

## **Impact of a Student-teach-student Model for IPE Between Pharmacists and Dermatologists on Student Knowledge and Attitudes**

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### **Abstract**

**Context:** *The effective delivery of patient care is a complex venture, often requiring efficient collaboration among varied healthcare professions. Not surprisingly, research continues to indicate collaboration between these diverse professionals can be challenging. Early exposure of health professions students to interprofessional education (IPE) offers a promising way to improve this collaboration and, in turn, improve patient care and service delivery.*

**Objectives:** *This study examines the impact of an innovative IPE cocurricular event on knowledge, understanding, and attitudes, regarding future healthcare delivery between medical and pharmacy students.*

**Methods:** *Students developed and conducted an IPE cocurricular event involving medical students of a dermatology-interest club, and pharmacy students of a compounding-interest club. Medical students introduced a patient case, delivered in a standardized-patient format. This was followed by a pharmacy student presentation representing compounding the prescriptions needed for the patient case and writing accurate prescriptions. Following both presentations, students from each program were paired. Each interprofessional pair then communicated and compounded two medications for the case, working*

*collaboratively. Pre- and post-questionnaires were designed with rating scales and open-ended questions for data collection.*

**Results:** *Both parametric and nonparametric tests revealed significant differences between the pretests and posttests. There was no significant difference in responding between the groups. Inspection of the open-ended questions revealed changes in attitudes regarding collaboration and learning.*

**Conclusions:** *This study found students of both professions reported significant improvements in their level of knowledge, understanding, and interest in interprofessional collaboration. The open-ended questions revealed both groups of students began the event with different expectations regarding cooperation and interprofessional activities but left the session with very similar perspectives. By including similar IPE activities in early healthcare education, medical students will gain an understanding of the knowledge, skills, and services that a compounding pharmacist can offer in personalized patient care, and pharmacy students will acquire clinical reasoning based on patient presentations. Both factors promote collaboration between professions and ultimately show promise in improving outcomes in patient care.*

**Keywords:** dermatology, pharmacy, compounding, interprofessional education

## **Introduction**

Modern healthcare is increasingly becoming a team endeavor, requiring collaboration, communication, and understanding of the roles and responsibilities between practitioners from different healthcare fields. This interprofessional approach to efficient and quality healthcare delivery faces particular challenges in underserved and rural populations.<sup>1</sup> In these communities, the shortage of all healthcare professionals creates gaps in compassionate care, which are widened when there are one or more missing members of the interprofessional healthcare team. These challenges make the rural and underserved health care system more susceptible to errors.<sup>2</sup> An efficient interprofessional team is now internationally recognized as a vital tool for effective, patient-centered healthcare delivery.<sup>3</sup> As a result, healthcare higher education models have embraced the perennial philosophies of interprofessional education (IPE) and interprofessional collaborative practice (ICP) as core to a cooperative model of teaching and learning. To address the need for quality interprofessional healthcare in rural and underserved areas, two leading health education programs located in rural Washington State have partnered to deliver interprofessional education to their students. The Pacific Northwest University of Health Sciences (PNWU-COM) educates and trains osteopathic physicians, emphasizing service among rural and medically underserved communities throughout the region. The Washington State University College of Pharmacy and Pharmaceutical Sciences (WSU-CPPS), Yakima Extension campus, gives student pharmacists interested in working with rural and underserved populations an ideal learning environment. Both programs recognize the need for the implementation of dynamic interprofessionalism as early as the preclinical years, in order to ensure the seeds of collaborative practice are sown and to promote this teamwork throughout the careers of these young professionals.

According to the National Center for Interprofessional Practice and Education, evidence supporting the teamwork and collaborative practice model and its ability to improve healthcare outcomes has existed for more than fifty years.<sup>4</sup> The push for collaborative care has recently experienced a resurgence in popularity due to increasing numbers of medical errors, as well as concerns about the diminishing quality of the healthcare system.<sup>5</sup> These issues are particularly pronounced in rural healthcare settings due to the restraints and limitations imposed on these systems. In an attempt to address these errors and enhance quality, several studies promote the importance of improving communication among healthcare professionals. In a review of eight years of patient outcomes, Lutfiyya et al. (2019), recommends interprofessional education as an essential component in the education of health professionals, particularly in the current complex and evolving healthcare environment.<sup>6</sup> This becomes especially true for rural physicians and pharmacists, who may not have any education-based opportunities to train side-by-side. Additionally, these professions often possess misconceptions about each other's patient care roles, both as practitioners and as part of a healthcare team. For example, Gordan et. al (2018) recommends developing strategies to improve collaborative relationships between physicians and pharmacists, as many physicians do not recognize the role of the pharmacist in clinical care beyond the physical act of filling prescriptions.<sup>7</sup> Fabro and colleagues (2019) found that in dermatological care, pharmacists report that physicians do not perceive them as equals, and feel their opinions are not valued by physicians.<sup>8</sup> Both of these studies conclude that these misunderstandings and lack of communication have led to siloing of the professions perpetuating the lack of trust and potential for error.

During pharmacy training, pharmacists rarely get to observe physicians' clinical thought processes and the events leading them to prescribe appropriate medications. This isolation becomes a barrier in patient care because these same pharmacists are then expected to catch any mistakes physicians may make without context of the visit or exposure to their clinical process. The introduction of more collaborative opportunities in an educational setting could enrich the knowledge and respect among these professions. This connection minimizes errors patients face by facilitating a more thorough and collaborative evaluation of the patient's condition, and helps them navigate the healthcare system.<sup>9</sup> Working together more closely enables both professions to not only better-recognize errors, but also to resolve them utilizing effective, complete and team-based communication.<sup>10</sup>

In this study, to promote interprofessional collaboration and education concurrently among both medical and pharmacy students, an interprofessional event was constructed based upon a profession-specific service within pharmacy: personalized, compounded medications. In the past, pharmaceutical compounding was standard in community care, with each medication being specifically created for an individual patient. As healthcare became more commercialized, this practice was mostly replaced with large-scale pharmaceutical manufacturing of medications and treatment guidelines involving fitting patients to a readily available "one-size-fits-most" medication and dosage form. There are many patients, however, for whom commercially manufactured medications may not be the best option. Community-based pharmaceutical compounding pharmacies can prepare personalized medication formulations based on individual patients' needs, thereby expanding the options of what dosage forms physicians can prescribe to best treat their patients.<sup>10</sup>

One area of medicine where personalized compounding is used prevalently is dermatology. Dermatologists treat numerous skin conditions each day. A diverse palate of active ingredients of differing strengths, various inactive ingredients, and dosage forms are often necessary to address differences in skin age, strength, and reactivity.<sup>12</sup> The lack of mainstream dermatological medications to treat a variety of dermatological conditions, along with the ability for pharmacists to compound specialized medications to treat these dermatological maladies, offers pharmacy and medical educators a unique interprofessional opportunity. Pharmaceutical compounding enables these two practitioner groups to take a hands-on approach to creating unique treatment options from patient diagnosis through patient treatment. With this in mind, an IPE event involving the Yakima WSU-CPPS Compounding Club and the PNWU-COM Dermatology Club was designed to introduce future prescribers to available compounding pharmacy services, and provide student pharmacists insight into the clinical reasoning process of diagnosis and treatment determination.

The purpose of this study was to examine the impact of an IPE compounding event on the attitudes of medical and pharmacy students concerning interprofessional relationships. It has been reported that dermatologists are often dissatisfied with their perceptions of pharmacists' expertise and cooperation in creating compounded medications.<sup>13</sup> This event was designed to foster a collaborative relationship between student pharmacists and student physicians, with the long-reaching goal of improving future patient care in rural and underserved areas. Finally, this event uniquely provided students of both disciplines the opportunity to design and lead the engagement and activities, enabling participants to learn with each other, from each other, and about each other.

## **Methods**

### ***Ethics***

This study was deemed exempt under the IRB due to use of minimal risk anonymous surveys with minimal risk associated. This study was self-funded by the individual clubs involved. Students participated on a volunteer basis and were not compensated. Students filled out pre and post surveys on a volunteer basis and consent was received by authors Cassidy Johnston and Huixian Pan.

### ***Subjects***

The Interprofessional Education (IPE) event was a collaborative event co-hosted by both the Osteopathic Medical Student (OMS 1-2) dermatology club and the Doctor of Pharmacy compounding club. 18 medical students and 21 pharmacy students participated in the event. Of the medical students, 5 identified as male and 13 identified as female, with 6 in their first year of the program (OMS1) and 12 in their second year (OMS2). Of the 21 pharmacy students, 11 identified as male and 10 identified as female. 8 students were in their first year, another 8 in their second year of the pharmacy program (PY1 or PY2), while 5 were in their third year (PY3). Some of these participants had to leave before the completion of the activity and failed to complete their posttests, and those protocols were removed from analysis, resulting in 17 osteopathic medical students and 18 pharmacy students included in the analysis.

### ***Materials***

The IPE event was advertised to students on both campuses and scheduled to take place in the evening to ensure adequate participation and to avoid conflict with academic obligations or other extracurricular events. The two-hour event took place in the pharmaceutical compounding lab located at the pharmacy school. This lab contains appropriate equipment necessary for compounding practice and storage of chemical ingredients, as well as monitor screens to project visual aids to student presentations. All equipment used during the event consisted of basic laboratory equipment used within the pharmaceutical compounding laboratory course.

### ***Procedure***

As part of the collaboration, the respective officers of the OMS Dermatology club and Pharmacy Compounding club met to determine a disease state commonly addressed by dermatologists in the field, treated using compounded medication. Participating medical and pharmacy faculty then evaluated the student-developed topics for appropriateness and feasibility. The mutually agreed-upon disease state for this event was erythema solare (moderate sunburn), and the subsequent medication treatments to be prescribed and compounded were a 0.5% Lidocaine topical spray and a protective SPF 15 lip balm. A pretest and posttest questionnaire were developed to assess the participants' knowledge about the procedures and attitudes toward interprofessional education.

The OMS student officers were responsible for developing a presentation from the student physician's perspective about the disease state, including current assessment techniques and the diagnosis process when working one-on-one with a patient. The students determined a patient simulation was the best format for presenting this information. One OMS member acted as a physician while another took on the role of the patient. A pre-developed script containing the chief complaint, the presenting symptoms and history, the review of systems, and the physical exam was performed for all medical and pharmacy students in attendance. This was to allow for the audience to clinically reason through the case to reach a diagnosis and treatment plan alongside the physician. As the OMS student progressed through the review of symptoms and assessment procedures, participants provided an explanation of each clinical evaluation tool or lab to ensure equal understanding by all students observing. Regardless of program or year of instruction, the explanation was provided in a simplified way to ensure all participants were able to follow and understand each intervention. The case involved a patient presenting with erythema solare following recent prolonged sun exposure during a boating trip. The "sunburn" was assessed and evaluated for treatment through interviewing during a simulated clinic visit. The OMS students used both body makeup and visual examples on a video screen behind them to simulate inflammation of the skin and variances in levels of damage. The "physician" then determined an appropriate medication to address symptoms related to the moderate burns and counseled the patient on future preventative measures.

Following the OMS physician/patient simulation, the pharmacy students then delivered a presentation on the pharmacy perspective and approach to the case, beginning with a how-to guide for writing a compounded prescription. This module addressed the necessary components of a prescription and other details which are left to the discretion of the compounder. An OMS and PY student were paired up to create a prescription for both predetermined treatment options. Once a prescription was created by each of the

participants, the pharmacy students continued their presentation by addressing interpretation of a compounded prescription, relevant calculations and ingredient selection, pertinent patient counseling, and the requirements and techniques involved in pharmaceutical compounding, with a focus on the techniques needed for the preparations each student would complete as the final step of the event. Each pair, working as a collaborative team, then compounded two formulations, a SPF 15 zinc oxide lip balm and a 0.5% Lidocaine topical spray based on compounding formulations prepared by the pharmacy students in advance specifically for the event. Students were able to take home their compounded medications as the active ingredients were either simulated using lactose or are available over-the-counter and non-restricted for personal use.

### **Design**

The study utilizes a mixed, repeated measure, pre-/post-questionnaire design, with the pseudo-independent variable being the activity and the dependent variable being student attitudes toward interprofessional compounding activities. Prior to and directly following the event, all students involved were asked to voluntarily complete a survey containing both knowledge-based and perception questions. All data were analyzed using SPSS for Windows.

### **Results**

To investigate the hypothesis this interprofessional event had an impact on the participants' attitudes (the dependent variable) toward an interprofessional practice and education event data were subjected to parametric and nonparametric analyses with the between subject variable being the program (medial student vs. pharmacy student) and the within subject variable being the pre- and post-questionnaire. Since this questionnaire consisted partly of Likert scale questions, the post-questionnaire responses were subjected to a Principal Components Analysis, which revealed all responses loaded onto a single component, which explained 62.04% of the variance. This allows for the combining of the Likert subscales into one variable (attitude) that can be analyzed with parametric statistics. This technique has been appropriately used in educational and health science research. For a review of this technique, please see Sullivan, G. & Artino (2013).<sup>14</sup> A similar argument for this technique can be found in Norman, G. (2010).<sup>15</sup> For verification of this technique, nonparametric tests were also conducted. As most readers are more familiar with t-tests and ANOVAs, we felt this was most appropriate. For the reader who is concerned about analyzing Likert scales with these tests (even though it is routinely done in social science), we back up our claims with the nonparametric analyses (Wilcoxon signed-rank tests).

No significant differences were found between the groups on any of the variables. Subsequently, the groups were combined to determine differences between the pre- and posttests. When looking at the combined subscales (each Likert scale combined into one measure), there were significant increases from the pretest to the posttests both parametrically and nonparametrically [ $t_{(34)} = 8.15, p < .001$ ; and Wilcoxon 4.83,  $p < .001$ ]. This effect allows for the analysis of the subscales. The means and standard deviations for the subscales are presented in the table below. Inspection of these means also showed significant increases in attitude

toward the elements of the event, for each subscale both via dependent t-tests and repeated measure Wilcoxon tests.

**Table 1. Descriptive and inferential statistics for subscales**

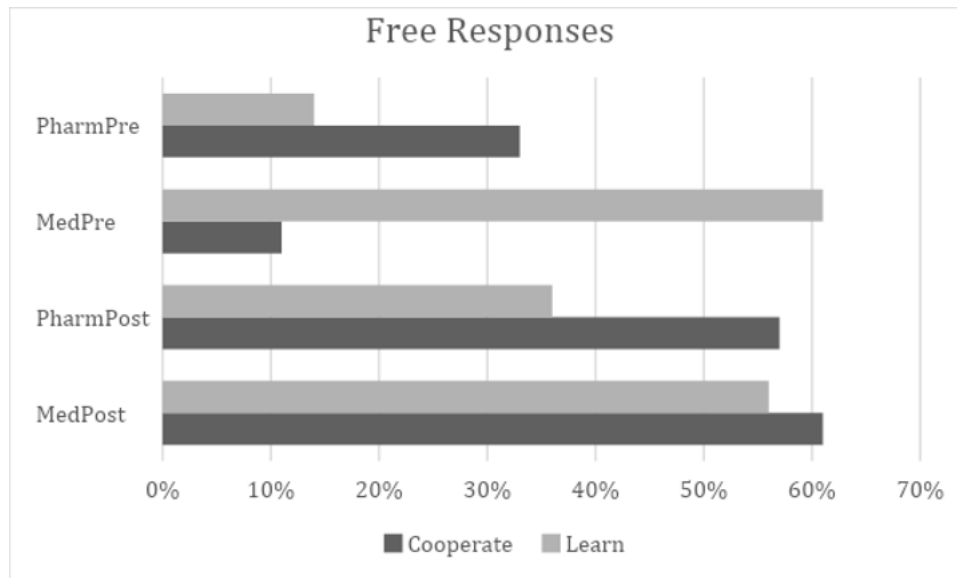
Subscale (attitude toward)	Pretest mean and (SD)	Posttest	t-test and (p)	Wilcoxon and (p)
Interprofessional collaboration	3.4 (.85)	4.3 (.73)	5.28 (.001)	3.98 (.001)
Interprofessional education	3.3 (.17)	4.4 (.12)	6.06 (.001)	4.28 (.001)
Knowledge of IPE	2.3 (.20)	4.1 (.17)	7.67 (.001)	4.62 (.001)
Interest in IPE	3.69 (.20)	4.8 (.08)	5.25 (.001)	4.01 (.001)

Table 1

Participants were asked if the event was helpful and useful for their education. The groups did not significantly differ in their responses to these questions (dependent t NS; Wilcoxon NS). Both groups found the event helpful (medical students 4.41; pharm students 4.72) and useful (medical students 4.06; pharm students 4.50)

Inspection of the open-ended questions revealed some qualitative differences in how the medical students and pharmacy students approached this event. Before the session (pretest) all participants were asked “What do you expect to get out of this session?” After the session, all participants were asked to “Describe what was particularly useful in today’s session.” For the medical students, 11 of the 18 (61%) open-ended responses on the pre-questionnaire used the word “learn.” The words “collaboration” and “interprofessional education” were used by only 2 of the 14 participants (11%) of the medical students. For the pharmacy students, “learn” was used by only two participants (14%) and words denoting cooperation (“collaboration, interprofessional education, and interaction”) were used by 6 of the participants (33%). For the post-questionnaire (“What was useful in today’s session), the medical students used words related to learning 10 out of 18 participants (56%), and words related to cooperation in 11 of the 18 responses (61%). The pharmacy students used words related to learning in the post-questionnaire 5 out of 14 responses (36%) and words related to cooperation in 8 out of 14 responses (57%). The chart below illustrates this change between expectations of the event and actual observations after the event.



**Graph 1: Free responses**

## Discussion

This single interprofessional event resulted in a shift in the attitudes of both pharmacy and medical student participants. Both groups self-reported gains in knowledge about interprofessional collaboration and education, gains in knowledge of compounding in dermatology, and interest in interprofessional compounding activities. Both groups of students found the event helpful and useful in their education. The open-ended questions revealed the two groups of students went into the activity with differing expectations regarding cooperation and interprofessional activities, but left the session with very similar perspectives and with increased regard for each other's professions. The medical students were focused on learning going into the session, but by the end were just as likely, if not more likely, to appreciate the interprofessional cooperation they experienced as the pharmacy students. Similar results have been found in the literature. For example, Dabaghzadeh et al. (2017) also found the attitudes of medical students changed positively after experiencing interprofessional education with pharmacy students.<sup>15</sup>

Positive change in attitude and appreciation for interprofessionalism promotes physician-pharmacist collaborations as students progress into their clinical fields in the rural communities served by their respective programs. Other studies, such as Matzke et al., have demonstrated the significant positive effects on patient outcomes due to these collaborative practices between pharmacists and physicians. With the limited opportunities for provider-patient interactions imposed by rural settings, the value of these positive outcomes becomes even more meaningful.<sup>16</sup>

Hallin (2011) suggests IPE experiences are a necessity to interdisciplinary collaboration and should become universally introduced into early healthcare education.<sup>17</sup> Our study confirms the effectiveness of such IPE events, providing further support for their integration into the curriculum of various healthcare fields. Despite the difference in the initial mindsets of the pharmacy students and medical students, this singular IPE event was able to successfully bring them together, suggesting similar IPE events could be used to address the recognized need for healthy interprofessional dynamism in order to foster communication, collaboration, and a common understanding between healthcare professionals.<sup>18</sup>



## Conclusions

This dermatological compounding IPE event is customizable and can be replicated with interchangeable cases to provide differing experiences involving multiple disciplines or specialties. This experience is unique in that it is primarily student-developed, student-led, and student-taught, which allows the students to gain confidence and leadership skills as they utilize and build upon knowledge already obtained early in their respective curricula to teach peers of a different discipline. There is significant overlap in the content taught within various healthcare programs, but each profession has specific roles in a cohesive healthcare team. The inclusion of IPE experiences in which the students provide education to one another allows the students to tangibly immerse themselves in that role, practice provider education, and collaboratively focus on delivering the highest level of patient care. Further, an IPE event involving compounding brings this care to a patient-specific level, as providers work together to develop treatments that will best suit the individual patient's needs and expand their overall treatment armamentarium.

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