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Development and Evaluation of an Inter-professional Education Course at a Medical School in Korea

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Disclosure

The authors declare that they have no competing interests.

Author Contributions

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ABSTRACT

Background: Interprofessional collaborative practice (IPCP) is emphasized in medical care for patient safety. As patient care is provided by teams, interprofessional competence is required to ensure the quality and safety of care and should be taught as early as possible. In this study, we introduced a 2-week interprofessional education (IPE) curriculum and attempted to describe and evaluate its effectiveness among medical students.

Methods: We developed a 2-week IPE course and gave it to third- or fourth-year medical students (n = 166) from 2018 to 2019. The curriculum was composed of interactive lectures, discussions, small-group discussions, and simulation and was given to diverse medical students. Students were asked to report their satisfaction with the IPE program, write a reflection paper, and complete readiness for interprofessional learning scale (RIPLS) questionnaires before, immediately after, and 4 months after the curriculum. We also obtained 360° evaluations of the students by other health professionals 1 year after the training.

Results: The IPE program changed students' attitudes about interprofessional learning, from less favorable to more favorable. The 360° evaluation by nurses revealed that students became more favored as teammates (overall satisfaction with them as teammates increased from 3.1/5 to 3.4/5) compared to medical interns before IPE training, and complaints from nurses about medical interns were significantly less frequent 1 year after the training.

Conclusion: The IPE program was effective in preparing medical students for team based collaborative practice even though it was short and exposed once in the curriculum. Further extension to other medical schools is recommended.

Keywords: Interprofessional Collaborative Practice; Interprofessional Education; Medical Education

INTRODUCTION

The importance of interprofessional collaborative practice (IPCP) in health care is now being emphasized more than ever. IPCP has been shown to improve patient outcomes such as blood pressure and glucose and cholesterol control, and thus reduce mortality. This change in health care delivery accelerated the introduction of interprofessional education (IPE) courses for physicians, nurses, pharmacists, and social workers.¹⁻⁵

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IPE is a collaborative approach for teaching and learning that fosters teamwork among two or more health-care professionals from different educational backgrounds.⁶⁻⁸ If students from different health-care professions learn together, they might be prepared to collaborate more efficiently and effectively in practice.⁹⁻¹¹ However, many undergraduate students of medicine, nursing, and other professions still have only limited opportunities to learn how to collaborate with other members of the health-care team and continue to be educated in isolation.^{12,13}

Recently, in countries such as Canada, Australia, the United States, and Europe, many schools for the health professions and academic health centers have made great efforts to implement IPE. The accreditation bodies for health science programs in Canada and the United States require the inclusion of IPE in curricula.¹⁴⁻¹⁶ Although growing amount of research have described various types of IPE programs with diverse curriculum content, course duration, participating group and outcomes and studies have provided evidence of a long-term impact of IPE on IPCP,¹⁷⁻¹⁹ we have limited experience of IPE program in Korea.

In fact, although an IPE program with active interactions among various health professionals would be ideal, implementing it has various practical limitations. This study thus aimed to develop an IPE program that can be implemented in medical schools that afraid to implement IPE due to various obstacles. In this study, we describe the process of developing and implementing an IPE program and evaluate the IPE curriculum based on Kirkpatrick's model.

METHODS

We developed and implemented an IPE curriculum for third- and fourth-year medical students before they started clinical practice.

The curriculum development and implementation

In early 2017, we developed an IPE curriculum to prepare health professionals for IPCP. We focused on third- or fourth-year medical students because we believe that students should learn interprofessional collaboration and communication during their clinical clerkships and before working as medical interns, as team members providing health care.

We invited experts from various fields to constitute an organizing committee for the IPE curriculum. They were from medical education, internal medicine, emergency medicine, nursing, and so on. Through consecutive meetings, discussions, and a workshop, we came to agreement on the core values and desired course outcome for IPE (**Supplementary Data 1**). The 2-week IPE curriculum was designed based on the core competencies for IPCP guidelines.²⁰ (**Tables 1 and 2**) Learning objectives and curriculum components were developed and coordinated. The contents of the IPE curriculum are as follows:

- Human centeredness/Patient centeredness
- Patient experience
- Patient safety
- Values/Ethics for Interprofessional Practice
- Roles/Responsibilities
- Communication with patients
- Communication with other professionals
- Teams and teamwork
- Respect

Table 1. Two-week schedule of the IPE program in 2018

Schedule	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Morning	Orientation	Patient-centeredness, communication (lecture, case discussion)	Debriefing for patient shadowing: focused on patient experience	Debriefing for patient shadowing: focused on IPC, patient experience	Case review: patient complaint etc. Root cause analysis	Lecture on IPE Teamwork game	Debriefing for other health professional shadowing	Communication (lecture, case discussion)	Role play	Making films for IPC
Afternoon	Introduction hospital to patient (experience as patient)	Patient shadowing (outpatient clinic, etc.)	Patient and nurse shadowing on ward, focused on IPC	Case-based discussion, understanding patient centeredness	Debriefing for patient complaint	Other health professional shadowing - Nurse - Pharmacist - Lab technician - Etc.	Topic presentation on IPC with case discussion	Case-making related to IPE	Wrap-up lecture for teamwork	Wrap-up paper

IPE = interprofessional education, IPC = interprofessional collaborative.

Table 2. Two-week schedule of the IPE program in 2019

Schedule	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Morning	Orientation	Patient-centeredness, communication (lecture, case discussion)	Communication (lecture, case discussion)	Debriefing for patient shadowing focused on patient experience, IPC	Simulation session with nursing students	Case-based discussion - Understanding patient centeredness	Debriefing for other health professional shadowing	Case review: patient complaint etc. Root cause analysis	Case-making related to IPE	Making films for IPC
Afternoon	Introduction hospital to patient (experience as patient)	Patient shadowing (outpatient clinic, etc.)	Patient and nurse shadowing on ward, focused on IPC	Other health professional shadowing - Nurse - Pharmacist - Lab technician - Etc.	Debriefing for simulation	Lecture on IPE Teamwork game	Team-building activity 1 Team building activity 2 Team building activity 3	Debriefing for patient complaint, interprofessional miscommunication	Role play Wrap-up lecture for teamwork	Wrap-up paper

IPE = interprofessional education, IPC = interprofessional collaborative.

These topics were taught using appropriate teaching methods such as interactive lectures, discussions, shadowing, small-group discussions, simulation, role playing, etc. (Tables 1 and 2). To assess student performance, we used multiple approaches including essays, performance in role play, video clips, and attitude toward participation.

Subjects

The subjects of the study were third or fourth-year medical students at the Chung-Ang University College of Medicine (Republic of Korea) from 2018 to 2019. In its first year, we launched the IPE program for fourth-year medical students. We subsequently switched it to the third year, thinking that earlier exposure to IPE is required before entering clinical clerkship. In the first year of implementing IPE, the main curriculum participants were medical students only (fourth-year medical students, n = 72). But in 2019, the second year, we added simulation sessions for medical and nursing students (third-year medical students (n = 94) and fourth-year nursing students). Seventy-five fourth-year nursing students from the Sung-Shin University College of Nursing participated in this class.

Outcome measures

For IPE course evaluation, we used Kirkpatrick's educational outcome model. We evaluated the participants' reactions, modification of attitudes and perception, acquisition of knowledge and skills, behavioral change, and change in organizational practice based on Kirkpatrick model.

Level 1 – Reaction: After the training, we asked all students to describe their satisfaction with the IPE program. We asked them to each write a reflection paper and to make a video clip describing their experiences, lessons learned, and feelings during the program.

Level 2 – Modification of attitudes/perceptions & acquisition of knowledge/skills: To analyze perceptual changes of students related to readiness for interprofessional learning, we asked all students to complete a readiness for interprofessional learning scale (RIPLS) 19-item questionnaire (see **Table 3** for items) before, immediately after, and 4 months after the training. The RIPLS is a commonly used tool for evaluating attitudes and perceptions of students regarding IPE that was developed by Parsell and Bligh.²¹ We used the 2009 version of the RIPLS that was adapted by Latrobe Health Service and the Health & Social Care Interprofessional Network

Table 3. Results of the RIPLS surveys before and after IPE training in 2018 and 2019

No.	RIPLS items	Before		Immediately after		4 months after		P value*		P value**	
		2018 (n = 72)	2019 (n = 94)	2018	2019	2018	2019				
1	Learning with other students/professionals will make me a more effective member of a health and social care team	4.28	4.26	4.19	4.71	4.72	4.69	0.418	0.000	0.000	0.000
2	Patients would ultimately benefit if health and social care students/professionals worked together	4.31	4.27	4.22	4.62	4.74	4.73	0.400	0.000	0.000	0.000
3	Shared learning with other health and social care students/professionals will increase my ability to understand clinical problems	4.07	4.22	4.06	4.61	4.65	4.54	0.905	0.000	0.000	0.000
4	Communications skills should be learned with other health and social care students/professionals	4.13	4.26	4.17	4.82	4.43	4.90	0.724	0.000	0.003	0.000
5	Team-working skills are vital for all health and social care students/professionals to learn	4.15	4.17	4.25	4.79	4.69	4.56	0.457	0.000	0.000	0.000
6	Shared learning will help me to understand my own professional limitations	4.21	4.20	4.06	4.48	4.44	4.62	0.267	0.000	0.006	0.000
7	Learning between health and social care students before qualification and for professionals after qualification would improve working relationships after qualification/collaborative practice	4.11	4.17	4.22	4.63	4.67	4.73	0.288	0.000	0.000	0.000
8	Shared learning will help me think positively about other health and social care professionals	3.92	4.05	4.10	4.56	4.65	4.59	0.085	0.000	0.000	0.000
9	For small-group learning to work, students/professionals need to respect and trust each other	4.50	4.51	4.36	4.70	4.85	4.80	0.175	0.000	0.000	0.000
10	I don't want to waste time learning with other health and social care students/professionals	1.90	1.87	2.13	1.54	1.33	1.56	0.145	0.000	0.000	0.002
11	It is not necessary for undergraduate/postgraduate health and social care students/professionals to learn together	1.89	1.84	2.13	1.29	1.25	1.49	0.107	0.000	0.000	0.000
12	Clinical problem solving can only be learned effectively with students/professionals from my own school/organization	1.79	2.31	2.19	1.55	1.42	1.28	0.005	0.000	0.000	0.000
13	Shared learning with other health and social care professionals will help me to communicate better with patients and other professionals	4.04	4.06	4.13	4.79	4.53	4.82	0.409	0.000	0.000	0.000
14	I would welcome the opportunity to work on small group projects with other health and social care students/professionals	4.11	4.20	3.90	4.65	4.33	4.32	0.087	0.000	0.077	0.124
15	I would welcome the opportunity to share some generic lectures, tutorials or workshops with other health and social care students/professionals	4.10	4.15	4.06	4.69	4.42	4.41	0.694	0.000	0.001	0.001
16	Shared learning and practice will help me clarify the nature of patients' or clients' problems	4.01	4.24	4.11	4.59	4.61	4.52	0.389	0.000	0.000	0.000
17	Shared learning before and after qualification will help me become a better team worker	4.18	4.21	4.15	4.74	4.60	4.78	0.765	0.000	0.000	0.000
18	I am not sure what my professional role will be/is	2.51	2.31	2.50	1.89	1.68	1.51	0.917	0.000	0.000	0.000
19	I have to acquire much more knowledge and skill than other students/professionals in my own faculty/organization	3.82	3.94	3.81	4.50	4.38	4.68	0.917	0.000	0.000	0.000

The scale is as follows: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

*P value for paired t-test comparing values before and immediately after the program; **P value for paired t-test comparing values before and 4 months after the program.

and consists of 19 questions and 4 subscales including teamwork and collaboration, negative professional identity, positive professional identity, and roles and responsibilities.²²⁻²⁴ In order to help students understand it, the questionnaire was written in both Korean and English. Students gave responses to the statements using a five-point scale (5 = strongly agree; 1 = strongly disagree).

Levels 3 and 4 – Behavioral change and change in organizational practice & benefit to patients: By the end of the medical internships of the medical graduates who first participated in the IPE program, we obtained 360° evaluation by diverse health professionals during the medical internships one year after the training. During 1 year of their internship, we received feedback repeatedly from senior doctors and nurses. At the end of each year, nurses have scored satisfaction with interns as team members using 5-point Likert scale (5 = very satisfied, 1 = very dissatisfied), and we compared satisfaction scores before and after IPE training. As for improvement of patient outcome and benefit to patients, we are planning a long-term follow-up comparative investigation to see if there was any change in patient outcomes after the IPE training.

Data analysis

Statistical analysis was performed using the SPSS (version 23) statistical package (SPSS, Chicago, IL, USA). Changes in RIPLS score after the IPE program were analyzed using a paired *t*-test and overall satisfaction score with working with interns *P* values of < 0.05 were taken to indicate statistically significant differences.

Ethics statement

The Seoul National University College of Medicine Institutional Review Board (IRB) provided study approval and waived the requirement for written informed consent (IRB No. 2003-055-1108).

RESULTS

Participant satisfaction with the education program

A total of 166 medical students in 2018 and 2019 (72 and 94, respectively) and 75 nursing students in 2019 participated in the curriculum. The reflection papers showed that students had learned and felt a lot during the training. The video clips that the students made in small groups showed that they also had a chance to think deeply, considering different perspectives.

At the end of the program, students were asked to give descriptive feedback about the curriculum. Most participants answered that they were fully satisfied with the program. They said that shadowing and interaction with other professionals helped them to understand and acknowledge other health professionals in the hospital and that they could understand the common situation of conflict among diverse health professionals. Comments about the educational program included the following:

- I'm glad I could participate in this curriculum before my clinical clerkship.
- I was surprised to see that there are so many different jobs in the hospital that I had not heard of before.
- It was only a few days' program, but as I toured various facilities in wards and hospitals, I realized that hospitals could never be run by doctors alone.
- It was good chance for me to see the system of the hospital as a whole before my clinical clerkship.

- I really enjoyed shadowing. After visiting various departments and experiencing other jobs indirectly through friends' presentations, I could feel that so many people were working together in the hospital. When I asked my seniors who are currently in practice, they said they didn't know there was such a department in the hospital after a year of practice.
- I now understand that the hospital needs a wide variety of other jobs besides doctor or nurse to function.
- It was an opportunity to feel how hard nurses were working and realize that patient care is not something that doctors can do without their cooperation.
- The simulation session with nursing students was so fun, and I couldn't help but admire the professionalism of the nursing students.

Reliability of the English with the Korean version of the RIPLS

The internal consistency of the RIPLS was overall good ($\alpha = 0.849$). Cronbach's α estimating the internal consistency of the four factors 'teamwork and collaboration,' 'negative professional identity,' 'positive professional identity,' and 'roles and responsibilities' were 0.819, 0.710, 0.828, and 0.371, respectively.

Students' perceptual change following the IPE program

We used the RIPLS to survey students to find out whether the IPE course had influenced students' attitudes or perceptions about interprofessional learning and collaborative care. All 166 students (72 for 2018 and 94 for 2019) answered the RIPLS questionnaire on the first day of the course, at the completion of the planned curriculum, and again 4 months later.

In 2018, there was no noticeable significant change in RIPLS scores immediately after the training (**Table 3**). But 4 months after the IPE program, students' RIPLS scores changed to be significantly more favorable to interprofessional learning (IPL). However, in 2019, all RIPLS scores changed to be significantly more favorable toward IPL immediately after the students completed the IPE program, and the changed scores were still valid 4 months later (**Table 3**). When we compared the 2018 with the 2019 RIPLS scores, there were no differences in the initial scores (before the IPE program). Immediately after the program, the average RIPLS score in 2018 was significantly less favorable to IPL compared with 2019, but 4 months after the program, most of these gaps had diminished (**Supplementary Table 1**).

The curriculum in 2019 is not significantly different from 2018 in terms of learning objectives or learning activities, but the order of lectures and practice was changed slightly and more participatory practice was reinforced. Above all, the biggest difference in the curriculum between 2018 and 2019 was the participation of nursing students and interaction with them during a simulation. The direct interaction with nursing students might have influenced medical students' attitudes toward IPL. Considering that there were no obvious differences between 2018 and 2019 in the responses before the training, direct interaction between medical and nursing students might have caused the difference.

Behavioral change one year after the IPE curriculum

The next outcome measurement was behavioral change, the third level of Kirkpatrick's model. We followed up on the IPCP-related performance of students who had participated in the IPE curriculum in 2018 and worked as medical interns in 2019. An assessment by a nurse was carried out as part of a 360° evaluation. The number of complaints related to interns decreased significantly compared with the prior consecutive 2 years, from 34 cases per

year to 17 cases per year. And overall satisfaction score with working with interns improved significantly, from 3.1 out of 5 points (a total 799 out of 975 nurses had answered) to 3.4 out of 5 points (a total 778 out of 982 nurses had answered) after IPE training ($P < 0.05$).

DISCUSSION

In this study, we introduced an IPE curriculum for training prior to medical internship and found that students' attitude toward IPCP improved after participating in the 2-week IPE program. Their positive attitudes toward IPL were still valid at 4 months and at 1 year after the training.

In spite of the significance of IPCP and the recognized need for IPE, there are some obstacles to developing and sustaining IPE. Common obstacles include institutional leadership, physical distance between different disciplines' institutions, student diversity, and pre-existing diverse curricula for different health professionals. The IPE concept and lack of an accredited, efficient teaching method are also common barriers.²⁵⁻²⁷ We intended to create an interactive IPE program in which students in diverse health professions would learn about, from and with each other, but it was difficult to gather them due to the geographically distant locations of their different disciplines' institutions and their diverse undergraduate curricula. As the curriculum for undergraduate students was already overwhelming, making space for IPE was not easy. In spite of these difficulties, we did start a 2-week IPE program and were able to add a simulation session with nursing students in the second year of the program.

As there is no gold standard for teaching interprofessional skills, we made an effort to match learning activities to each objective. A recently published review paper reported that didactic, small group discussion, patient case analysis, simulation, and shadowing are major educational strategies currently available for IPE.²⁸ We started various educational tools for IPE and focused on experiential learning because we thought IPE skills could be acquired through experience. In our curriculum, we minimized one-way teaching such as lectures, and maximized interactive learning, self-directed learning, and diverse experiences by which students could discover the importance of IPE and interaction with other professionals. Among diverse learning activities, a majority of students rated the simulation session with nursing students as the most satisfactory class, and the nursing students were also satisfied with the class. We concluded that real interaction with diverse health professionals is the most effective way to learn IPCP. The more favorable change in students' attitudes toward IPCP at their completion of the training in the second year compared with the first year might have been caused by their direct interaction with nursing students in the second year. Besides adding the simulation session with nursing students, in that year we also added various learning activities such as a team building game or communication game, while small group discussions were the main activity in the first year. Insufficient inter-professional interaction in 2018 might be the cause of the insignificant RIPLS score change right after IPE course. But 2-week IPE training would have influenced students' attitudes resulting in change in RIPLS scores after 4 months.

A favorable view of IPE by hospital leadership is necessary for IPE implementation, not just for implementing IPCP in the hospital, but also for introducing an IPE curriculum in medical school. We need support from other health professionals and cooperative hospital leadership for shadowing programs and creating a collaborative culture in hospitals. Thus, successfully implementing IPE is a kind of IPCP process itself. However, IPE program leadership is the

most important factor in IPE implementation and maintenance. Persuading the health care community of the importance of IPCP, appealing to other professions and hospital leadership to elicit cooperation, and operating IPE courses using various educational methods are possible only when the IPE program leader has a strong will and drive.

Interprofessional learning is known to help prepare students for team-based practice, but the appropriate time for intervention is not well understood. In our study, we introduced IPE in the third or fourth year of medical school, before the medical internship. Traditionally, curricula for doctors and medical students have more focused on clinical skills such as diagnosis or treatment of disease and paid little attention to teamwork, communication, or cooperation with other health professionals. But nowadays these skills are more emphasized than clinical skills and are known to be proven, effective ways of improving patient outcomes. Therefore, all undergraduate medical students should have the necessary competence to be good team players.²⁹⁻³³ The critical period for IPE might be before students work with other professionals, because teams do not function well without practice. An IPE program at the prelicensure level has been shown to produce positive outcomes in patient satisfaction, collaborative team behavior, and reduced medical error.³⁴ Hence, gradual implementation of IPE is recommended for undergraduate students.

IPE's learning outcomes are not simple knowledge or skills, but contextual knowledge and performance skills in collaborations among different professions, so the curriculum should be designed not only at the individual level but also at the organizational level, and an inter-organizational learning process should be arranged. Our results support these lessons. We included interactions with other professionals through shadowing in the first year of IPE when medical students were the only participants in the program, and then added a multi-profession simulation session in the second year. Students' satisfaction increased in the second year when direct interaction was present.

Despite debate about the validity and reliability of the RIPLS, a number of studies have reported that RIPLS is a reliable and valid tool.^{35,36} Our results revealed the weak internal consistency (0.371) in the roles and responsibilities subscale that has already been reported.^{22,37} We used a bilingual version of the RIPLS questionnaire because we did not have previous data from the Korean version of RIPLS and medical students are very good at English.

Our study has several limitations. First, we started the IPE program at a small institution and the number of participants was limited, so it is hard to generalize our results to other institutions. Second, nursing students participated only in the simulation session and were not included in the rest of the IPE training. The curriculum was designed mainly by medical doctors for medical students. Because we still do not have a curriculum that involves multiple professions from the start, we need to develop and apply an IPE curriculum that includes diverse professions throughout the program. Third, the validity of measuring students' attitudinal changes using RIPLS is still debated, and multi-faceted evaluation using various tools could be a better option for assessing students' attitudinal change. Fourth, as the internship period was one year after the IPE course and various factors could affect the intern's performance in addition to IPE training, it may be difficult to conclude that the improvement of intern' performance as teammates was only achieved by IPE training. And last, although the final outcome measure for the IPE program was improvement in patient outcomes and benefits to patients, the fourth level of Kirkpatrick's model, we do not have data regarding any change in patient outcomes or benefits to patients. A long-term follow-up study will provide it.

In conclusion, the IPE curriculum was satisfactory in that it changed students' attitudes to be more favorable to IPCP and these changes were maintained until the end of the medical internship. This study shows that even a single, short IPE program with limited interaction with other health professionals can change medical students' attitudes about IPCP. We also found that students enjoy interaction with students in other health care professions and that this interaction increases IPE effectiveness. The program should be extended to more diverse groups of health professionals and students.

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SUPPLEMENTARY MATERIALS

Supplementary Table 1

Students' perceptual change after the IPE program with or without interaction with students from other health professions

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Supplementary Data 1

Core value and course outcome

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