A number of student-focused educational initiatives were developed to facilitate the revision of practical drug knowledge, including a core drug list, unscheduled formative quizzes, speed dating activities and review lectures.

1.1 Core Drug List

The creation of core drug lists, often using identified commonly-prescribed drugs, facilitates medical prescribing education and has been adapted in UK hospitals to minimise prescribing errors. [12, 13] These are often extensions of individual lists of essential drugs, called personal or “P-drugs”; as described in the World Health Organisation’s Guide to Good Prescribing, aimed at developing rational and responsible prescribing in medical students. [14] The rationale of using a core list of drugs based on common use in clinical practice is that a more defined list, albeit less comprehensive perhaps than those defined using other approaches, is focused and more useful to practice. [12] It was believed that a drug list of relevance to future pharmacy practice would assist students’ engagement in the core material and enable them to focus their study and revision on relevant drug knowledge. [15, 16]

1.2 Formative Quizzes

Unannounced quizzes (i.e. pop-quizzes) have often been conducted in educational settings to interactively engage students, and reinforce learning and the retention of important information. [17] We aimed to introduce these occasional assessment activities to engage pharmacy students with commonly prescribed drugs and the core information they should know about those drugs. The use of formative quizzes, as opposed to summative, was to alleviate any student anxiety around the conduct of the activity, as it does not impact on students’ overall grades.

1.3 Speed Dating

Speed dating is a networking technique used to facilitate rapid exchange of core information, traditionally utilised in social or romantic settings. [18] Time limited interpersonal exchanges akin to speed dating have been identified as a potential method of transferring discrete amounts of knowledge, and in recent years the technique has been employed in higher education as a tool for building research culture. [19, 20] Speed dating has been employed to aid knowledge exchange in health professional continuing education. [21] It has also specifically been used by pharmacists for the quick delivery of important medication tips in the context of professional conferences. [22, 23]

1.4 Review Lectures

Lectures are a traditional feature of teaching and learning in higher education. [15] In pharmacy education capstone courses, and educational modules, aim to assemble students’ knowledge from previous courses. [24] Unlike traditional end of course review lectures, we planned to develop and
present a compendium of lectures that reviewed key drug knowledge in significant areas of practice that had been taught, both in the current and in earlier semesters of the program. The review lectures addressed, but were not limited to, many of the drugs in the core drug list. The intention was to encourage not only revision and reflection but also retention of knowledge via a deeper approach to learning. [15]

1.5 Aims and Objectives

Our aim was to implement and assess an array of practical drug review initiatives, including speed dating as an innovative tool, to help graduating students revise core drug knowledge, improve self-reflection and confidence in counselling, and to prepare for internship and pharmacy practice. The objective was to instil students with a collective skill set for improved learning and self-reflection.

2 METHOD

During the final semester of a Master of Pharmacy program, students were exposed to a variety of strategies aimed at reviewing and imbedding core drug knowledge prior to their graduation and internships. The strategies included the implementation of an examinable core drug list of 100 significant drugs, speed-dating workshops, didactic and interactive practical drug review lectures and formative and unscheduled quizzes.

2.1 Core Drug List

In 2012, a list of 100 significant drugs was compiled that included the 50 most commonly dispensed drugs in Australia [25] and 50 drugs that teacher-practitioners considered to be important to current pharmacy practice. These included drugs with a narrow therapeutic index, those with potential for serious adverse effects, those requiring important counselling, and drugs with significant roles in special populations. The list was distributed to final semester pharmacy students who were advised that the drugs would be fully assessable by the end of semester, regardless of their presence or absence in the semester’s face-to-face therapeutic curricular activities.

2.2 Formative Quizzes

Intermittent and unscheduled quizzes on the 100 significant drugs were delivered at the start of selected lectures in the final professional pharmacy practice course. Students were allocated five drugs from the core drug list and given ten minutes to address their drug knowledge, within the provided structure of drug class, indication, usual dose, dose range, counselling, and monitoring. This formative activity was followed by immediate feedback and class discussion.

2.3 Speed Dating

Speed dating workshops were developed in which students rotated between timed stations of student peers and pharmacy academics to demonstrate drug knowledge. From the 100 significant drugs list, half were selected by the teacher-practitioners based on whether there was a practice-specific context where additional knowledge would be expected, e.g. the use of sildenafil in cardiac patients or amitriptyline in neuropathic pain, an over-the-counter request for fluconazole, or counselling for warfarin. Cards were constructed: 50 with the name of a drug and 50 with the name of a drug plus a practice-specific context.

In 2012, voluntary speed dating workshops were held in the final semester of the Master of Pharmacy degree. In these workshops groups of three students and one academic were formed. The academic remained in the position of listener while the students rotated between one listener position and two speaker positions. Speakers drew a card from a facedown shuffled pile and had to inform their respective listener about the drug, or the drug plus context, on the card they had drawn. In line with speed dating, each speaker had five minutes in which they were expected to draw two or three cards. Without reference to external resources, e.g. texts, students addressed aspects of each medication including drug class, indication, dosing, counselling and monitoring, as they drew the drug (+/- the practice-specific context) card from the top of the pile. Students were allowed to set aside a card if they chose.
2.4 Review Lectures

The final module of lectures for students in their final semester of a Master of Pharmacy program was a series of review lectures. The topics covered included cardiovascular drugs, anti-infective therapies, drugs significant in the hospital practice setting and drug counselling. Students were encouraged to participate and discuss medications as they were addressed.

2.5 Evaluation

The initiatives were evaluated by anonymous questionnaire distributed during a timetabled class. Students were asked to rate the degree to which they perceived each activity improved their core drug knowledge, self-reflection, confidence in medication counselling, and overall preparedness for pharmacy practice using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Students were also invited to openly comment on the review activities, including the speed dating workshop. University Ethics Approval was granted (PHM/04/12/HREC).

3 RESULTS

Of 98 students enrolled 78% (n=76) received and completed the questionnaire.

3.1 Core Drug List

All students were exposed to the core drug list. Responses were similar for most perceptions, with self-reflection being most highly rated and confidence trending towards neutral (Table 1). Most students agreed or strongly agreed that the list improved their core drug knowledge (87%, n=66), allowed for reflection on areas in which they needed to improve (93%, n=70), improved their confidence in medication counselling (76%, n=56), and improved their preparedness for pharmacy practice (88%, n=66).

Table 1. Student perceptions of the drug review initiatives.

<table>
<thead>
<tr>
<th>Teaching Initiative</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Mean *</th>
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<tr>
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<td></td>
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<tr>
<td>Improved core drug knowledge (n=76)</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td>9 (12)</td>
<td>40 (53)</td>
<td>26 (34)</td>
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<tr>
<td>Allowed for self-reflection (n=75)</td>
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<td>1 (1)</td>
<td>4 (5)</td>
<td>24 (32)</td>
<td>46 (61)</td>
<td>4.53</td>
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<tr>
<td>Improved confidence in counselling</td>
<td>1 (1)</td>
<td>4 (5)</td>
<td>15 (20)</td>
<td>32 (42)</td>
<td>24 (32)</td>
<td>3.97</td>
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<tr>
<td>Improved preparedness for practice</td>
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<td>2 (3)</td>
<td>7 (9)</td>
<td>36 (48)</td>
<td>30 (40)</td>
<td>4.25</td>
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<tr>
<td>Improved core drug knowledge (n=74)</td>
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<td>1 (1)</td>
<td>8 (11)</td>
<td>44 (59)</td>
<td>19 (26)</td>
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<td>43 (57)</td>
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<tr>
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<td>3 (4)</td>
<td>16 (21)</td>
<td>34 (45)</td>
<td>22 (29)</td>
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<tr>
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<td>7 (9)</td>
<td>38 (51)</td>
<td>27 (36)</td>
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<tr>
<td>Improved core drug knowledge (n=67)</td>
<td>2 (3)</td>
<td>1 (1)</td>
<td>9 (13)</td>
<td>21 (31)</td>
<td>34 (51)</td>
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<td>Allowed for self-reflection (n=67)</td>
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<td>Improved core drug knowledge (n=73)</td>
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<td>30 (41)</td>
<td>30 (41)</td>
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<tr>
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<td>28 (37)</td>
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<tr>
<td>Improved preparedness for practice</td>
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<td>6 (8)</td>
<td>13 (18)</td>
<td>36 (50)</td>
<td>17 (23)</td>
<td>3.85</td>
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</tbody>
</table>

*Mean of (Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5)

Positive student comments on the core drug list included:

“Really like the top 100 drugs... it’s really helping me w[i]th/ study now, also letting me know what I do know, don’t know [and] what I know but did[n’t] think I knew”
“I think learning about the top 100 refreshes knowledge more…”
“The 100 drugs list was very varied and helped a lot.”

Many students suggested introducing the core drugs list and activities earlier into the degree program:
“Please give top 100 drugs list earlier… so we can work on it”
“I wish we had started the Top 100 stuff in 4th year”
“Was a great addition to the syllabus. But would have really appreciated it earlier on, that is in Semester 1 of Masters.”

3.2 Formative Quizzes

The majority of students were exposed to the drug quizzes conducted at unscheduled times during timetabled lectures. Like the drug list, the formative quizzes were most highly rated for their allowance for self-reflection (Table 1). Most students agreed or strongly agreed that it improved their core drug knowledge (85%, n=63/74), allowed for reflection on areas in which they needed to improve (94%, n=71/75), improved their confidence in medication counselling (74%, n=56/76), and improved their preparedness for pharmacy practice (87%, n=65/75).

Generally, student comments on the formative quiz activities were positive, including:
“The pop quizzes were a great way to find out what I didn’t really know”
“We could have had more of those pop quizzes.”

Again, students recommended an earlier introduction of the activities into their program:
“Speed dating [and] pop quizzes were good but would be better to start from 1st year Masters rather than in last semester.”

3.3 Speed Dating

88% (n=67) of respondents had attended the speed dating workshop. Self-reflection was the perception rated most highly by student respondents (Table 1). The majority of students who attended the workshop agreed or strongly agreed that it improved their core drug knowledge (82%, n=55), allowed for reflection on areas in which they needed to improve (90%, n=60), improved their confidence in medication counselling (79%, n=52), and improved their preparedness for pharmacy practice (86%, n=57). End of semester exam results for drug knowledge questions was high (mean 91%) compared to total exam results (mean 72%).

Student feedback on the speed dating included the following positive comments:
“Loved the ‘speed dating’ workshop- helped with areas I need to study further and showed I know more than I realised…”
“Was an amazing experience…”
“Was a great addition to the syllabus…”

Several students suggested increasing the number of speed dating workshops that are conducted:
“The best practise was definitely the speed-dating workshops; think I would benefit from more of them”
“More speed dating.”

Negative comments were based around student anxiety at having to verbally demonstrate knowledge before peers and academics:
“I don’t think it was very effective… I think because everyone was too scared.”

As with the other drug review initiatives, many students suggested an earlier introduction into the Master of Pharmacy curriculum.

3.4 Review Lectures

Results were combined for the four lectures of the review module. Of the perception areas, self-reflection again achieved the highest rating from respondents. Most students agreed or strongly
agreed that the lectures improved their core drug knowledge (68%, n=50/73), allowed for reflection on areas in which they needed to improve (82%, n=60/73), improved their confidence in medication counselling (59%, n=44/74), and improved their preparedness for pharmacy practice (74%, n=53/72).

4 DISCUSSION

The key finding of this research was that while all activities were beneficial, the provision of a core list of drugs was the most valuable addition to the curriculum in the final semester of the degree program. Having a defined list allowed students to focus their attention and revision towards those drugs most relevant to their future careers. By deconstructing the large pool of drug knowledge into individual components of information (in particular the 100 significant drugs) students were able to reflect on their current body of knowledge and incrementally (drug by drug) address their knowledge gaps. Reviewing significant drugs, even if they had been taught in previous semesters, helped to imbed core knowledge that may not have been retained due to prior surface learning. Students rated the core drug list highest in both providing self-reflection and in preparedness for practice. Preparedness for practice requires relevant knowledge, skills and competencies [3] and students are likely to have realised the relevance of the core drugs to practice during experiential pharmacy placements as they would have witnessed the frequent supply of these drugs.

Speed dating was an effective strategy for improving core drug knowledge, reflection, confidence and preparedness for pharmacy practice, receiving the highest ratings of all initiatives for improving both knowledge and confidence. Both the core drug list and speed dating activities can be used by students for revision and reflection away from traditional learning environments. The speed dating activities required students to recall and verbalise their knowledge, exercising communication skills and competencies. Effective communication is a professional requirement of pharmacy students and graduates [3] and an expectation of prospective pharmacy employers. [26] While speed dating is becoming established in tertiary education it has only been used to transfer information between researchers and interns for networking purposes, [19, 20] rather than teaching and learning.

The speed dating activities and formative quizzes, which were both structured around the core drug list, were forms of practice testing. Practice testing benefits learners of different ages and abilities and boosts performance in many areas. [27] The repetition of these activities throughout semester is an example of distributed practice as it provided a number of learning opportunities. Distributed practice has also been associated with improved learning outcomes. [27]

Of the initiatives implemented the module of review lectures had the least impact on all the students' perceptions. This may be explained by the fact that content lectures were the least interactive, and therefore were arguably less engaging than the other initiatives. However, it is important for educators to offer learning opportunities for students to revise content knowledge based on gaps self-identified in other activities. Review lectures provide a capstone opportunity to assemble knowledge from previous courses. [24] Overall, students mostly agreed or strongly agreed that the lectures aided their preparedness for practice, improved their counselling and core drug knowledge, with the ability to self-reflect being the highest ranked attribute of this activity.

Student perceptions of the benefits of these initiatives were reflected in the end-of-semester exam results where the average marks for questions linked to these activities were higher than those for questions linked to other course content. Improved student performance in areas associated with the practical drug review activities may be linked to increased self-reflection. Accurate self-reflection is important as it has been shown that students who perform poorly in assessments tend to perceive their performance as having been better than it actually was. [5] Self-reflection on areas in which they need to improve was the attribute identified by students as most relevant across all activities, with a number of these activities testing their actual performance. In order of impact (greatest to least) improvement in self-reflection was attributed to the core drug list, the unscheduled quizzes, the speed-dating activities and the module of review lectures.

Our response rate was high, however our sample group was a single fourth year pharmacy cohort from one university. Despite this the ease of application of these interventions should enable their effectiveness to be tested in a wider variety of contexts. This may involve other courses and other student cohorts.

Students enjoyed most of the practical drug review initiatives. Feedback suggested that these activities should be offered earlier in their degree program. However, the academic objective was to use these strategies as capstone revision activities. The introduction of a core drug list into earlier
courses could facilitate students’ focus on core knowledge sooner. Conversely, it could foster a surface approach, or limited focus to their study, giving them perceived permission to disengage with the complexity of drug treatments to which they are exposed. Earlier introduction of speed dating workshops might enable students to develop confidence in drug knowledge conversation and embed an approach to self-reflective learning. Similarly, an earlier application of formative quizzes may be valuable, as they focus students on the current topic and encourage engagement. [17] Whereas unscheduled quizzes have a proven benefit, [17] the novel application of speed dating in a wider context in teaching and learning is yet to be proven. Further research is required to assess the broader application of speed dating.

5 CONCLUSION

The drug review activities engaged students and improved their drug knowledge. A combination of innovative and traditional educational tools can engage students and facilitate student self-reflection on areas in need of improvement. Students agreed the initiatives improved their counselling and preparedness, and the students valued the ability to self-reflect on their knowledge gaps.

REFERENCES


