Effectiveness of Conducting Interprofessional Education Virtually among Pharmacy and Medical Students

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***Abstract*—Interprofessional education (IPE) helps fostering collaboration between pharmacy (PH) and medical (MD) students. However, the effectiveness of conducting IPE virtually has not been tested. This study aimed to evaluate the effectiveness of virtual IPE activity among PH and MD students. A pre-post analytical cohort study was conducted among second-year PH and MD students. The students were divided into groups, which consisted of both MD and PH students. The students from the two disciplines had to work on a clinical case and present it creatively. All the sessions were conducted virtually. The students' team-based competencies were measured before and after the IPE activity using a self-administered Interprofessional Collaboration Competency Attainment (ICCA). Students' responses were analyzed using a paired t-test in SPSS, version 26. P-value less than 0.05 was considered to show significant changes in the students' competencies before and after attending the IPE activity. The mean competencies score of the students before the IPE was 97.8±25.2 and improved to 107.9±21.4 after the activity. A paired t-test showed a significant increase in competencies score, $p < 0.05$. More than half of the students (54.3%) had adequate team-based competencies after the virtual IPE activity. Online learning is not a barrier to cultivating collaboration and knowledge sharing between two disciplines, and virtual IPE was effective in fostering interprofessional experiential learning among students. As there is a lack of sustainable data and qualified faculties to fully address the implementation of IPE programs, this research can act as a guide to support the needs and identify the challenges around such implementation of IPE program in future academic curriculums.**

***Index Terms*—Interprofessional education, virtual, pharmacy, medical.**

I. Introduction

The World Health Organization defines interprofessional education (IPE) as two or more groups from different disciplines working together and learning from each other to ensure effective collaboration and improve the health outcomes of the community [1]. Advances in the medical field alone are not sufficient to improve patient well-being, but patient-centered care is equally important [2]. Professional healthcare providers such as doctors and pharmacists not only need to be competent but also collaborate with each other [3]. It was reported that around 70% to 80% of failures in health-related services are due to poor communication among healthcare providers [4]. This can be resolved through a multidisciplinary approach where various disciplines communicate and work together in a formal arrangement to provide optimized health services. Moreover, a multidisciplinary approach also investigates the use of knowledge between two professions in deciding the treatment plan as well as enhancing psychosocial care. Likewise, interprofessional teams can boost the quality of patient care, reduce hospital costs, shorten patients' length of stay, and reduce medical discrepancies [5]. Research has shown that team collaboration improved patient satisfaction in hospital [6].

Furthermore, the 'Framework for Action on Interprofessional Education & Collaborative Practice' released by WHO has stated that IPE and the ability to work effectively as well as collaboratively with other healthcare professionals can reduce the difficulties faced by healthcare organizations in different countries [1]. The end goal is to prepare a "collaborative, practice-ready" healthcare workforce that is competent in responding to healthcare needs [7]. Several studies have reported that it is crucial to develop an IPE curriculum in an academic healthcare program nowadays to allow undergraduate healthcare professional students to gain experience in working collaboratively with other professionals in the sector [8]-[11].

In addition, a study done by Guraya & Barr [12] suggested that IPE for undergraduates in the field of health sciences fosters students' understanding of the value and significance of other professions. The students get to recognize one another's contribution in a holistic approach when the IPE curriculum is implemented [13]. There are also findings showing that an IPE experience encourages students to collaborate and familiarize themselves with one another before entering the clinical workplace [14]. Next, Kangas *et al.* [15] found that IPE helped to improve healthcare professional students' self-perceived abilities and confidence when they were assigned to work as a team for patient care.

Although, IPE has attracted a lot of attention at the international level, some deny the need for an IPE curriculum and argue that it is extremely difficult to implement and develop an IPE curriculum in undergraduate courses. According to Guraya and Bar [12], the sophisticated teaching dynamics in different academic healthcare programs have made it difficult for implement of IPE curriculum or activity. The study suggested that packed timetable and logistical problems related to IPE participation from a large number of students have contributed to the difficulty in achieving the implementation of IPE [12]. In addition, Ahmady *et al.* [16] carried out a qualitative study on 15 IPE professors to explore the challenges of implementing IPE in health profession education in Iran. They found that the resistance to the shift to IPE is due to the mentality of educators, the low understanding IPE among educational policymakers and managers, and financial issues of many institutes like

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universities and clinical settings. The last and most impactful factor that challenges the implementation of IPE is student's. Some students' discriminating attitudes towards students from other courses can hinder IPE implementation [17]. The main purpose of IPE will not be achieved if the interprofessional students deliberately choose to not get involved in IPE activities. Other than attitude, a study from Qatar also found that student's gender can hinder the implementation of IPE [14]. Realizing the importance of having effective collaboration, introducing IPE among undergraduate health sciences students is an important pedagogical approach for preparing health professions students to provide patient care in a collaborative team environment. It has also been suggested that students need to start IPE early in their semester [18]. Through IPE sessions, healthcare students can transfer the knowledges and skills that they gained from interprofessional collaboration into real-life interprofessional work-based problems [19]. Moreover, through IPE activities essential elements for student's perspective such as effective communication, problem-solving, teamwork, and enhancing knowledge and skills will be optimized [5]. These key competencies are required to increase mutual respect, understand professional roles and create job satisfaction in delivering patient care [20].

Knowing that IPE activities act as a powerful learning tool in efforts to improve and enhance healthcare delivery [21], the implementation of IPE amongst health students has emerged worldwide [22]. Many countries such as Canada, the United States, the United Kingdom, and other European countries have implemented IPE among their health sciences students [23]. A study by Brock *et al*. [24] showed that students' perceptions was positive after the IPE activity. Similarly, IPE was beneficial in improving healthcare students' attitudes around learning with others [25].

However, these outcomes were reported when the activities were done physically. COVID-19 significantly disrupted the healthcare education system around the world, forcing the academic community to shift from face-to-face sessions to a virtual learning environment [26]. The sudden shift from physical delivery to a virtual approach was unplanned and uneasy. Moreover, the impact of COVID-19 on higher education and IPE programs has not yet been established due to the unpredictable nature of the pandemic [27]. Having said that, conducting IPE via an online platform should not jeopardize the outcome of the activity.

Moreover, there are few universities in Malaysia that conduct IPE either physically or online [28]. The effectiveness of conducting IPE virtually has not been tested and cannot be compared with existing results regarding the physical implementation of IPE in other countries. Therefore, this study aims to evaluate the effectiveness of a virtual IPE activity conducted among pharmacy and medical students.

II. Methodology

A. Study design and Sampling

This study adopts a pre-post-study design using convenience sampling among participants of the interprofessional education activity. This survey-based study is conducted among year 2 students from the schools of pharmacy and medicine at Taylor's University, Malaysia.

B. Study Instrument

The effectiveness of collaboration competencies were assessed using the Interprofessional Collaboration Competency Attainment (ICCA). This tool was designed by Archibald *et al*. [29] to assess the change in interprofessional collaboration-related competencies among healthcare students This self-administered questionnaire has 20 retrospective pre-post questions with respondents rating using a 7-point Linkert scale type. It has been validated to measure collaboration and communication between two or more disciplines [30], [31]. The mean value was used as the cut-off point, with higher readings than before, indicating improvement in student collaboration.

C. Study Flow

The online interprofessional education activity was a half-day event for two days held between two health programs, medicine and pharmacy. As facilitating the IPE learning can be challenging, academics from the two schools were recruited to facilitate the activity. Prior to the activity, these academicians attended a workshop on IPE which gives information on the program, the ways to assess the students and types of responses they should expect. The IPE activity was conducted in two phases. In the first phase, a short briefing regarding the IPE activity was given to the students and consent was taken. Then, the students were randomly assigned to nine groups comprised of 9-10 students consisting of equal numbers from the two health professions. An academician was assigned to each group to guide the discussion and answer any questions. Before starting the activity, the students were encouraged to answer the pre-IPE survey ICCA.

A patient case scenario was then given to each group. Academicians from the two health schools developed a case relevant to each profession, for which the students needed to share knowledge from their own professions and communicate with their partners to solve the issues. This ensured that main objectives of the IPE activity can be achieved. At the end of the phase one activity, the students were given a week to discuss the case and prepare the answers for the guided questions.

In the second phase, all nine groups were required to present their findings with prepared PowerPoint slides or a video. The medical students summarized the medical conditions, treatment plan and problems that arose, while the pharmacy students focused on patients' adherence to medication, follow up, and lifestyle modifications. The presentation took approximately 10 minutes per group, followed by a question-and-answer session with the academician. At the end of the session, the students were given feedback and asked to complete the post-IPE ICCA survey. All the sessions were conducted virtually.

D. Data Analysis

All the demographic factors were analyzed and presented as frequency and percentage. Students' pre-post responses to the ICCA questionnaire were analyzed using a paired t-test in

SPSS version 25.0. The significance level was set at $p < 0.05$ where changes show the students' competencies before and after attending IPE activities. A logistic regression test was performed to identify if there was any significant association between the demographic factors and post ICCA score. This research gained ethical approval from the Ethical Committee of Taylors University.

III. Results

There are 20 domains tested using the survey form. The list of the domains and themes are well detailed in Table I.

TABLE I: Items Tested in ICCA Survey Form

Themes	Statements No.	Description
Communication	1	Promote effective communication among members of an interprofessional (IP) team
	2	Actively listen to IP team members' ideas and concerns
	3	Express my ideas and concerns without being judgmental
	4	Provide constructive feedback to IP team members
	5	Express my ideas and concerns in a clear, concise manner
Collaboration	6	Seek out IP team members to address issues
	7	Work effectively with IP team members to enhance care
	8	Learn with, from and about IP team members to enhance care
Roles and responsibilities	9	Identify and describe my abilities and contributions to the IP team
	10	Be accountable for my contributions to the IP team
	11	Understand the abilities and contributions of IP team members
	12	Recognize how others' skills and knowledge complement and overlap with my own
Collaborative patient/Family centered approach	13	Use an IP team approach with the patient to assess the health situation
	14	Use an IP team approach with the patient to provide whole person care
	15	Include the patient/family in decision-making
Conflict management	16	Actively listen to the perspectives of IP team members
	17	Take into account the ideas of IP team members
	18	Address team conflict in a respectful manner
Team functioning	19	Develop an effective care plan with IP team members
	20	Negotiate responsibilities within overlapping scopes of practice

Around 46 students took part in the activity. Almost half of them (54.3%) were from the school of pharmacy. The majority of the students were female (56.5%) and most were from a Chinese background (65.2%). Only 11 students have family members working in healthcare. The details of the demographic characteristics are shown in Table II.

Table III illustrates that there were differences in mean score between both schools after attending the IPE activity virtually. The mean scores differ more among pharmacy students than medical students.

TABLE II: Demographic of Respondents

Characteristics	n(%)
Gender	
Male	20(43.5)
Female	26(56.5)
Ethnicity	
Malay	3(6.5)
Chinese	30(65.2)
Indian	9(19.6)
Others	4(8.7)
Family members in healthcare	
Yes	
No	11(23.9)
	35(76.0)
School	
Pharmacy	25(54.3)
Medicine	21(45.7)

TABLE III: Comparison of Mean Scores on pre-post ICCA Themes between Pharmacy and Medical Students

Themes	School	Pre score Mean(SD)	Post score Mean(SD)
Communication	Pharmacy	24.6(6.2)	27.4(5.0)
	Medicine	25.6(5.7)	27.0(5.9)
Collaboration	Pharmacy	13.3(4.9)	16.4(3.3)
	Medicine	15(3.5)	15.1(4.5)
Roles and responsibilities	Pharmacy	18.5(5.7)	21.8(3.7)
	Medicine	20.3(4.5)	21(4.7)
Collaborative patient/Family centered approach	Pharmacy	13.5(4.7)	16.1(3.2)
	Medicine	14.6(3.5)	15.4(3.6)
Conflict management	Pharmacy	15.5(4.6)	17.5(2.9)
	Medicine	15.7(3.4)	16.1(3.6)
Team functioning	Pharmacy	9.3(3.5)	11.1(2.1)
	Medicine	9.9(2.0)	10.3(3.1)

Table IV reveals that mean score differences for of 6 ICCA themes (communication, collaboration, roles and responsibilities, collaborative patient and team functioning) was statistically significant ($p < 0.05$). The conflict management theme showed no significant statistical difference ($p = 0.082$).

TABLE IV: Comparison of Pre-post ICCA Score by Themes

Variables	Pre-score mean (SD)	Post-score mean (SD)	P value*
Communication	25(5.9)	27(5.3)	0.004
Collaboration	14.1(4.4)	15.8(3.9)	0.016
Roles and responsibilities	19.3(5.2)	21.4(4.1)	0.009
Collaborative patient/Family centered approach	14.0(4.2)	15.8(3.4)	0.003
Conflict management	15.6(4.1)	16.7(3.8)	0.082
Team functioning	9.6(2.9)	10.8(2.6)	0.012

*paired t-test

An overall comparison of the pre and post ICCA scores between the two schools is shown in Table V. The mean score between pre and post IPE was significantly different

(p=0.006, 95% CI -17.0, -3,0). The mean competencies score of the students before the IPE was 97.8 ±25.2 and improved to 107.9 ±21.4 after the activity. Paired *t*-test showed the mean score between pre and post IPE is significantly different (p=0.006, 95% CI -17.0, -3,0). More than half of the students (54.3%) have adequate team-based competencies after the virtual IPE activity. This shows, with 95% confidence the mean improvement in IPE score is between 3.0 and 17.0. Therefore, online learning is not a barrier to cultivate collaboration and knowledge sharing between two disciplines. Virtual IPE was effective in fostering interprofessional experiential learning among students. The post mean score was used as the cutoff point to categorize the post results to high and low groups as shown in Table VI.

TABLE V: OVERALL COMPARISON OF PRE-POST ICCA SCORE

Variables	Pre-score mean (SD)	Post-score mean (SD)	Mean of score difference (95% CI)	P value*
Score	97.8 (5.2)	107.9 (21.4)	10.02 (-17.0, -3.0)	0.006

*paired t-test

TABLE VI: POST ICCA SCORE CATEGORIZATION

Category	School n(%)	
	Pharmacy	Medicine
High	15(60)	10(40)
Low	10(47.6)	11(52.4)

A logistic regression test was performed to identify if there was any significant association between the demographic factors and post ICCA score. The test showed that it was only significant for the students with family members working in healthcare with having odds ratio (OR) = 5.34(95% CI 1.00,28.4). The odds of students with family members involved in healthcare having a high ICCA score is 5.34 times more than students with no family members in healthcare.

IV. DISCUSSION

The results showed there was a positive outcome from the IPE activity conducted virtually. Students from both schools demonstrated good improvement in collaboration competency. Besides that, this IPE activity could have encouraged better understanding of professional roles in patient care as well as generate constructive mutual attitudes. The IPE activity was as effective as others done physically that other studies have reported on [32]. One of the reasons for the successful outcome might be that the patient case was designed in such a way that both disciplines had to use their knowledge and communication to solve it. To achieve best outcomes in patient care, effective communication, and collaborative efforts to resolve clinical issues across healthcare professions are needed [33]. The online IPE activity was able to foster teamwork and understanding between the two sets of health professionals. The findings were similar to another IPE activity done physically and showed that IPE can promote cooperation and communication between interprofessional team [34].

Furthermore, the study shown that students who have family members in healthcare have positive high ICCA scores. The findings were different to another study done by Zanotti *et al.* [35] who reported that stereotyped behavior against other healthcare professions was one of the barriers in integrating communication between the two disciplines. Moreover, students with any family member working in a healthcare setting perceive that physician work independently as preeminent members in a healthcare team [36]. Hence, their point of view regarding teamwork and collaboration was better than students who did not have any relatives who were healthcare workers. Thus, implementing this IPE activity among students will be able to break the barrier between healthcare professionals.

The sub-theme analysis done between the two schools identifies that changes occur more among pharmacy students than medical students. This might be due to student factors, as reported by other studies [37], [38]. Besides that, medical students might consider IPE as a waste of time due to their heavy academic workload, which causes them to show less passion towards it. This also makes them more skeptical about IPE than pharmacy students [39].

On the other hand, our study also found that there was lack of improvement in conflict management skills among the students. This might be due to ineffective communication because of a hierarchical organizational culture and lack of interpersonal skills [40]. Conventionally, Malaysia's national healthcare system was built on a strict order of rank among healthcare professionals, which have a stronger social hierarchical culture than Western countries. This medical environment might have influenced the low perception of medical students. [41]. Likewise, the perception of pharmacists as a part of the medical team is still low as reported by one study [42]. Hence, the conflict gap broadens between these two disciplines.

Overall, this study contributes to the evidence that virtual IPE can provide standardized and guaranteed opportunities for pharmacy and medical students to collaborate as part of a health care team. Students' participation in IPE activity regardless of the mode of delivery, still ensures broad understanding of the skills and knowledge, as well as boosting the confidence level of various healthcare professionals. Hence, the pandemic situation is not a reason anymore to prevent ongoing IPE activities.

The findings of this study indicate that the IPE program conducted virtually fulfilled its interprofessional objectives as much as physical IPE program. Multi-media and e-learning resources would be beneficial to IPE activities. The success of IPE conducted via online reflects students' self-motivation, and the effectiveness of online communication and self-directed learning [43]. Therefore, innovative approaches such as web based, and e-learning are needed to overcome the barriers and facilitate the uptake of quality IPE more broadly [44].

This current study indicates the imperative steps for applying IPE activity in the curriculum. This study can be a source of new learning and proof for the worth of IPE implementation into the syllabus. However, the small response rate of participating students was a limitation of this

study. Therefore, future studies should consider a larger sample size, upper year students and a larger variety of healthcare professionals.

V. Conclusion

Virtual IPE was effective in fostering interprofessional experiential learning among students. This study provides baseline data for planning and realizing IPE activities between domestic and foreign universities. Incorporation of IPE in the curriculum is important to teach future health professionals to work as a team, communicate effectively and implement shared decision making for optimum healthcare delivery.

Conflict of Interest

The author declares no conflict of interest.

Author Contributions

The author contributed to the study design, write up and approved the final version.

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