

The effect of interprofessional team-based learning among nursing students: A quasi-experimental study

Abstract

Background: Although interprofessional education has received attention in recent years as a means of providing opportunities for health-care professionals to learn with, from and about other disciplines and enhance the quality of patient care, evidence of its effectiveness is limited. Interprofessional team-based learning was introduced to make it possible for students in different healthcare disciplines to interact with each other, and to prepare them to function effectively within a team in their future career.

Objectives: To examine the effects of interprofessional team-based learning for undergraduate nursing students in terms of knowledge level, readiness for interprofessional learning, attitude towards various aspects of team learning, and perceived collective efficacy.

Design: The study employed a one-group pretest-posttest quasi-experimental design.

Methods: An interprofessional education program was given to students from two universities in Hong Kong who were in different healthcare disciplines including medicine, nursing, pharmacy, biomedical science, and Chinese medicine programs. The program was based on four phases of student learning—individual readiness assessment test, ice breaking session, team readiness assessment test, and application exercise. Nursing students involved in the program were invited to complete anonymous questionnaires to evaluate their interprofessional team experience.

Results: A total of 40 nursing students (9 male, 31 female) participated in the study. A statistically significant improvement was identified in their knowledge level ($p<0.001$), attitude towards readiness for interprofessional learning, team learning, and perceived collective efficacy ($p<0.001$).

Conclusion: This study suggests that interprofessional team-based learning can enhance cross-disciplinary learning and outcomes resulting from team efforts.

Keywords: Interprofessional education, interprofessional team-based learning, nursing education, patient care

Introduction

Professional education ultimately aims at preparing students for their future expected roles and to function optimally in the health-care team. Given that the health-care professions are facing a range of challenges including an expanding aging population with complex health-care needs (Lynch, Ash, & Chadwick, 2010), the introduction of new technologies (Nichols, Malone, & Esden, 2016), a shortage of manpower and striving for a greater standard of care (Bridges, Davidson, Odegard, Maki, & Tomkowiak, 2011; Croker & Hudson, 2015), they are increasingly expected to work as a team and provide high-quality care to patients (Thompson et al., 2015). Exposure to interprofessional education (IPE) is therefore imperative in preparing health-care students for working and collaborating with other health-care disciplines in a real work environment.

During the past decade, IPE has been implemented in many countries, including the UK and US (Ritchie, Dann, & Ford, 2013; Addy, Browne, Blake, & Bailey, 2015). Medical practitioners (Scrandis & Bussell, 2016), dentists (Wilder et al., 2008), nurses (Whiting, Caldwell, & Akers, 2016), and social workers (Aase, Aase, & Dieckmann, 2013) are just a few of the many health professionals that have received IPE in their professional education.

Nurses are one of the key players in the health-care team. They spend most of the time with their patients and are in a prominent position to encounter and collaborate with a variety of disciplines to provide optimal patient-centered care. Without learning about the different values, roles and responsibilities of other health-care professions, a source of conflict may arise due to different perspectives, resulting in poor outcomes for patients (Cranford & Bates, 2015). Therefore, universities have a responsibility to provide IPE training to nursing students, who can then enter their professions equipped to function in a collaborative context. By being exposed to interprofessional training at an early stage in their university education, students can gain knowledge of the concepts of team and shared care, and subsequently apply these skills in their clinical placement and coursework (Cartwright, Franklin, Forman, & Freegard, 2015).

However, there is a dearth of studies evaluating the impact of IPE on nursing students. Delunas and Rouse (2016) examined the perceptions of both nursing and medical students about interprofessional collaboration after an IPE experience. Their comments revealed that nursing students were not satisfied with the overall communication and collaboration in patient care decisions due to logistical problems and the lack of a formal introduction to each other's role at the beginning of the program. This result is consistent with the finding in another study that nursing students did not have enough time to communicate with other health-care disciplines during their educational programs (Gordon, Lasater, Brunett, & Dieckmann, 2015). Based on

these results, there is still considerable uncertainty about the attitude of nursing students towards IPE.

A curriculum with IPE elements could help nursing students to understand the roles and responsibilities of other health-care professions. Team-based learning seems to be a logical approach to enabling nursing students to learn to become team members and collaborate with other professions (Aase et al., 2013). Team-based learning has been embraced as an active learning strategy to promote critical thinking and problem-solving skills (Nguyen, Wong, & Pham, 2016). Students in a team are required to learn individually and then bring the acquired knowledge to the table, discuss it with other team members and apply it to complex scenarios. Previous studies have indicated that team-based learning improves student performance and engagement in class (Hrynychak & Batty, 2012; Cheng, Liou, Tsai, & Chang, 2014). Students also praised highly the value of team cohesion and teamwork (Haidet, Kubitz, & McCormack, 2014; Roh, Lee, & Mennenga, 2014). Acquiring the knowledge and skills to work efficiently in a team can be best gained through IPE (Sullivan, Kiovisky, Mason, Hill, & Dukes, 2015).

However, exploring the boundaries of their roles as well as sharing the knowledge gained by communicating in a team happens best through learning in a small team. The incorporation of IPE into team-based learning not only further consolidates the concepts of collaborative sharing of skills and knowledge among students, but allows them to respect and appreciate what other health-care disciplines can contribute to the improvement of health-care outcomes for patients.

Although IPE has been widely adopted, according to a systematic review (Reeves, Perrier, Goldman, Freeth, & Zwarenstein, 2013), evidence of its effectiveness is limited. A recent review by the Cochrane Collaboration showed that seven out of fifteen studies in which IPE was provided to health-care professionals obtained positive outcomes (Reeves et al., 2013). These

included patient satisfaction, clinical error rates, collaborative team behavior, work culture, and mental health practitioner competencies. Another eight studies showed either mixed or no positive outcomes. Very few articles discussed IPE and team-based learning together as a teaching component in the curriculum, despite the widespread knowledge that team-based learning has positive effects on students. Incorporating these two concepts may be challenging due to the manpower, timetabling and logistical issues, yet it is worth attempting due to the above-mentioned benefits.

In order to successfully implement IPE, at least two professionals have to minimize territoriality and tribalism and come together to design the project (Salazar, Andiappan, Radford, & Gallagher, 2016). Currently, students from health-care educational programs in Hong Kong are primarily prepared in their own schools, with few opportunities to learn with students from other disciplines. IPE has not yet been initiated as a formal component in health professional education. This silo approach to education does not provide opportunities for students to learn with, from and about each other, which can result in poor communication within the health-care team, stereotypes about each other's roles and responsibilities, and ultimately poor patient outcomes (Croker & Hudson, 2015).

It is important to provide collaborative health-care practice to students so that in the long term, this training will enable them to be collaborative practice ready upon graduation. In effect, patients will also benefit from the relative advantage of being cared for by an interprofessional team of health-care providers.

In response to this, The University of Hong Kong (HKU) and the Hong Kong Polytechnic University (HKPU) have jointly implemented a half-day course called Interprofessional Team-

based Learning for Health Professional Students (IPTBL), with the content in discussing plan of care for a patient with atrial fibrillation who has started anticoagulation therapy. This course involves health and social care undergraduate students in Hong Kong and utilizes team-based learning as its pedagogy in IPE implementation. The aim of this paper is to examine the effectiveness of IPTBL for nursing students in terms of knowledge gain and their readiness, attitude, and perceived collective efficacy towards IPE.

Methods

Design

The study employed a one-group pretest-posttest quasi-experimental design.

Sample

The IPTBL targeted students who were in the latter half of their respective programs, when they had already developed certain aspects of their professional identity and competency. In HKPU, all 40 third year full-time baccalaureate nursing students were invited because they have just completed the clinical placement and may benefit from the real case scenario in the course.

Framework

The framework adopted in this program was guided by the four competency domains from Interprofessional Education Collaborative (IPEC) report which include values/ ethics, teamwork

and team-based practice, communication practice, and roles and responsibilities for collaborative practice (Interprofessional Education Collaborative Expert Panel, 2011, 2016). Addressing these four domains in the program enabled students to explore one's professional identity, understand the roles and responsibilities of their team members, learn the communication skills and cooperate with the diverse, interprofessional team.

Implementation

The course, which was implemented in January of 2016, was developed according to the team-based learning model (Michaelson & Sweet, 2008). At the beginning of the course, students were pre-assigned to a group with multi-disciplinary programs. Each team had student representatives from medicine, nursing, Chinese medicine, biomedical sciences, and pharmacy of both universities. To facilitate and promote interprofessional interactions, we strived for approximately the same numbers of students from different disciplines in teams. Each team had a maximum of five to six students in order to enhance small group learning (Michaelson, Parmelee, McMahon, & Levine, 2007).

In the context of the study, the students were provided with pre-class study materials via which they were tested by answering a set of multiple-choice questions. This flipped classroom approach enabled them to be prepared before coming to class, thereby enabling the face-to-face session time to be utilized in doing more meaningful activities (Chan & Ganotice, 2015). When the students attended the face-to-face session, they first individually answered ten multiple-choice test questions (called the individual readiness assurance test or iRAT) based on the pre-class study materials.

After the iRAT, an icebreaking game was played to allow the students to get to know each other and facilitate communication among them during the course. When finished, they grouped together for the team readiness assessment test (tRAT) and discussed with the team the same questions that were in the iRAT. The tRAT aimed to give students an opportunity to contribute to the answer and then share the knowledge gained from pre-reading materials, interact and debate among group members, and arrive at a group response. Both the iRAT and the tRAT were given in the format of multiple-choice questions. During the tRAT, teams answered the questions using an answer form with scratch-off boxes. Each team could scratch off a maximum four boxes for one question, until they found a star in the box that indicated a correct answer. Students could appeal the questions if they did not agree with the answer. In launching an appeal, they had to support their arguments based on their pre-class study materials. Content experts responded to the appeals of the teams.

The final part was the application session, in which students had to answer questions based on another real clinical encounter. After completing the session, all team leaders were required to raise a card of a particular color corresponding to their answer. Content experts, based on the visual inspection of the cards raised by all the teams, stimulated discussions between teams with different answers.

Data collection

To compare the change in students' knowledge level before and after they had interacted and debated in a team, the iRAT and tRAT scores were collected, since iRAT indicated the scores attained by students when they answered the set of questions in the readiness assurance test

individually, while the tRAT score was the result of team discussion. The only difference was that the students answered the questions in collaboration with all members in an interprofessional team.

At the end of the course, students were invited to complete anonymous questionnaires to evaluate their interprofessional team experience. The original English versions were used. They are: (a) readiness for interprofessional learning, (b) attitude towards various aspects of team learning, and (c) perceived collective efficacy. The questionnaires were administered before and after the course. It was explained to the students that their participation was entirely voluntary, that the information they provided would be kept confidential, and that their responses to the questions would not affect their course grade.

Readiness for interprofessional learning scale (RIPLS)

A 5-point Likert scale questionnaire was used to measure students' readiness to engage interactively and their attitude towards interprofessional learning in shared learning (Parsell, 1999; Reid, Bruce, Allstaff, & McLernon, 2006). There were four subscales which included teamwork and collaboration, negative professional identity, positive professional identity, and roles and responsibility. The RIPLS is a well-established psychometric instrument and has been widely adopted and used in IPE studies (Ahmad, Chan, Wong, Tan, & Liaw, 2013; Boyle et al., 2013).

Attitudes towards various aspects of team learning (ATL)

This questionnaire comprised 15 items and measured the overall satisfaction with team experience, team impact on quality of learning and clinical reasoning ability, and attitudes towards professional development (Parmelee, DeStephen, & Borges, 2009). The questions were formulated as statements, and students were required to mark their level of agreement on a 5-point Likert scale, where 1 indicated strongly disagree and 5 indicated strongly agree. The tool presents high internal consistency values with Cronbach's alpha 0.82.

Perceived collective efficacy

Collective efficacy belief is consistent with social cognitive theory and is a strong predictor of team performance (Lent, Schmidt, & Schmidt, 2006). Students with higher perceived collective efficacy tend to think that teamwork is meaningful and necessary (Tucker, Jimmieson, & Oei, 2013). There were four items in the questionnaire, ranging from 1 (strongly disagree) to 5 (strongly agree). Good internal consistency was shown in an earlier study, with Cronbach's alpha 0.88 (Salanova, Lorens, Cifre, Martinez, & Schaufeli, 2003).

Data analysis

Descriptive and inferential statistics were calculated using SPSS. Paired sample t-test was used to compare the students' iRAT and tRAT scores. A significance level of less than 0.05 was considered an effect of the intervention. The same statistical method was used to identify changes in students' readiness, attitude, and perceived collective efficacy towards interprofessional team-based learning before and after the intervention.

Results

A total of 40 nursing students (9 male, 31 female) from HKPU were enrolled. They were in the third year of their undergraduate degree. Their ages ranged from 19 to 23 years, with a mean age of 20.45 (standard deviation [SD] = 0.75). These students were placed in 31 interprofessional teams, with at most two nursing students participating in any one team. All students indicated that they did not have previous exposure to interprofessional team-based education.

Knowledge level

A two-tailed, paired sample t-test with an alpha of 0.05 was used to compare the iRAT (mean= 43.00, SD= 15.39) and tRAT scores (mean= 76.03, SD= 9.14). A mean improvement of 33.03 points was evident, which was statistically significant ($p<0.001$).

Readiness for interprofessional learning

Students' attitudes towards interprofessional learning as measured by the RIPLS are summarized in table 1. Generally, they showed a positive attitude towards and readiness for interprofessional learning. With respect to the teamwork and collaboration subscale, students reported that IPE improved their relationships with health-care providers after qualification ($p=0.016$) and helped them to think positively about other professionals ($p<0.001$). Regarding the positive professional identity subscale, students suggested that interprofessional learning could help them clarify the nature of patient problems ($p=0.03$). For the negative professional identity subscale, students

thought that clinical problem-solving skills could only be learned with students from their own department ($p=0.008$). Findings indicated that they had a strong sense of professional identity. They had unique knowledge, skills and techniques that separated them from other disciplines, but generally the nurses were mainly used to provide support for doctors in the clinical area ($p=0.037$).

Attitudes towards various aspects of team learning

The results of the attitudes of students towards various aspects of team learning are shown in table 2. The findings suggest that students were satisfied in all aspects of team-based learning, including team experience ($p=0.004$), team impact on quality of learning ($p=0.001$), team impact on clinical reasoning ability ($p=0.048$), and professional development ($p=0.007$).

Perceived collective efficacy

Table 3 illustrates the perceived collective efficacy of students about teamwork. The study findings revealed positive and significant changes in the confidence levels of students as a result of working as a team. Students reported that they felt confident about the capacity of the group to perform the tasks very well ($p<0.001$). They also believed that their group was totally competent to solve the task ($p=0.002$) and able to solve difficult tasks if they invested the necessary effort ($p=0.01$).

Discussion

An interesting result of the study was the statistically significant improvement in students' knowledge in caring for patients with complex health-care needs after interprofessional team-based learning. The differences between iRAT and tRAT scores suggested that the students worked better to solve problems with a multidisciplinary team than individually. During group discussions, students went through the processes of shared decision-making and collaborative problem-solving with their team members, which may have paved the way (Cartwright et al., 2015). It is possible that they gained knowledge by communicating, learning and understanding the roles and values of each member in the team.

This encouraging finding suggests that as long as a course has been developed with careful planning, positive outcomes may still be found despite its short length. The length of IPE for undergraduate health-care students in previous studies varied from four classes in four weeks to one semester (Cartwright et al., 2015; Dow et al., 2016; Nguyen et al., 2016); however, a shorter length did not guarantee a better result. A systematic review of IPE to health-care professionals suggested that a short 2.5-hour intervention timeframe is not enough to change the knowledge (Olson & Bialocerkowski, 2014). This study thus suggests that with careful curriculum design, short student contact seems to bring about a positive effect.

The results also suggest that following this course, students had an increased appreciation of opportunities to learn in interprofessional teams. They were found to have significant improvements in attitudes towards team learning and perceived collective efficacy about teamwork, and to recognize their own professions as well as respecting the roles and values of other professions. These positive outcomes enabled students to extend their interdisciplinary mindsets and learn how to work closely with other professions in order to provide holistic, compassionate and coordinated care to patients in the future. However, these positive views

might not be surprising, as other studies have also produced similar findings regarding the positive changes of attitude towards and beliefs regarding IPE (Roh et al., 2014; Lefebvre, Wellmon, & Ferry, 2015; Salazar et al., 2016).

Seeing their roles as important to the team is an important element in determining team effectiveness (Morrison, 2007). In this study, nursing students tended to agree with the statement that they were the supporters of doctors. Different training levels may be the reasons why they thought in this way. The medical students were in their fourth year of study and already had plenty of experience and exposure to clinical cases, while the nursing students were in their third year of a 5-year baccalaureate program. Their clinical experience was minimal and they were still in the stage of familiarizing themselves with the clinical environment and practicing clinical skills. When they were in the same team, the medical students would unfailingly dominate the discussion. There is a great potential to include team members with similar training levels in the course in order to reach a better understanding of the roles played by different professions, thereby improving working relationships, teamwork and patient care.

There were clearly some strengths identified in this study. A recent review found that two-thirds of universities in the UK did not receive sufficient support to embed IPE within their institutions (Barr, Helme, & D'Avary, 2014). A successful interprofessional team-based learning program requires substantial support from both universities (Bridges et al., 2011). This study received support and commitment from faculty members of different departments from top to bottom in both universities. Deans and department program leaders did the curriculum mapping. Teachers in different departments prepared pre-class study materials, case scenarios, and questions and answers, and provided training to students. Educational administrators were responsible for room booking, IT support, and contacted and confirmed the availability of both teachers and students.

This support allowed students in both universities to have a unique opportunity to learn with, from and about each other (Freeth, Hammick, Reeves, Koppel, & Barr, 2005). In addition, all the students who participated in this study were experiencing interprofessional learning for the first time. This prevented the varied experience of interprofessional collaboration students from influencing the results.

There were a few limitations to this study. Firstly, its aim was to determine whether IPE could achieve the goal of enhancing the knowledge and attitudes of nursing students towards other health-care professions. Although the study included students in other health-care disciplines, such as pharmacy and Chinese medicine, the focus was on the attitudes and knowledge of nursing students. Secondly, the results should be interpreted cautiously due to the small sample size, although in developing a new course between two universities, starting small seems to be feasible and practical (Appleton & Nacht, 2015). Thirdly, this study did not use a randomized controlled trial, which is a robust experimental design. Further studies should consider this design in comparing the effect of interprofessional team-based learning with traditional silo education. Fourthly, the goal of this study was to prepare nursing students to work with other professions in the health-care team so as to provide the best care to patients. Future studies can consider including students' clinical performance and patients' effects as outcome measures. Lastly, this study showed an improvement in students' knowledge level immediately after attending the course. While this is acceptable, it is also worth conducting longitudinal tracking of students' change in attitude towards interprofessional learning to determine whether they can retain the knowledge on a long-term basis. In spite of these limitations, the results are encouraging, which may suggest the need to make IPE an important component of the HKPU nursing curriculum. Through IPTBL, nursing students can prepare for better communication and

teamwork with team members and ultimately achieve their aim of contributing different aspects of patient care in a collective way.

Conclusions

Effective teamwork among healthcare professions is crucial in contemporary healthcare systems. Teaching students in different healthcare disciplines to learn effective teamworking skills and understand the roles of other professions is the first step toward improving quality of care and patient outcomes in the future. This study is one of the first to integrate IPE into team-based learning to evaluate the knowledge and attitudes of nursing students towards IPE. The results are inspiring and form the basis for further studies to incorporate IPE into the teaching curriculum.

Funding

This work was supported by the University Grant Council, Special funding for teaching and learning [grant numbers 3.53.CT.89HX].

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