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Integrating virtual simulation (MyDispense) for teaching Pharmacy curriculum

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Abstract

MyDispense, a web-based pharmacy simulation program, allows students to assume the role of a pharmacist to evaluate, verify, and dispense a prescription in a virtual pharmacy setting. The aim of this study was to create MyDispense simulation activities to teach Pharmacy curriculum within a therapeutic unit and measure its effects on student perception and learning. Clinical Practitioners reviewed existing case-based teaching material and incorporated new elements to the cases, to simulate the identification, resolution and documentation of medication related problems. A secondary review was conducted and cases were built onto the MyDispense web-based platform. Cases were designed with a primary focus of teaching contraception and diabetes patient-centred management and counselling. In addition, a complex case was designed to include real-life complexities such as prioritisation of tasks, conflict resolution and patient-centred care to better simulate an authentic experience. Virtual simulations such as MyDispense, offer an authentic teaching tool for Pharmacy curriculum.

Keywords: *MyDispense; simulation; pharmacy; curriculum.*

1. Introduction

Pharmacists play a vital role in the evaluation of primary care conditions, and the suitability of therapeutic options in complex conditions encountered in clinical settings (Pharmaceutical Society of Australia, 2010). One of the challenges of pharmacy programs worldwide is the need to link theoretical training with the mastery of practical skills (Mak *et al.*, 2021). For future pharmacists, these skills include safe provision of medications and medical devices. In line with this, students enrolled in the Bachelor of Pharmacy (Hons)/Master's degree at Monash University's Faculty of Pharmacy and Pharmaceutical Sciences, are introduced to applied therapeutic-focused 'Comprehensive Care' units from their second year. Often, students at this stage have had limited to no exposure to pharmacy practice. The Comprehensive Care units integrate multiple disciplines such as physiology, chemistry, therapeutics and professional practice. The complex integration of these disciplines is applied through case-based learning to promote problem solving and critical thinking, communication and empathy.

MyDispense is a virtual simulation tool that Monash University's Faculty of Pharmacy and Pharmaceutical Sciences developed to help students master the skills they need as a pharmacist-in-training (Costelloe, 2017). The web-based Pharmacy dispensing program provides a virtual environment in which it is safe for students to make mistakes without the potentially life-threatening consequences of a real-world dispensing error. This is akin to a pilot practising their skills using a flight simulator or an astronaut using a space flight simulator. Students can practise tasks as many times as they need and receive instant, tailored feedback on these attempts. As a consequence of the Global pandemic, face-to-face case-based activities in the "Comprehensive Care" therapeutic units were replaced with virtual case-based MyDispense activities. MyDispense provided an active and constructive educational environment based on challenges and learning objectives that promote deeper learning, emphasising understanding and the application of knowledge students have learnt. Furthermore, whilst there has been some research conducted on the use of MyDispense to integrated virtual pharmacy scenarios (Shin *et al*., 2018; Ferrone *et al*., 2017), there has been little research into more of a scaffolded approach to the use of MyDispense from simple primary care cases, to developing into more complex cases in a clinical setting to enhance problem solving and critical thinking skills.

2. Aim

The aim of this study was to create and implement MyDispense virtual simulation activities to teach Pharmacy case-based therapeutic curriculum and measure its effects on student perception and learning.

3. Method

MyDispense activities were incorporated into two therapeutic units taught within the 2nd year pharmacy curriculum of the Bachelor of Pharmacy (Hons)/Master's degree: Comprehensive Care Endocrinology and Renal (PHR2042) and Comprehensive Care Cardiovascular (PHR2142). PHR2042 spans the treatment and management of endocrine diseases and disorders/conditions such as thyroid disease, diabetes, as well as chronic kidney disease and contraception and is required for all second year Pharmacy students. PHR2142 specifically covers cardiovascular diseases and disorders such as hypertension, heart failure, atherosclerosis and thromboembolic disorders. The 'Contraception' topic within PHR2042 was identified for incorporation of MyDispense activities. Clinical Practitioners reviewed existing case-based teaching material and incorporated new elements to the cases, to simulate the identification, resolution and documentation of medication related problems. A secondary review was conducted and cases were built onto the MyDispense web-based platform. Elements such as information from other sources such as MyHealth records, prescriber information gathering and dispensing history were incorporated into the MyDispense activities. For PHR2142, a MyDispense activity was constructed to represent a complex case which contained multiple comorbidities, multiple information sources and multiple medication related issues. Distractors such as phone calls and interprofessional queries were used to mimic real-life environments. The developed simulation cases were founded on four key underlying principles which offered students: 1) a realistic pharmacy environment to learn and practice a variety of skills; 2) the opportunity to practice exercises multiple times without the risk of causing harm to a patient; 3) individualised learning opportunities and immediate feedback; and 4) flexibility in terms of when and where learning can take place.

For students, each MyDispense case exercise started with a brief description of patient history and the instruction to critically evaluate each medication from both a new prescription or a refill request by the patient. The simulation activity required gathering and summarizing relevant information, including patient dispensing history on the pharmacy computer, correspondence from the doctor and laboratory test results attached to the case. During the virtual encounter, students were required to interview the patient and search existing pharmacy patient records to acquire all necessary information to fully evaluate a given prescription. Students then had to submit a final answer by writing a professional note within the online patient profile in the program regarding medications in the prescriptions they would fill and/or would not refill, along with their rationale. If they had a medication they would not fill, they needed to recommend an alternative medication, if necessary, and provide justification for their selection. Students could access the answer key and feedback only after their answers were submitted. This was coupled with a class discussion with their facilitators

Following completion of the MyDispense activities, students were invited to participate in an online survey using the Qualtrics (Qualtrics, Provo, UT) platform. Survey responses were collated and de-identified. The survey consisted of 20 items. Of these, three items were about the general evaluation of the MyDispense tool, five items determining the most useful features of the MyDispense tool and eight items measuring student perceptions on the quality of the MyDispense activities embedded within PHR2042 and PHR2142. Student perceptions were measured using a 5-level Likert-type scale (1=strongly disagree; 3=Satisfactory; 5=Strongly agree. Descriptive statistics was used to determine frequency distribution and percentage distributions. This project was approved by the Monash University Human Research and Ethics Committee (Project ID: #26899).

4. Results

A total of 38 out of 174 students enrolled in PHR2042 and PHR2142 participated in the study (response rate: 22%). More than 90% of the students felt that the MyDispense simulation activities were well organised and made the learning process more engaging (Table 1). All students felt that the MyDispense software created an environment that was realistic to a pharmacy setting.

Table 1. General evaluation of the MyDispense tool.

Item	Class response (N=38) n (%)				
	Strongly disagree	**Dgree**	**Neutral**	**Agree**	**Strongly agree**
The MyDispense activities were well organized.	0.0 (0.0)	0.0 (0.0)	3 (7.9)	16 (42.1)	19 (50.0)
The MyDispense activities made the learning process more engaging.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	1 (2.6)	37 (97.4)
The MyDispense interface/environment was realistic.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	4 (10.5)	34 (89.5)

As seen in Figure 1, students deemed the two most useful features of MyDispense were its ability to provide immediate feedback and to be accessed at any time and place for practice purposes. More than 50% of students felt that MyDispense allowed them to practice their history taking skills. More than 45% of students felt that MyDispense provided a safe environment to practice and 40% of students were in agreement that MyDispense allows for them to identify and obtain patient specific information.

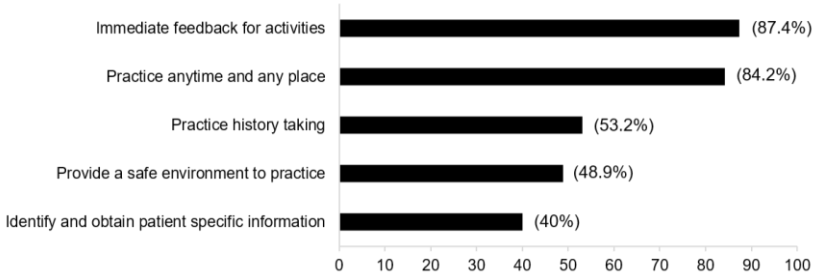

Figure 1. Students' perceptions of the most useful features of MyDispense.

Overwhelmingly, 84% of students felt the case-based MyDispense virtual simulation activities were of excellent quality (Table 2). Within the context of the PHR2042 therapeutic units, more than 94% of students felt that MyDispense helped them to better understand and practise the steps involved in history taking. In PHR2142, the MyDispense activity was constructed to represent a complex case which contained multiple comorbidities, multiple information sources and multiple medication related issues. More than 70% of students felt that using MyDispense in PHR2142 helped them better understand and practise collaborative decision making and prioritisation. More than 60% of students strongly agreed felt that the MyDispense activities in PHR2042 sufficiently prepared them for the critical thinking skills required for the complex scenario in the MyDispense activity in PHR2142 and furthermore, more than 40% of students strongly agreed that it sufficiently prepared them to apply their knowledge of management of a complex range of ailments in the complex scenario PHR2142. The complex case scenario developed in PHR2142 also incorporated distractors such as phone calls and interprofessional queries were used to mimic real-life environments. Encouragingly, more than 90% of students felt that the MyDispense activity in PHR2142 simulated real-life complexities such as prioritisation of tasks, conflict resolution and necessity of patient-centred care to better simulate an authentic experience.

Table 2. Students' Perception of the usefulness of MyDispense in Therapeutic units.

Item	Class response (N=38) n (%)				
	Strongly disagree	**Dgree**	**Neutral**	**Aisagree**	**Strongly agree**
In PHR2042, using MyDispense helped me better understand and practise the steps involved in history taking.	0 (0.0)	0 (0.0)	0 (0.0)	2 (5.3)	36 (94.7)
In PHR2142 (Workshop 5C: Complex patient), using MyDispense helped me better understand and practice collaborative decision making and prioritisation.	0 (0.0)	0 (0.0)	5 (13.2)	28 (73.6)	5 (13.2)
MyDispense is a stimulating learning environment.	0 (0.0)	0 (0.0)	0 (0.0)	9 (23.7)	29 (76.3)
MyDispense helped me learn from mistakes I made	0 (0.0)	0 (0.0)	0 (0.0)	5 (13.2)	33 (86.8)
The MyDispense workshop and assessment activities were consistent with the learning.	0 (0.0)	0 (0.0)	5 (13.2)	25 (65.8)	8 (21.0)
The MyDispense workshop activities in PHR2042 (Workshop 2C: Contraception management & Workshop 3B: Injectables) sufficiently prepared me for the critical thinking skills required for the complex scenario MyDispense activity in PHR2142 (Workshop 5C: Complex patient).	0 (0.0)	0 (0.0)	0 (0.0)	13 (34.2)	25 (65.8)
The MyDispense workshop activities in PHR2042 (Workshop 2C: Contraception management & Workshop 3B: Injectables) sufficiently prepared me to apply my knowledge of management of a complex range of ailments in the complex scenario MyDispense activity in PHR2142 (Workshop 5C: Complex patient).	0 (0.0)	0 (0.0)	2 (5.3)	18 (47.4)	18 (47.4)

The MyDispense workshop activity in PHR2142 (Workshop 5C: Complex patient) simulated real-life complexities such as prioritisation of tasks, conflict resolution and necessity of patient centred care to better simulate an authentic experience.	0 (0.0)	0 (0.0)	0 (0.0)	3 (7.9)	35 (92.1)

5. Discussion

In this preliminary study, we utilised a case-based virtual simulation tool, MyDispense to seek students' perception of the online tool and to ascertain the benefits of using MyDispense to teach pharmacy curriculum in 2nd year 'Comprehensive Care' therapeutic units. Problem solving and critical thinking are an essential part of the Comprehensive Care stream, whereby one of the core learning outcomes of the unit is to evaluate a patient's condition and provide patient-specific care after clinical review. MyDispense offers active experiential learning to enhance the attainment of higher order learning outcomes and supports students to become fluent in the Five Rs of dispensing: Right drug, Right route, Right time, Right dose, Right patient in a safe, low stakes environment, thereby supporting students' successful transition from university to the clinical setting (Grissinger, 2010).

During the MyDispense simulation activities, students observe virtual representations of patients, prescriptions, medicines on shelves, dispensary and ancillary labels and note-taking tools. There are also web links to legally required pharmacy references. By allowing ongoing access to the virtual simulated pharmacy scenarios, students are able to practice processes they must undertake when providing patient care, reflecting on how to improve their interaction and errors which may have occurred (McDowell *et al.*, 2016). Accordingly, all students surveyed perceived that the MyDispense program created an environment that was comparable to a pharmacy setting.

The use of a simulated environment changes the teaching method from direct instruction, or didactic teaching, to that of 'productive failure', and, as a result of feedback, are able to learn from their mistakes in a safe environment (Kapur, 2008; Moreno, 2004). Feedback to students is immediate, thus students have a real-time opportunity to reflect on the case and learn from their mistakes and errors of judgment. Students deemed one of the most useful features of MyDispense was the ability to provide immediate feedback and to be accessed at any time and place for practice purposes.

The MyDispense simulation allows a full spectrum of challenges to be presented, from simple to highly complex. These can be one-dimensional focusing on a single technical element or can be blended to help students practise technical procedures, cognitive skills and personal

skills in conjunction with each other. By adding complexity in line with the knowledge students are gaining in their broader pharmacy education, lies the opportunity of scaffolding the skills of the student from novice level to mastery. In this preliminary study, the MyDispense cases in the 'Endocrinology and Renal' therapeutic unit (PHR2042) were comparatively simpler than the complex case in the 'Cardiovascular' (PHR2142) unit where students were challenged with a complex problem, involving patients with multiple comorbidities, and a range of distractors. The majority (>70%) of students reported that using MyDispense in PHR2142 supported their understanding of collaborative decision making and prioritisation of tasks. A significant number of students (>60%) strongly agreed that the MyDispense activities in PHR2042 sufficiently prepared them for the critical thinking skills required to decipher the complex scenario in PHR2142.

6. Future directions

Virtual simulation is useful to promote student learning and the MyDispense tool allowed curriculum to be shifted to online learning during the global pandemic. The combination of virtual and real-world practical training will better prepare students for pharmacy placements at various points during their degree and for their internship. The outcomes of this preliminary study will inform curriculum development in the effectiveness of utilising virtual simulated pharmacy scenarios in therapeutic units. This may also identify new approaches which can be applied to other units such as professional pharmacy practice units, as it also has the capacity to be a virtual practice platform for the Objective Structured Clinical Examinations (OSCEs), incorporating professional practice with legal and ethical scenarios.

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