

# Creation of nurse-specific integrated interprofessional collaboration and team-efficiency scenario/video improves trainees' attitudes and performances

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## Abstract

**Background:** It is important to train the interprofessional collaboration (IPC) and team-efficiency (TE) of medical trainees. This prospective study evaluates whether implementation of scenario/video-created workshops in integrated IPC and TE (IIT) program provides additional benefits for IPC-TE skills of nursing trainees.

**Methods:** Mock simulation with two IIT scenarios was held as preintervention IPC-TE assessment. Basic and advanced workshops were arranged for teams of intervention groups for creation of discipline-specific scenario and video. Thirty-six nursing trainees were randomized into teams of five members (three nursing students, one standardized medical student, and one standardized trainees of other profession) in either intervention (scenario plus video and scenario) or control groups. After intervention, all groups received the formal simulation-based assessment using another two IIT scenario. In addition to instructors-based assessment of team performance in mock and formal IIT simulation using interprofessional team collaboration scale (AITCS), self-assessment of attitudes and program-value score were completed by each trainee, using attitudes toward interprofessional health care teams scale (ATIHCTS) at all stages.

**Results:** Nursing trainees in intervention group gave high satisfaction score to this IIT intervention. In comparison with control group, greater increase in instructor-assessed team performance in the "partnership," "cooperation," and "shared decision making" domains of AITCS and the self-assessed "quality of care delivery" and TE domains of ATIHCTS were noted in the intervention groups. The overall improvement was greater in the scenario plus video group than those in the scenario group. Further, these improvements among nursing trainees persisted until follow-up stage at 4-weeks later.

**Conclusion:** For nursing trainees, our study suggested that implementation of a scenario creation-based training resulted in additional improvement in trainee IPC and TE behaviors and attitudes. Additionally, making video of newly created nurse-specific scenario enhances partnership and cooperation among nursing trainees and their interprofessional team members.

**Keywords:** Interprofessional collaboration; Nursing trainees; Simulation; Team-efficiency; Workshop

## 1. INTRODUCTION

In an increasingly complex healthcare system, partnership, cooperation, coordination, and shared decision making are important to increase team-efficiency (TE) and to ensure a good quality of

care by nursing and multiprofessional teams. Simulation program for training in TE involving interprofessional care givers have been documented to decrease operative mortality in a clinical setting.<sup>1,2</sup> Until now, the literature on simulation-based training in TE had focused on junior doctors rather than nursing trainees. However, the landmark report from the Institute of Medicine *To Err Is Human: Building a Safer Health System* stated that health care organizations should establish TE training program for all health professionals.<sup>3</sup> For nursing teams, teamwork and TE are the core elements to achieve successful interprofessional collaboration (IPC)<sup>4</sup> and competencies that can be attained through partnership, cooperation, coordination, and shared decision-making process among team members.<sup>5</sup>

A background for the present study was the course evaluations among nursing trainees in 2016, which showed that the TE-focused IPC training was highly appreciated. Further, almost all nursing trainees recommend others to take part in this training. Nonetheless, some trainees responded that

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discipline-focused integrated IPC plus team efficiency (IIT) training should be arranged for all healthcare professionals. To provide holistic care for patients with complex diseases, a mutual understanding of cross-profession language and capacity need to be enhanced by training between nursing and other professions.<sup>6</sup> In addition, the experience-based learning model suggested that learning outcomes are acquired through participation in creative activities.<sup>7</sup>

Thus, our study aims to evaluate the effectiveness of implementation of scenario/video-created workshops in IIT program for training IPC-TE skills of nursing trainees.

## 2. METHODS

### 2.1. Design

This prospective integrated IPC with team-efficiency (IIT) study was conducted from March 2017 to February 2018. Ethical approval (IRB 2016-12-010B) was obtained from the Ethics committee of our institution, and care was taken to apply the World Medical Association Declaration of Helsinki principle of research.

### 2.2. Participants

Voluntary nurses of department of internal medicine and health professionals having >1 year but <3 years of clinical work experience were invited to participate in this IIT interventional program. Randomly enrolled nursing trainees were divided into teams of three groups: a scenario plus video group, a scenario group, and a control group. There were five persons in each team. In addition to one standardized medical student and one standardized partner of other profession (such as pharmacist, respiratory therapist, dietetics, radiologist, physiotherapy, occupational therapists, social worker, psychotherapist, speech therapist, pathologic technologist, medical laboratory technician, etc), there were three nursing trainees in each nursing team during the training day. For final analysis, completed data of nursing trainees were collected from four scenario plus video group (n = 12), four scenario group (n = 12), and four control group (n = 12).

In this study, we recruited 24 standardized partners including 12 medical students and 12 cross-professional trainees for IIT program of nurses. To control the heterogeneity, standardized partners were trained each time for 2 hours by senior instructors before mock and formal assessments. The standardized training included viewing videotapes of the pilot scenarios and playing of their roles in IIT simulation.

### 2.3. Four tested IIT scenario used for mock and formal assessments

Either for preintervention or postintervention simulation-based assessment, two of the four tested IIT scenarios that are prepared by educational committee were chosen. The educational committee consisted of experts with experiences in creating IIT scenario, making video, organization of the IIT workshop and assessment of the IIT program. During the preparation, application, and follow-up stages of this study period, team members of IIT met monthly to discuss the details of program. Simulation nursing IIT scenarios were anaphylactic shock, stable atrial fibrillation, chronic obstructive pulmonary disease exacerbation, and acute coronary syndrome. Scenarios were conducted with standardized programmed clinical case details, standardized orientation to the simulator, environment, equipment, and simulation rules of engagement. All IIT scenarios were tested by group of nursing before making the training video to check and, if necessary, modify the content, which emphasizes on TE, partnership, cooperation, coordination, and shared decision making.

### 2.4. Preintervention mock and postintervention formal simulation-based assessments

Before the IIT interventional workshops, all nursing teams received preintervention mock assessments after standardized introduction to simulation, which included establishing a safe learning environment, reviewing the simulation/debriefing process, and orientation to the capability of high-fidelity SimMan 3G simulator. To foster TE and break the boundary between professions, fixed ratio of three nursing trainees, standardized undergraduate medical student, one standardized trainee of other professions, participated in the mock assessment by acting both nursing team leader and other standardized team members. During simulation of two tested IIT scenarios, each team worked actively to assess and treat two simulated patients.

Instructors rated the team performance according to the selected items in assessment of Interprofessional Team Collaboration Scale (AITCS) as the team' preintervention performance (Supplementary Table 1).<sup>8</sup> Instructors were physicians with simulation-based teaching experience, who were specialized in chest medicine, internal medicine, and family medicine. At the end of assessment, instructors led the debriefing and the introduction of Attitudes Toward Interprofessional Health Care Teams Scale (ATHCTS) (Supplementary Table 2).<sup>8</sup> Then, nurse-specific scenario/video workshops were held as mentioned below.

### 2.5. Basic and advanced workshops

Before postintervention assessments, two additional 4-hours workshops were held for teams of scenario plus video and scenario groups to establish the skill of scenario creation and video making. In the basic workshop, the structure of an IIT scenario and corresponding training video were introduced in the first 2-hours. In the second hour, the training scenario that is different from the tested IIT scenario was discussed and practiced. Then, nurse-specific scenario was created on the third hour. Finally, each other's knowledge of IPC-TE was tested with their newly created scenario on the last hour. Topics of nursing IIT scenario were chosen based on the common situation that required care from multiple health professions. The content of the IIT scenarios were worked out by the nursing students and verified by experienced nursing and medicine faculties.

The scenario development and testing process were under the supervision of the relevant instructors on the medical education. The advanced 4-hours workshop was arranged one week after basic workshop to help teams to finalize their newly created nurse-specific scenario by small group discussion and role-playing in IIT simulation setting. In addition to the similar activities as scenario group, scenario plus video group' teams need to produce 10-minutes training video before the end of the advanced workshop. Two weeks after basic and advanced workshops, all teams received the postintervention IIT simulation assessment.

### 2.6. Postinterventional (formal) IIT simulation

Finally, the postintervention IIT simulation was held to observe the changes in IPC and TE performance of all teams. After completion of two tested IIT scenarios different from preintervention assessments, all teams attended an instructor-guided interactive course group wrap-up session, intended to review the main educational objectives and encourage group reflection and discussion using the framework of "debriefing with good judgment" as described by Rudolph et al.<sup>9</sup>

### 2.7. Scenario plus video nursing group

A total of 12 nursing trainees (with their eight partners including four standardized undergraduate medical students and four standardized students of other profession), in their first year

of clinical work, were divided into four teams in scenario plus video group (Table 1). As a collaborated team, team members work together to decide which clinical relevant topics that they want to create in IIT scenario. With the assistance of nursing and medicine faculties, four nurse-specific scenarios were developed. Trainees were encouraged to use their own technology (smart phones, tablets, etc.) to film and edit their video according to previous example.

### 2.8. Scenario group

Similar to scenario plus video group, nursing teams and their interprofessional partners in scenario group developed four nurse-specific scenario without making video.

### 2.9. Control group

By contrast, control group nursing teams did not receive aforementioned additional basic and advanced workshops and continued their regular disciplines. This group served as control to exclude the advantage of the scenario and video-created workshop.

### 2.10. Measured outcomes and instructors

AITCS is a diagnostic instrument, which is designed to measure the IPC among team members. It consists of 48 statements, which considered the characteristics of IPC. Scale items represent four rationally determined subscales, which included the following: (1) Partnership: 14 items; (2) Cooperation: 15 items; (3) Coordination: 7 items; and (4) Shared Decision Making: 12 items. Respondents indicate their general level of agreement with items on a 5-point rating scale that ranges from (1) "Never" to (2) "Rarely" to (3) "Occasionally" to (4) "Most of the time" to (5) "Always". This scale produced scores from 48 to 240. For TE in our study, only two items in the partnership domain (item 2 and 7), eight items in the cooperation domain (item 3, 6, 7, 8, 10, 11, 13, and 15), one item in the coordination domain (item 7), and two items in the shared decision making domain (item 2 and 3) were included. In other words, 13 items of AITCS were used for assessment of team performance in tested nursing IIT scenario (Supplementary Table 1). The higher score indicated good efficiency of nursing team in our study.

ATHCTS is a 14-item scale that classified further into three subscales including "Quality of care delivery," "Patient-centered care," and "Team efficiency."<sup>8</sup> For the objectives of our study, Only four items in the "quality of care delivery" domain and three items in the "team efficiency" domain were included to measure the IPC and TE attitude before and after training by IIT interventional program for trainee self-assessment (Supplementary Table 2).

After the mock (preintervention) and formal (postintervention) IIT simulation, all nursing trainees completed their pre-intervention and postintervention AITCS- and ATHCTS-based assessments for group performance, personal attitude, and program-value (Fig. 1). The follow-up ATHCTS and satisfaction questionnaires were completed 4-weeks after this new interventional program. The items of satisfaction questionnaires were listed in Supplementary Table 3. Overall, the comparison of degree of improvement in the AITCS score was at the group level whereas individual improvement was assessed by self-reported ATHCTS score.

Using lectures, discussion, and training video, experienced instructors were trained to use AITCS by differentiation of team performance of selected items in AITCS and ATHCTS. Serial meetings were arranged for all instructors to gain a consensus on how to rate their agreement about the degree of nursing team's performance in "quality of care delivery, team efficiency, partnership, coordination, shared decision making, and cooperation" skills in mock and formal simulations.

### 2.11. Statistical analysis

Data were expressed as mean and SD. A significance level of  $p = 0.05$  was chosen. The magnitude of change in team AITCS and individual ATHCTS scores between preintervention and postintervention assessments were calculated and compared among the three groups. Meanwhile, the postintervention and follow-up satisfaction and follow-up ATHCTS scores were compared among groups.

## 3. RESULTS

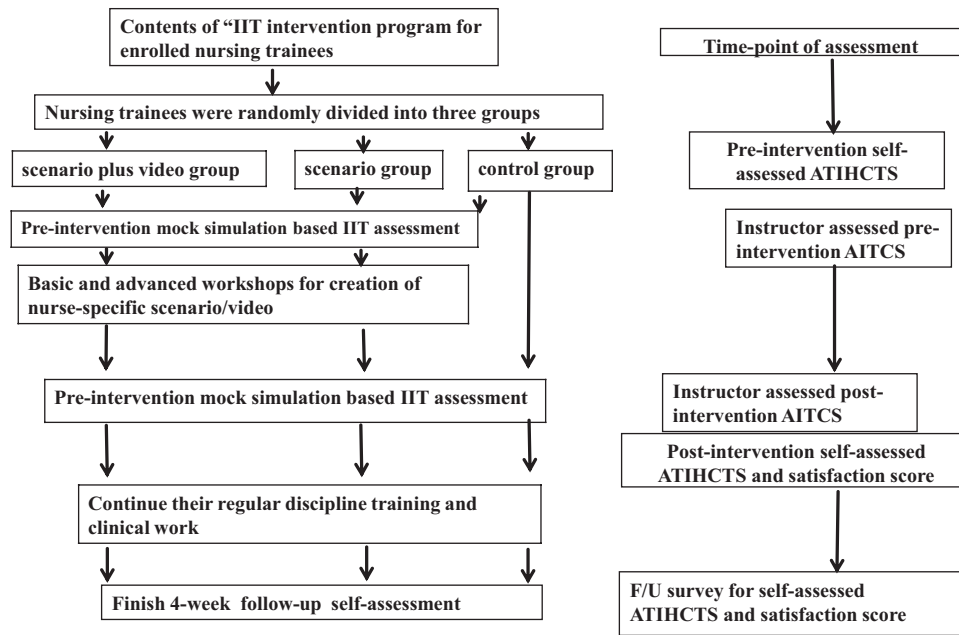
### 3.1. Participants

The final enrolled team member in each nursing team of every group had been listed in Table 1. Notably, the gender distribution and mean age were similar among the three groups (Table 2). Notably, the working experience and the number of nursing trainees having previous experience of IPC or TE education were not different among the groups (Table 2). To test the collaborated skills of nursing students, the team members in the postintervention assessment were different from preintervention assessment in the same group. For example, nursing trainees in scenario plus video group are randomized with other professional trainees in scenario plus video group and the same for scenario and control group in postintervention assessment. In mock and formal assessment, the good inter-rater reliability among instructors suggested by the acceptable kappa values (0.71, 0.67, 0.78, and 0.69) for four scenarios were observed.

**Table 1**  
Team member (n = 5) in each nursing team of three different groups

Different group	Team no.	No. of nursing trainees in each team	Other standardized partners	
Scenario plus video group	Team 1	3 nurses	One standardized medical student in each nursing team	One social worker
	Team 2	3 nurses		One respiratory therapist
	Team 3	3 nurses		One pharmacist
	Team 4	3 nurses		One radiologist
Scenario group	Team 1	3 nurses	One standardized medical student in each nursing team	One traditional medicine
	Team 2	3 nurses		One dietitian
	Team 3	3 nurses		One physiotherapist
	Team 4	3 nurses		One occupational therapist
Control group	Team 1	3 nurses	One standardized medical student in each nursing team	One psychotherapist
	Team 2	3 nurses		One medical laboratory technician
	Team 3	3 nurses		One pharmacist
	Team 4	3 nurses		One speech therapist

There are 36 nursing trainees and 24 standardized partners



**Fig. 1** The flow chart of this integrated interprofessional collaboration and team-efficiency (IIT) interventional program. Detailed time points for trainings and assessment of this prospective study.

**Table 2**  
Demographic data of nursing trainees of all groups

	Scenario plus video group	Scenario group	Control group
Number of team	4	4	4
Number of nursing trainees in each team	3	3	3
Gender (female/male, %)	90/10	88/12	95/5
Mean age (y)	31.4 ± 0.9	32.6 ± 1.1	30.5 ± 1.3
Distribution of case number of nurses with 1 to 2 or 2 to 3 years of working experience	9/3	10/2	8/4
Distribution of case number of nurses with and without previous experience of receiving IPC or TE education	3/9	4/8	5/7
Participation of preintervention mock IIT assessment	Yes	Yes	Yes
Participation of basic and advanced workshop	Yes	Yes	No
Participation of postintervention formal IIT assessment	Yes	Yes	Yes

IIT = integrated IPC and TE; IPC = interprofessional collaboration; TE = team-efficiency.

**3.2. Nursing trainees satisfaction with the new intervention program**

Notably, scenario plus video group trainee’s gave higher satisfaction score in the IPC and TE components than scenario group. Especially, scenario group’s trainees satisfy more on the IPC component whereas the nursing trainees of the scenario plus video group satisfy both on the IPC and TE components. In general, nursing trainees are satisfied with the whole intervention program (Fig. 2A, B). In comparison with control group, scenario group gave higher satisfaction score in the IPC component (Fig. 2C).

**3.3. Nursing trainees reported that new interventional program build their attitudes in the domains of “quality of care delivery” and “team efficiency”**

In comparison with control group, scenario and scenario plus video group nursing trainees reported that their attitudes in the “quality of care delivery” and “team efficiency” were significantly improved at the postintervention stage than at the preintervention stage (Fig. 3). Notably, higher percentage of increase in the postintervention attitudes was noted in scenario plus video group than that in the scenario group. Overall, the

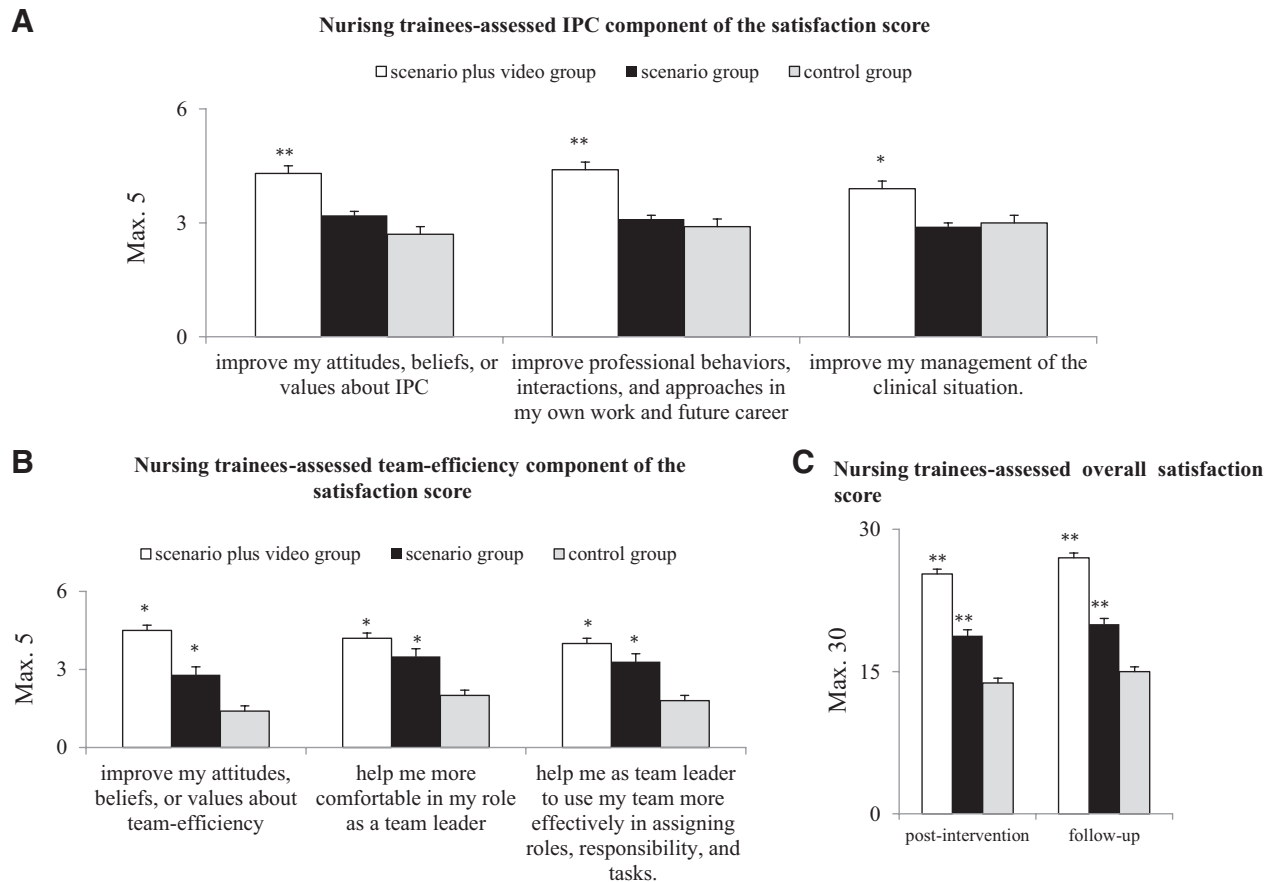
positive effect of this new intervention was noted on the “IPC-team efficiency” attitudes of nursing trainees.

**3.4. Much IPC-TE performance change was noted in intervention group than that in control group by instructor-assessment**

Overall, the postintervention IPC-TE performance of intervention (scenario plus video and scenario) groups were better than their preintervention performance (Fig. 4A). The significant improvement was noted in the “partnership,” “cooperation,” and “shared decision making” domains of AITCS. Particularly, the magnitude of improvement was greater in scenario plus video group than that in scenario group (Fig. 4B). Nonetheless, the team performance of “coordination” domain of AITCS across the three nursing groups was not significantly different between preintervention and postintervention assessments.

**3.5. Follow-up effectiveness of this new intervention program**

Figure 2C revealed that the high program-value score of scenario plus video and scenario nursing groups persisted until 4-weeks after receiving the training of this new interventional program.



**Fig. 2** The comparison of trainee-assessed program-value between groups. A, Trainees-assessed “IPC” component. B, “Team-efficiency” component, C, Overall program-value score; \*,\*\* $p < 0.05, 0.01$  vs control group. Scenario plus video/scenario groups: trainees experienced nurse-specific scenario/video creation in workshops.

Moreover, the positive effects of this new intervention on the attitudes of nursing trainees in the “quality of care delivery” and “team efficiency” domains persisted after training (Fig. 3A).

#### 4. DISCUSSION

Multiprofessional health care can be enhanced by streamlining team processes and encouraging partnerships, cooperation, coordination, and shared decision making, which are the core elements of both IPC and TE.<sup>10</sup> Implementation of team training was found to reduce surgical mortality by 18% in previous multicenter studies.<sup>1,2,11</sup> In addition to acquire knowledge and skills, a learner’s performance can be modified by simulation-based training. Most of the medical and nonmedical trainees in multicenter TE training program reported that simulation helped them to provide safer patient care.<sup>12</sup> Accordingly, with the aims of ensuring high-quality care, our study demonstrated that IIT is a feasible and successful strategy for the training of nursing trainees.

It has been found that people’s behavior during simulation mirror their actual performance and attitudes,<sup>13</sup> and it is thus concluded that simulation scenario is an ideal tool to consistently train and assess trainees’ performance.<sup>14–16</sup>

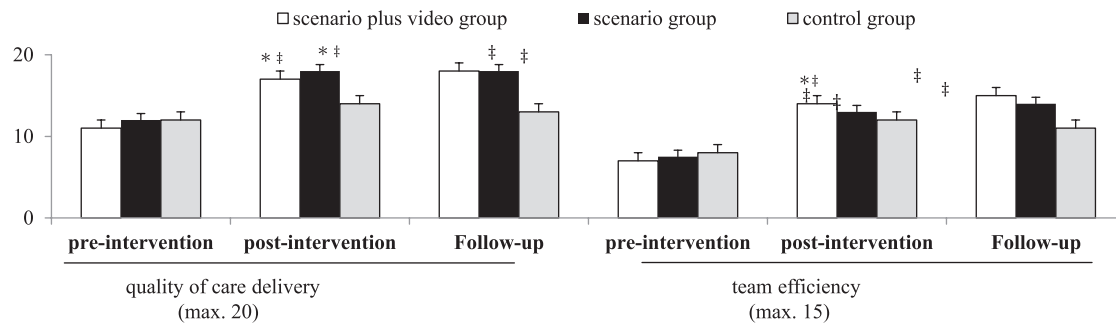
The creation of a scenario involved the processes of identification of learning need (active on reflection), scenario-based simulation activity (reflection on active), feedback and review (reflection on active), self-evaluation (analysis of personal learning needs), apply and enrobed (reflection in live situation), and

planned action (identified transferable learned skills).<sup>17</sup> Our study was designed by the pedagogy of experiential learning theory (ELT). Notably, scenario creation helps nursing trainees progress through the experiential learning cycle including the first step of concrete experience (identifying the learning need by reinterpretation of an existing experience for creation of a scenario), the second step of reflective observation of the new experience (finding any inconsistencies between experience and understanding from a scenario-based simulation activity), the third step of abstract conceptualization (reflection in the second step gives rise to a new idea through feedback, review, and self-evaluation after the activity of scenario simulation), and the fourth step of active experimentation (making a video by applying and enrobing the newly produced scenario).

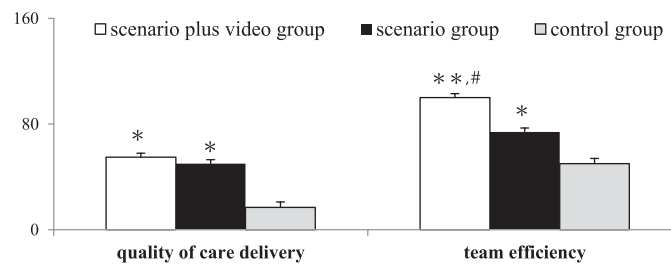
In our study, nursing trainees were divided into the following three groups: scenario (“preassessment, scenario-created workshop, postassessment”), scenario plus video (“preassessment, scenario + video-created workshop, postassessment”), and control (“pre and postassessments”). Particularly, trainees of the scenario group participate in basic and advanced workshops to create the nurse-specific IIT scenario through the first, second, and third step of experiential learning cycle. Notably, making video is the fourth step of experiential learning cycle. Scenario plus video group’s trainees participate in workshops to create scenario and video through all four steps of ELT. The control group without the experience of workshops on the IIT scenario and video creation by contrast did not go through this experiential learning cycle. Additionally, the intervention groups



### A Nursing students self-assessed attitudes toward Inter-professional health care teams scale (ATIHCTS) for attitude changes



### B Percentage of the increasing of post-intervention ATIHCTS score from pre-intervention score



**Fig. 3** The comparison of degrees of trainee' self-assessed attitudes changes between groups. A, Comparison of trainee' self-assessed attitudes toward interprofessional health care teams scale (ATIHCTS) among group. B, Percentage of the increasing of postintervention ATIHCTS score from preintervention score among group; \*,\*\* $p < 0.05, 0.01$  vs control group; #, ## $p < 0.05, 0.01$  vs scenario group.

were given more opportunities to learn and practice than the control group. ELT suggests that learning through the experiential learning cycle will significantly increase the effectiveness of training.<sup>7</sup> Therefore, it is reasonable to find that the degree of improvement was higher in intervention groups (scenario or scenario plus video groups) than in the control group.

In our study, although without additional workshops, the control group trainees gave positive response to the new elements of IIT in preintervention mock and postintervention formal assessments. Notably, the progressive improvement in postintervention performance and attitude of nursing team confirmed the effectiveness of our new educational program.

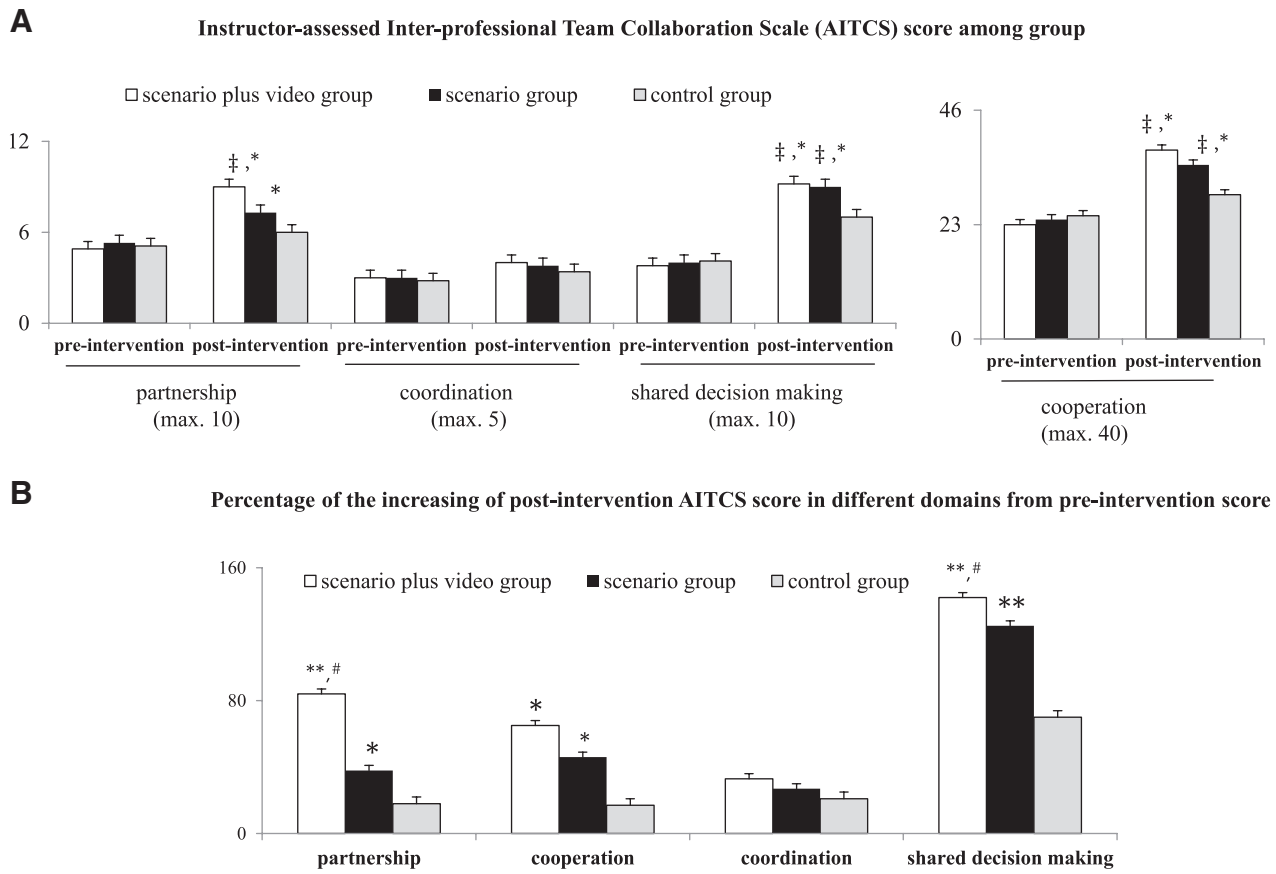
Our study was designed on the principle of diversity in complexity theory<sup>18,19</sup> by including nursing and other standardized profession in every team to create a discipline-specific IIT scenario/video with the intention of maximizing participants' diversity. In the mock and formal simulation-based IIT assessment, we developed tested cases, which required application of nurse-specific knowledge. In the process of development of a nurse-specific scenario/video, nursing trainees in the same team had the opportunity to elicit, build on, and challenge each other's ideas to create the integrated IIT scenario by meaningful interaction. For healthcare professionals, video production (including scripting, acting, etc) follows a team reflection modality to encourage creativity and judge their team performance by reviewing their scenario.<sup>20</sup> With regards to problem solving skills, healthcare professionals need to explore novel ideas and engage with new technologies in their professional lives. Hence, it is reasonable to observe that this new intervention benefit more in scenario plus video group more than the scenario group in our current study. Additionally, most of the intervention group nursing trainees gave positive response to this creative element of developing scenario and video.

In our current study, data were gathered at the first three of Kirkpatrick's four levels of training evaluation (reaction, learning, and performance).<sup>21</sup> Evaluation at level 4 (results) was beyond the scope of this study. Reaction data were collected via postintervention and follow-up questionnaires (Supplementary Table 3), and learning data were gathered via the pre, postintervention and follow-up attitudes toward ATIHCTS-based attitude self-assessment by nursing trainees. Performance data were derived from the pre and postintervention instructor-assessment of team performance in simulated IIT scenarios using the AITCS. Training and assessment for all groups was completed within a timeframe of 6-months.

In addition to creative learning activities like scenario/video creation in our study, team dynamics had been reported to be influenced by overall diverse composition of nursing and team member from nursing and other professions.<sup>14-16,22</sup> Hence, it is interesting to observe in our study that successful partnership was associated with good cooperation and shared decision making by members of nursing and other professions.

Notably, during preintervention mock and postintervention formal stimulation, the raters for the nursing trainees' performance are physician instructor. The item that we selected from ATIHCTS to assess "coordination" in a nursing team is "there is consistent communication within team members to discuss patients care." In clinical practice, physicians rather than nurses are responsible for coordination between healthcare team members. The lack of improvement of "coordination" skills after our trainings indicated that more effort is needed to adjust the nurse's role in clinical practice, and are accordingly reminders for educators to rethink strategies to balance interprofessional training.

On the contrary, in addition to three nursing trainees, the simulation team member in our study included medical students, a



**Fig. 4** The comparison of degrees of instructor-assessed performance changes between groups. A, Comparison of instructor-assessed Interprofessional Team Collaboration Scale (AITCS) score among group; B, Percentage of the increasing of postintervention AITCS score in different domains from preintervention score; \*,\*\* $p < 0.05, 0.01$  vs control group; #,## $p < 0.05, 0.01$  vs scenario group.

social worker, respiratory therapist, pharmacist, radiologist, a practitioner of traditional medicine, dietitian, physiotherapist, occupational therapist, psychotherapist, medical laboratory technician, and a speech therapist. Naturally, it is not easy for nursing team to achieve the coordination among such a diverse set of participants from other professions. This indicates that more training sessions is necessary to improve the coordination competency of our nursing trainees.

Globally, the healthcare needs are becoming increasingly complex, and health care is typically being delivered by collaboration between nursing and other healthcare professionals. This challenges the organization to equally train nursing and other healthcare workers as a team to provide quality health care across all clinical setting. Our study demonstrated that integrated IPC-team-efficiency (IIT) training is an effective way to foster IPC and TE of diverse teams comprising nursing and other healthcare professionals. Positive effects of our new intervention are evident from program satisfaction, as well as attitudes, and behavioral changes that were brought about by actively involving nursing trainees in simulation-based assessment, scenario and video creations. Future research can explore the impacts of this interventional program on clinical practice and long-lasting dynamics among nursing teams and other professional teams.

**APPENDIX A. SUPPLEMENTARY DATA**

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jcma.2018.01.013>.

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