BRIEF

Use of the Virtual Simulation Tool ‘MyDispense’ By Pharmacy Programs in the United States

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Objective. Pharmacy programs are increasingly using virtual simulation to provide a safe and realistic environment for students to practice critical patient care skills. The aim of this study was to describe the use of MyDispense, a virtual simulation tool, by pharmacy programs across the United States.

Methods. Researchers developed a 16-item survey focused on program characteristics and MyDispense integration in pharmacy curricula. It was sent to MyDispense administrators of pharmacy programs in the United States. Descriptive statistics were used to analyze the results.

Results. Administrators from 36 pharmacy programs responded to the survey (72%). MyDispense was most commonly integrated into one or two courses for first- or second-year students. The most common skills that students practiced were medication dispensing, communication with patients, and drug information skills. Validation exercises were most commonly followed by dispensing and over-the-counter exercises. The number of pharmacy schools using MyDispense suggests the potential for collaboration among instructors to increase efficiencies in the delivery of course materials as well as evaluate student learning.

Conclusion. Instructors most used MyDispense in courses for first- and second-year students to teach medication dispensing, communication with patients, use of drug information resources, application of pharmacy laws, and how to make recommendations about over-the-counter medications.

Keywords: simulation, pharmacy education, MyDispense

INTRODUCTION

Simulations play an essential role in educating health care professionals and allow learners to engage in a realistic situation or environment in order to safely develop knowledge and skills. Simulated learning environments can be used with many students, enhance knowledge transfer to practical situations, and impact patient safety. Studies have demonstrated an increasing trend of simulation-based programs or virtual learning simulations used in various educational and training contexts to supplement traditional educational methods. Virtual simulation, in which students engage with a computer display simulating the physical world, provides an opportunity to increase knowledge, develop relevant skills, and increase learning motivation.

In pharmacy education, simulations have been used in various areas such as pharmacotherapeutics, communication, manufacturing, law and ethics, and patient care and safety. Doctor of Pharmacy (PharmD) programs are increasingly using simulation, as it has been shown to positively impact problem-solving in patient care topics, improve learner performance and satisfaction, and may advance pharmacy students’ education and training with the ultimate goal of enhancing patient care and safety.

MyDispense, a free web-based community pharmacy simulation program developed by Monash University, is designed as an authentic and safe learning and teaching environment to help student pharmacists develop their outpatient pharmacy skills and competency in dispensing medicinal products systematically, safely, and accurately without the danger of negative health outcomes. The program allows students the opportunity to engage with the entire process of dispensing while providing interactive explanations, self-assessment, and performance feedback. It has been used in both didactic and experiential curricula to teach topics such as medication dispensing, pharmacy skills, pharmacy law, and pharmacotherapeutics. McDowell and colleagues found that student pharmacists who used...
MyDispense in their dispensing tutorials reported positive perceptions of the tool to learn dispensing skills.\textsuperscript{3} Student pharmacists who completed MyDispense exercises in pharmacy law courses valued the innovative program and reported that the program helped them to recall pharmacy laws and focus on topics that were challenging.\textsuperscript{9,16} Mospan and Gillette also presented that there was a positive relationship between completion of MyDispense exercises and student pharmacists’ performance on a pharmacy law examination.\textsuperscript{9} Shin and colleagues reported that examination scores were positively impacted when MyDispense was integrated into a therapeutics course.\textsuperscript{8}

With MyDispense, Instructors are able to develop customized dispensing, over-the-counter, and validation exercises that align with the complexity of the course or experience in which the content is integrated.\textsuperscript{17} Dispensing exercises focus on determining whether a prescription is appropriate to dispense, and if so, to prepare the medication and provide patient counseling. Over-the-counter exercises focus on the provision of advice related to non-prescription medications. When completing validation exercises, the student checks the prescription, medication label, and medication bottle for accuracy, legality, and medicine safety.\textsuperscript{12} The program is hierarchically organized in order to manage access to exercises and assessments. A unit can contain many tutorials and assessments, a tutorial can contain many exercises, and assessments contain graded exercises.\textsuperscript{18} Several research teams have reported that student pharmacists who used MyDispense during their courses showed positive performance and achievement of learning outcomes.\textsuperscript{9,15,19} Additionally, student pharmacists have reported positive perceptions about learning via this tool.\textsuperscript{9,20,21}

After the original version of MyDispense was introduced by Monash University in Australia in 2010, it was expanded into different countries such as Namibia, South Africa, the United States, Malaysia, Singapore, the United Arab Emirates, and the United Kingdom.\textsuperscript{12} In 2014, the first regional version of MyDispense, the United States version, was released with support from Monash, and five pharmacy programs in the United States adopted this software.\textsuperscript{22} Its use has expanded, as evidenced by more than 186 schools and colleges of pharmacy across 34 countries currently using the program.\textsuperscript{23} As of June 2020, the program has had the highest adoption in the United States.\textsuperscript{24}

Because many more schools of pharmacy in the United States use MyDispense than in other countries, the program has been implemented in the United States in a wider range of courses, including introductory and advanced pharmacy practice experiences (IPPEs and APPEs).\textsuperscript{5,9,16,19,21,25} So far, most studies of MyDispense have focused on students’ attitudes, perceptions, and learning outcomes. No studies have been conducted among administrators to explore how MyDispense has been integrated into various courses of pharmacy programs in the United States. The objective of our study was to describe the use of MyDispense in pharmacy programs across the United States. This information, such as courses, skills, types of exercises, and assessment features, may be useful for institutions considering adopting or expanding activities using MyDispense in their curricula.

METHODS

We developed a 16-item self-administered electronic survey (Appendix 1) using Qualtrics software (Qualtrics International Inc). The first section (nine questions) included institutional demographic information, such as name of institution, year of MyDispense adoption, and number of courses that used the tool during the academic year 2019-2020. The second section (seven questions) asked about the use of MyDispense for each specific course at each institution. Pilot testing of the survey was conducted among two administrators to ensure clarity of questions. This study was deemed exempt by the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board.

We then obtained a list of instructors in the United States with MyDispense administrator accounts (n=72 administrators from 67 institutions). The administrators were typically key users of the MyDispense program at their institutions, and they would be able to contact their colleagues to gather additional information about using MyDispense in their courses. All administrators were initially emailed to confirm whether they were the correct person to respond to the survey. If an institution had more than one contact, clarification was obtained about which person should receive the survey. In addition, we provided a summary of the study questions and asked administrators to gather information from their colleagues who use MyDispense, if needed. A final contact list composed of 66 administrators (one for each institution) was created. Of these, 16 contacts were not affiliated with PharmD programs, and, therefore, those institutions were excluded. Thus, 50 pharmacy programs out of the total number of accredited colleges and schools of pharmacy in the United States (n=50/141, 35%) were eligible to participate.\textsuperscript{26} Data collection occurred from July 1 to August 31, 2020. During this time, four automatic reminders were sent to administrators who had not responded in order to encourage them to participate. The data were downloaded using Microsoft Excel 2016. Descriptive statistics were used to analyze the results. All responses were included in our results.
RESULTS
A total of 36 responses (72%) from schools or colleges of pharmacy across five regions, namely the Midwest, Southeast, Northeast, West, and Southwest, were obtained (Table 1). Most were public institutions (n = 22, 61%), and over one-third had implemented MyDispense in 2019 or 2020 (n = 13, 36%). Institutional characteristics were different between respondent and nonrespondent institutions; for example, a majority of respondent institutions were public (n = 22, 61%) and located in the Midwest (n = 13, 36%), whereas a majority of nonrespondent institutions were private (n = 8, 57%) and located in the Northeast (n = 5, 36%) (Table 1). MyDispense was most commonly integrated into one course (n = 12, 46%) or two courses (n = 7, 27%). About 50% of the respondents (n = 13/24) reported that the use of MyDispense began or increased due to teaching during the COVID-19 pandemic.

MyDispense was used in 46 courses during the 2019-2020 academic year. Most courses (n = 41, 89%) were required courses and were delivered only to one professional year of student pharmacists (n = 43, 93%). The remaining courses (n = 3) were delivered to two cohorts of student pharmacists simultaneously (eg, first-year and third-year students), resulting in 49 course offerings (the courses delivered to two cohorts had different learning objectives for each cohort). About half of the courses (n = 25/49, 51%) were delivered to first-year student pharmacists, followed by second-year (n = 10/49, 20%), third-year (n = 10/49, 20%), and fourth-year student pharmacists (n = 4/49, 8%), respectively. The most common skills that student pharmacists practiced were medication dispensing, communication with patients, and drug information skills (Table 2). Dispensing exercises were used in the most courses (n = 40), followed by validation (n = 29) and over-the-counter (n = 29) exercises. When validation exercises were included, there were more of these exercises (n = 19) than the dispensing (n = 16) or over-the-counter (n = 9) exercises (Table 3). A total of 17 courses (37%) used the assessment feature to grade MyDispense activities. Most courses (n = 35/46, 76%) intended to use MyDispense during the upcoming academic year, while nine (20%) were unsure, and two (4%) intended to discontinue use. Approximately 90% of the respondents (n = 32/36) were willing to share their information with instructors who use MyDispense in the United States and with the MyDispense team at Monash University.

| Region          | Responded to survey, No. (%) | Did not respond to survey, No. (%) |
|-----------------|------------------------------|-----------------------------------|
| Midwest         | 13 (36)                      | 2 (14)                            |
| Northeast       | 7 (19)                       | 5 (36)                            |
| Southeast       | 10 (28)                      | 1 (7)                             |
| Southwest       | 2 (6)                        | 3 (21)                            |
| West            | 4 (11)                       | 3 (21)                            |

| Type of institution | Responded to survey, No. (%) | Did not respond to survey, No. (%) |
|---------------------|------------------------------|-----------------------------------|
| Private             | 14 (39)                      | 8 (57)                            |
| Public              | 22 (61)                      | 6 (43)                            |

| Accreditation status | Responded to survey, No. (%) | Did not respond to survey, No. (%) |
|----------------------|------------------------------|-----------------------------------|
| Accredited           | 35 (97)                      | 14 (100)                          |

| Year MyDispense was implemented | Responded to survey, No. (%) | Did not respond to survey, No. (%) |
|---------------------------------|------------------------------|-----------------------------------|
| 2014                            | 2 (5.6)                      | -                                 |
| 2015                            | 3 (8.3)                      | -                                 |
| 2016                            | 5 (13.9)                     | -                                 |
| 2017                            | 1 (2.8)                      | -                                 |
| 2018                            | 2 (5.6)                      | -                                 |
| 2019                            | 6 (16.7)                     | -                                 |
| 2020                            | 7 (19.4)                     | -                                 |
| Not implemented                | 9 (25)                       | -                                 |
| Information not provided       | 1 (2.8)                      | 14 (100)                          |

DISCUSSION
This study provides evidence to support the idea that virtual simulation, specifically via MyDispense, is increasingly being used among pharmacy programs in the United States. It is most frequently used in the first half of the curricula to provide student pharmacists practice with medication dispensing, communication with patients, using drug information resources, applying pharmacy laws, and making recommendations about over-the-counter medications. This is similar to the use of MyDispense in Australia and the United Kingdom, where the program has been implemented in medication dispensing for first- and second-year student pharmacists.3,14,27 On the other hand, MyDispense has been used in Malaysia and Saudi Arabia by more advanced (eg, fourth- and fifth-year) student pharmacists in their experiential practices/clerkships.28,29

The use of MyDispense continued to grow during the COVID-19 pandemic, suggesting that attributes such as being free, web-based, customizable, and available to students at any time are facilitators for use.21,28-30 The number of pharmacy schools that have adopted the MyDispense program has been continuously increasing since 2014.31 As of August 2020, more than one-third (n = 50/141, 35%) of
Pharmacy schools across the United States have gained administrative access to the program. This positive trend of program adoption provides opportunities for collaboration, such as by creating common cases that can be used in similar courses in order to decrease faculty workload. As a result, instructors would have more time to focus on cases that are more complex/advanced or to manage other crucial work. This may also decrease barriers to entry for new faculty interested in adopting this approach in their teaching.

In South Africa, pharmacy schools expressed interested in using MyDispense, leading to the South African MyDispense Forum being launched in May 2021. Our study provides insights into potential areas of focus for multi-institutional and multicountry studies to evaluate effectiveness of student pharmacist learning. In particular, first- and second-year courses that target topics such as medication dispensing, drug information resources, and pharmacy law may align with existing use of the program while providing opportunities to shift from studying for short-term educational gains in one course to longer-term educational gains.

Instructors of schools of pharmacy in the United States and abroad can use this information to determine how and when MyDispense is a good supplementary learning resource.

The primary limitation of this study that not all PharmD programs in the United States provided data. One administrator from each program was asked to provide information, which may have resulted in estimated as opposed to actual numeric values reported. Institutions that did not respond or did not have contact information included on the initial list were not included. It is possible that institutions modified their approach to using MyDispense during the 2020-2021 academic year, particularly in light of the COVID-19 pandemic. Finally, data was not gathered about instructor attitudes or beliefs, which may serve as facilitators or barriers to using this program, as we

Table 2. Courses at US Pharmacy Schools in Which Specific Skills in Using MyDispense Are Taught

| Skills students practiced using MyDispense | Number of courses, No. (%) |
|-------------------------------------------|---------------------------|
| Medication dispensing                      | 21 (84) 6 (60) 8 (80) 4 (100) 39 (79.6) |
| Communication with patients               | 20 (80) 4 (40) 6 (60) 4 (100) 34 (69.4) |
| Drug information skills                    | 16 (64) 5 (50) 8 (80) 3 (75) 32 (65.3) |
| Pharmacy law                              | 12 (48) 7 (70) 6 (60) 4 (100) 29 (59.2) |
| Over-the-counter recommendation            | 13 (52) 7 (70) 6 (60) 2 (50) 28 (57.1) |
| Communication with health care professionals| 11 (44) 3 (30) 5 (50) 3 (75) 22 (44.9) |
| Therapeutic decision-making               | 7 (28) 5 (50) 6 (60) 1 (25) 19 (38.8) |
| Dosage forms                              | 8 (32) 2 (20) 3 (30) 3 (75) 16 (32.7) |
| Calculations related to patient assessment | 5 (20) 3 (30) 5 (50) 2 (50) 15 (30.6) |
| Ethical decision-making                    | 3 (12) 2 (20) 3 (30) 1 (25) 9 (18.4) |
| Interpreting laboratory values and diagnostic tests | 0 (0) 2 (20) 3 (30) 1 (25) 6 (12.2) |
| Dietary supplements                        | 4 (16) 0 (0) 0 (0) 1 (25) 5 (10.2) |
| Nonsterile compounding                     | 2 (8) 0 (0) 0 (0) 0 (0) 2 (4.1) |
| Other (MyDispense version 6 features)      | 0 (0) 0 (0) 1 (10) 0 (0) 1 (2) |

**Abbreviations:** P1 = first-year pharmacy student; P2 = second-year pharmacy student; P3 = third-year pharmacy student; P4 = fourth-year pharmacy student

*Courses that enrolled students in multiple years were classified as separate courses.

Table 3. MyDispense Exercises Used in Courses Taught at US Pharmacy Schools

| Type of exercise (No. of courses using exercise type) | Average number of exercises, mean (range) |
|------------------------------------------------------|------------------------------------------|
|                                                      | Required       | Optional       | Total   |
| Dispensing/prescription (40)                          | 10 (2-31)      | 6 (1-21)       | 16      |
| Validation/checking station (29)                      | 11 (1-61)      | 8 (1-24)       | 19      |
| Over-the-counter recommendation (29)                 | 7 (1-30)       | 2 (1-4)        | 9       |

*Among each course that uses this type of exercise
sought to collect use data from one key administrator per institution as opposed to from each individual instructor who used the tool. Future directions include identifying opportunities for sharing exercises and assessment strategies as well as engaging in research to study pharmacist learning.

CONCLUSION

Pharmacy programs in the United States are increasingly using MyDispense for students to practice critical patient care skills including medication dispensing, communication with patients, and drug information skills. Instructors in the United States most commonly used MyDispense in courses for first- and second-year student pharmacists to teach medication dispensing, communication with patients, using drug information resources, applying pharmacy laws, and making recommendations about over-the-counter medications.

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Appendix 1. MyDispense Key Administrator Survey

**We would like to know how MyDispense is used at your institution.**

What year was MyDispense initially used at your institution?

2013 – 2020 [drop down]

I do not know

I have not implemented MyDispense into my course, but I’m interested in it.

How many courses at your institution used MyDispense during the academic year 2019-2020? (If you have more than 9 courses, please select the top 9 courses where MyDispense is used.)

0 – 9 [drop down]

These following questions are for each individual course in MyDispense has been used during the 2019-2020 academic year.

What is the course name?

What year students participate in this course? Select all that apply. [P1, P2, P3, P4]

Is this course required or an elective? [Required, Elective]

What topic or skills do students practice using MyDispense in this course? Select all that apply.

Calculations related to patient assessment

Communication with healthcare professionals

Communication with patients

Dietary supplements

Dosage forms

Drug-information skills

Ethical decision making

Interpreting laboratory values and diagnostic tests

Medication dispensing

Non-sterile compounding

Over-the-counter (OTC)/Self-Care

Pharmacy law

Sterile compounding

Therapeutic decision making

Other, please provide___________________________

How many of each of the following types of exercises are in this course? Please fill out the total number of individual exercises. For example, if one validation exercise includes three prescriptions, count this as three. If there are no exercises of this type, type 0.

| Types of exercises             | Required | Optional |
|-------------------------------|----------|----------|
| Dispensing/ Prescription      |          |          |
| Validation/ Checking station  |          |          |
| Over-the-counter/ Self-care   |          |          |
Is the assessment feature in MyDispense used to grade activities or exams? Mark “yes” or “no” for each type of exercise. If there are no exercises of this type, mark “no.”

| Types of exercises                  | Assessment features |
|-------------------------------------|---------------------|
| Dispensing/ Prescription            | Yes                 |
| Validation/ Checking station        | Yes                 |
| Over-the-counter/ Self-care         | Yes                 |

Will MyDispense be used in this course next year? [Yes, No, Not sure]

*We would like to learn more about your institution.*

Where is your institute located? [drop down list of states]

Is your institution public or private? [Public, Private]

How did COVID-19 impact the use of MyDispense at your institution?

- Increased use of MyDispense
- No change in use of MyDispense
- Decreased use of MyDispense
- Started use MyDispense