RESEARCH BRIEF

A Pilot Study on an Interprofessional Course Involving Pharmacy and Dental Students in a Dental Clinic

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Objective. To assess the effect of a dental clinical rotation program involving pharmacy students and dental students.

Methods. An interprofessional education (IPE) course was offered as an elective to second-year pharmacy students and required for third-year dental students. The course included two in-class sessions, one online lecture, and five clinic sessions. Program evaluation analyses included a comparison of participating versus nonparticipating students on a knowledge survey of pharmacotherapy and IPE, and a descriptive analysis of IPE course evaluation results.

Results. Among pharmacy students, mean scores were significantly higher for participants than nonparticipants on the 31-item pharmacy knowledge component of the survey. On the eight-item IPE component of the survey, scores were significantly higher for participants than for nonparticipants, both among pharmacy students and among dental students. Awareness and attitudes about IPE were generally high among course participants.

Conclusion. An IPE course that integrates second-year pharmacy students with third-year dental students in the dental clinic to provide medication history, education, and identification of potential drug-related problems improved pharmacy students’ knowledge of pharmacotherapy related to or associated with dental conditions and improved pharmacy and dental students’ knowledge and attitudes about IPE.

Keywords: interprofessional education, interprofessional practice, pharmacy, dentistry, patient care

INTRODUCTION

Over the past several years, health profession education programs have increased their interest in interprofessional education (IPE).1 This interest is driven by a broader recognition of the importance of interprofessional collaboration to improve health care and patient safety, and the introduction of accreditation standards in various health professions calling for more IPE.2-4

One of these IPE initiatives is collaboration between dentistry and pharmacy. There are many areas, including prevention and treatment of infection and pain management, in which patient care can be enhanced through this interprofessional approach. With the percentage of adults using at least one prescription medication in the past 30 days being reported at 48.7% in 2012, it is of growing importance for dentists to have adequate pharmacotherapy knowledge.5 Furthermore, pharmacists should be able to offer counseling on nonprescription dental products, provide basic oral health advice, and triage patients who need urgent dental care.6

A recent survey of 63 U.S. dental schools found that 58.1% offered a formal university-led IPE experience to their students and more than 90% offered some form of IPE.7 This study also found that the three most common professions included in dental schools’ IPE experiences were pharmacy, nursing, and medicine. A survey in 2007 reported that more than 50% of pharmacy schools offer IPE, and a survey in 2011 reported that IPE was a stated curricular goal in 78% of pharmacy schools.8,9 With the addition of IPE as accreditation standard 11 to the Accreditation Council for Pharmacy Education in 2016, it is expected that IPE will continue to increase in pharmacy schools.4

While many pharmacy and dental medicine schools are offering IPE, the type of IPE can vary from institution to institution. A recent literature review of innovative IPE
approaches or models showed that the most commonly used methods of IPE in the health sciences included small group discussion, patient case analysis, and large group lecture.10 Among dental schools, the most common methods are large or small group classroom activities, simulations, and activities in community agencies.7

One innovative IPE program, targeted to dental and pharmacy students, was implemented at Midwestern University-Glendale in 2015. The program was developed in the context of a broader university IPE initiative, in which first-year students from multiple health professions participate in a lecture-based IPE course. The dental/pharmacy IPE was developed to build upon the lecture-based course as IPE is thought to be more effective when it is delivered longitudinal throughout a curriculum.11 The innovative aspects of this dental/pharmacy IPE experience include the dental clinic setting, the consultation between dental and pharmacy students, and the ability for this experience to be offered to a significant number of students.

This pilot study was conducted to assess this IPE opportunity, addressing the following research questions: whether an IPE experience improves students’ knowledge, awareness and attitudes about interprofessional health care, and whether pharmacy and dental students who complete the IPE experience gain more knowledge about pharmacotherapy in the dental patient, compared with nonparticipating students.

METHODS

The study was a prospective analysis of cohorts of dental and pharmacy students enrolled in the IPE experience from December 2015 through February 2016. The Midwestern University Institutional Review Board granted approval to conduct the study.

The Midwestern University College of Dental Medicine-Arizona is a four-year professional program enrolling approximately 140 students each year. The third and fourth professional years consist of 10% didactic courses and 90% clinical practice experience with patients at the college’s dental institute.

The Midwestern University College of Pharmacy-Glendale is an accelerated professional pharmacy program completed in three calendar years of four quarters each. Enrollment includes approximately 150 students each year, with didactic courses in the first and second professional years and advanced pharmacy practice rotations in various pharmacy practice settings in the third professional year. For its first offering, the IPE course was presented as a new elective to second-year pharmacy students, of whom 25 signed up and completed the experience. For the seven participating dental student suites, the experience was implemented as part of an existing required clinical course for third-year dental students.

The IPE experience, which included dental students from the included suites and elective pharmacy students, included two in-class lecture and workshop sessions, one online lecture, and five clinic sessions. The first classroom session was two hours and included a one-hour lecture introducing IPE, professional roles, and common interactions between pharmacists and dentists. The second hour introduced students to their team members, then discussed a simulated patient case. Between the first classroom session and the first clinic session, students had one week to review an online lecture and take a quiz that covered common dental issues that may be encountered by pharmacists, such as medication-induced xerostomia.

Clinic sessions took place at the Midwestern University-Arizona Dental Institute. The student dental clinic includes 10 dental suites with 14 student pairs and three dental faculty per suite. In each suite, dental students were assigned to one patient in a pair consisting of one third- and one fourth-year student. Seven out of the 10 dental suites were used for the IPE experience, with three or four pharmacy students and one pharmacist preceptor being assigned to each suite. Suite assignments were consistent from session to session. Each interprofessional team consisted of one second-year pharmacy student, one third-year dental student, one pharmacist preceptor, and one dental preceptor.

Clinic sessions were approximately two hours and occurred one day per week over five weeks. The dental students and the pharmacy students arrived at the dental clinic approximately 45 minutes prior to patient arrival. Pharmacy students were assigned to a patient who had been identified by a dental student or faculty member as having a challenging medical history. Pharmacy students briefly reviewed the patient’s medical history in the electronic medical record. Before the patient arrived, the dental student discussed with the pharmacy student the reasons for the upcoming dental visit.

Upon patient arrival, the pharmacy student briefly interviewed the patient (maximum interview time of 5 minutes), focusing on the patient’s medication history, current disease states, influenza vaccination history, and lifestyle factors, such as smoking or nutrition, that could affect the patient’s dental health. The dental student observed this interview, documented appropriate patient information in the electronic medical record, and performed a blood pressure check. After the interview, the pharmacy student left the patient and worked in another area in the dental suite to research any drug-related issues or
questions/concerns that the patient had. The pharmacy student performed a drug-drug interaction check via Lexicomp (Hudson, OH) or Micromedex (Greenwood Village, CO) for each patient and identified potential drug therapy problems. The pharmacy student briefly (maximum time of 3 minutes) presented the patient to the pharmacist preceptor, while the other pharmacy students in the suite observed. After each pharmacy student presented their unique patient, individual patient plans were developed with the help of the pharmacist preceptor. Brief medication recommendations were written for the patient, and the student pharmacist returned to the patient to provide these recommendations (maximum interview time of 2 minutes). Any drug therapy information that had been identified was relayed to the dental student to enhance the interprofessional learning environment of the course.

At the end of each clinic session, the pharmacy students wrote a reflection on what went well during the session, what did not go well, what surprised them, and what they learned about dental practice during that encounter. The pharmacist preceptors were encouraged to discuss these reflections with their pharmacy students each week. These reflection documents were submitted to the course coordinator and reviewed for completeness after the final clinic session.

The final classroom session was a workshop in which students discussed a simulated conflict resolution case that had been developed and taped by faculty members from both colleges. Each simulation represented a common miscommunication error seen between pharmacists and dentists, such as prescribing inappropriate doses. This case was shown to the class, and students were asked to discuss case-related questions in groups with a faculty facilitator. During this final classroom session, students were requested to document a peer review of a student from the other profession with whom they worked throughout the experience. Peer evaluations were used for formative purposes, and students received their peer evaluation results upon request.

The grading process differed for pharmacy and dental students. For the pharmacy students, the course grade included a brief quiz covering the online lecture material, class and clinic attendance, pharmacist preceptor midpoint and final evaluation, peer evaluation skills, and a comprehensive final exam. Dental students who were in one of the seven participating suites were asked to complete the brief quiz covering the online lecture material, attend all classroom sessions, and work with a pharmacy student at least once during the quarter. Dental students received a grade as part of the existing course in which this experience was implemented.

Two instruments were used to measure the effect of the IPE program. First, all students from the second-year pharmacy class and third-year dental class, regardless of IPE participation, were asked to complete a voluntary 39-question multiple-choice knowledge survey several weeks after the course had ended. This survey covered the same concepts as the comprehensive final examination taken by IPE-participating pharmacy students. Thirty-one questions covered five main topics that were categorized as knowledge and eight questions were categorized as IPE (Table 1). This survey was anonymous, but students indicated on their survey whether they had participated in the IPE experience so that results of participating and nonparticipating students could be compared.

Second, to measure awareness and attitudes about IPE, an anonymous, voluntary IPE course evaluation was given during the final classroom session to participating pharmacy and dental students. The IPE course evaluation was adapted from an instrument developed by the Center for Health Sciences Interprofessional Education, Research, and Practice at the University of Washington. It included 18 Likert-type questions on four domains of IPE: benefits of training, team structure, mutual support, and communication, measured on a scale of 1 to 5 where 1 = strongly disagree and 5 = strongly agree.

For analyses of knowledge, bivariate comparisons of participants vs nonparticipants were made, stratified by program (dental and pharmacy). Independent-sample 2-tailed t-tests were used for interval-scale items, presented as means and standard deviations. Additionally, the percentages of students with a passing grade, defined as at least 70% correct, were calculated for participants vs nonparticipants and tested for statistical significance using t-tailed Fisher’s exact tests. A p-value of <.05 was used to determine statistical significance. The analyses of awareness/attitudes toward IPE were univariate and descriptive. All analyses were performed using IBM SPSS Statistics, version 19 (Armonk, NY).

RESULTS

For the 39-question knowledge and IPE survey, the response rate was 80% (112 of 140) for dental students and 76% (117 of 154) for pharmacy students. Among pharmacy students, mean scores were significantly higher for participants than nonparticipants on the 31-item knowledge component of the survey [73.6% (15) vs 45.7% (12.2), respectively; p < .001]. On the eight-item IPE component of the survey, scores were significantly higher for participants than for nonparticipants, both among pharmacy students [67.9% (18.4) vs 45.7%
(18.2); $p < .001$] and among dental students [49.4% (14.2) vs 41.4% (14.5); $p = .005$]. Participating pharmacy students had significantly higher passing rate, as defined by a score of greater than 70%, when compared to nonparticipating pharmacy students on the knowledge and IPE components of the survey (pass rates: 61% vs 2%; $p < .001$ and 52% vs 10%; $p < .001$, respectively). Significantly higher pass rates for participating dental students as compared to nonparticipating dental students were also seen on the IPE component of the survey (pass rates: 60% vs 2%; $p < .001$ and 52% vs 10%; $p < .001$, respectively). When the survey was separated into topics, all topics remained significant for pharmacy students and IPE remained significant for dental students

Table 1. Student Knowledge Survey Scores by Topic, Participants and Nonparticipants

| Knowledge survey topic (number of questions) | Pharmacy Students | Dental Students |
|---------------------------------------------|-------------------|-----------------|
|                                             | Participant Mean % (SD) | Nonparticipant Mean % (SD) | $p$ valuea |
| Basic dental care (6)                       | 71.7 (8.1)         | 30.7 (13.8)     | <.001b |
| Antibiotic use in dental practice (6)       | 74.6 (18.0)        | 47.7 (15.6)     | <.001b |
| Pain management (8)                         | 79.9 (12.9)        | 64.9 (17.5)     | <.001b |
| Self-treatment of dental problems (5)       | 78.3 (22.5)        | 36.6 (15.9)     | <.001b |
| Medication-associated dental side effects (6) | 62.3 (20.8)      | 40.6 (19.5)     | <.001b |
| Interprofessional Education (8)            | 67.9 (18.4)        | 45.7 (18.2)     | <.001b |

Abbreviations: SD = standard deviation

$^a$Between-group differences were tested for statistical significance using independent-sample two-tailed $t$-test

$^b$Statistically significant with a $p < .05$

DISCUSSION

This novel pilot project investigated the IPE experience between pharmacy and dental students in a dental clinic setting. While there are several studies in the literature of IPE experiences including dental and pharmacy students such as ethical cases in a team-based format, interprofessional standardized patient activity, using online modules for teaching and physical assessment skills, dental student observation in community pharmacies, pharmacy and dental students working among other health professional students in a clinic environment, and a pharmacist providing patient care in a dental clinic, to the authors’ knowledge, no studies have investigated this type of collaboration in a dental clinic.13-21

Some strengths of this study include the high response rate, a research design that included knowledge assessments and comparison groups consisting of nonparticipating pharmacy and dental students. Most currently available research assessing IPE was developed with a pre/post-study design and assessed only attitudinal change.11,13,15-20 Furthermore, this IPE experience has capacity for a large number of pharmacy and dental students, while most IPE involving direct patient care is limited in this regard.13-20

There are several possible reasons why pharmacotherapy knowledge scores were higher among participating versus nonparticipating pharmacy students but not among dental students. Some possible explanations include the following: the anonymous survey was designed to have students self-report if they worked with a student from the other profession throughout the quarter, and some dental students who were assigned to a participating suite never had an opportunity to work with a pharmacy student, therefore they were classified as a nonparticipant even though they participated in the other aspects of the course; the knowledge survey was similar to the comprehensive final exam the pharmacy students received for a grade, which may have caused them to study the material beyond the discussion time in the clinic; the pharmacy students were moved to a different setting, causing them to be more engaged in the activity. This last reason has
been shown in other research, in which nursing students who were placed in a dental clinic setting had improved in readiness for interprofessional learning compared with dental students.\textsuperscript{22} Lastly, while dental pharmacotherapy is not a course in the pharmacy curriculum, some key dental pharmacotherapy was likely taught as it overlapped with other curricular topics, as seen in the higher overall scores of pharmacy students than dental students.

Other research has shown that IPE should educate professionals about their future roles and scope of practice of other health care professions, as well as teamwork.\textsuperscript{23} Assessment of this course showed significantly higher scores on the IPE knowledge survey for participants among both dental and pharmacy students. These results suggest that the course improved IPE knowledge, skills, and attitudes for both professions, but was not as effective at improving dental students’ pharmacotherapy knowledge. The fact that all of these students were enrolled in the university-wide IPE course in their first year of education could have also influenced these results. This area warrants further research so that educational interventions can be developed in which all students gain similar knowledge and experiences.

This study could be subject to selection bias, as the course was an elective for pharmacy students and students who signed up could have been more interested in IPE or oral health; dental students in one of the assigned

### Table 2. IPE Awareness and Attitudes Among Pharmacy and Dental Students Following an IPE Experience

| Statement About Interprofessional Practice | Percentage Agreement$^b$ |
|-------------------------------------------|--------------------------|
| **Benefits of Training**                  |                          |
| Learning with other students helps me become a more effective member of the health care team. | 92.6$^b$ |
| Patients ultimately benefit if interprofessional health care students learn together to solve patient problems together. | 96.3$^b$ |
| Shared learning with other health care students increases my ability to understand clinical problems. | 92.6$^b$ |
| Interprofessional health care team training exercises help me appreciate other professionals. | 96.3$^b$ |
| **Team Structure**                        |                          |
| It is important to ask patients and their families for feedback regarding patient care. | 98.8$^b$ |
| Patients are a critical component of the care team. | 100$^b$ |
| A team’s mission is of greater value than the goals of individual team members. | 98.8$^b$ |
| High-performing teams in health care share common characteristics with high-performing teams in other industries. | 98.8$^b$ |
| **Mutual Support**                        |                          |
| To be effective, team members should understand the work of their fellow team members. | 100$^b$ |
| Asking for assistance from a team member is a sign that an individual does not know how to do his/her job effectively. | 60.5$^c$ |
| Providing assistance to team members is a sign that an individual does not have enough work to do. | 56.8$^c$ |
| Offering to help a fellow team member with his/her individual work tasks is an effective tool for improving team performance. | 97.5$^b$ |
| It is appropriate to continue to assert a patient safety concern until you are certain that it has been heard. | 97.5$^b$ |
| Personal conflicts between team members do not affect patient safety. | 64.2$^c$ |
| **Communication**                         |                          |
| Teams that do not communicate effectively, significantly increase their risk of committing errors. | 98.8$^b$ |
| Poor communication is the most common cause of reported errors. | 87.7$^b$ |
| Adverse events may be reduced by maintaining an information exchange with patients and their families. | 100$^b$ |
| It is nearly impossible to train individuals how to be better communicators. | 69.1$^c$ |

Abbreviations: IPE = interprofessional education
N = 81 responses
$^a$Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree
$^b$Percentage agreement was defined as answering agree or strongly agree
$^c$Percentage agreement was defined as answering strongly disagree or disagree
suites were required to participate. Additional shortcomings of this study include the use of a knowledge survey that had not been previously validated, and limited opportunity for interaction of some teams. This cannot be quantified, as the study design did not allow for the researchers to determine how many IPE interactions each dental student participated in. Student learning throughout the course could have been variable, with inconsistency in interactions with patients and preceptors due to the nature of the clinic environment. Another potential limitation is the lack of distinction between pharmacy and dental students on the awareness and attitudes IPE survey, and some of the survey questions were negatively worded, which could have led to incorrect responses due to misreading the question. This is supported by the fact that the four negatively worded questions have the lowest percent agreement.

Future plans for this course include expansion to all pharmacy students, with the course becoming a required course for all second-year pharmacy students. Other ideas to enhance the interprofessional learning in the course include requiring dental students to complete the same reflection document the pharmacy students complete, having the dental student attend the pharmacy student’s patient presentation to the pharmacist preceptor, and expanding the course into multiple quarters to allow for more interactions. Patient satisfaction could be gathered to assess the course’s impact on patient care and tools could be implemented to measure the behavioral changes that occur among students.

CONCLUSION

An IPE course that integrates second-year pharmacy students with third-year dental students in the dental clinic to provide medication history, education, and identification of potential drug-related problems improved pharmacy students’ knowledge of pharmacotherapy in dental patients and improved pharmacy and dental students’ knowledge and attitudes about IPE.

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