Effects of handover education using the OPT model and SBAR protocol in nursing students: A quasi-experimental design

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Research Article

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Abstract

Background

Since most of nursing students lack clinical reasoning competency, for effective handover education, it is necessary to include a strategy to improve the clinical reasoning competency of nursing students in the practical training course of the nursing department.

Methods

This study is a quasi-experimental research design using a non-equivalent control group pretest-posttest design to verify the effectiveness of the practice education program using the OPT model and SBAR. The subjects of this study were 73 third-year students from two universities participating in internal medicine ward practice or clinical alternative practice.

Results

Homogeneity was ensured in all variables of the experimental group and the control group. The experimental group showed significantly better communication clarity \((t=-12.262, p=<.001)\), communication confidence \((t=-12.486, p=<.001)\), problem-solving processes \((t=-13.100, p=<.001)\), and team efficacy \((t=-6.197, p = <.001)\) compared to before the intervention. However, there was no significant difference between the pre- and post-intervention scores of the control group.

Conclusion

In a situation where clinical practice is difficult for nursing students, the handover education program using the OPT model and SBAR protocols can helps improve nursing students’ communication clarity, communication confidence, problem-solving process, and team efficacy. Further studies are required to confirm these results.

Introduction

As the importance of nurse handover has recently been recognized, the International Medical Institution Evaluation Committee recommends the use of standardized handover forms, education, and coaching on handovers to prevent communication errors between medical personnel and ensure patient safety [1, 2]. However, it has been reported that handover education is mostly learned through senior nurses during nursing practice or through observation of fellow nurses during handovers, and there are few cases of education on handovers using standardized forms in Korea [3, 4, 5]. Previous studies in Korea showed, only 8.4% of all respondents claimed to have received handover education as a component of an official course in the form of lectures, training sessions, and standardized educational materials. Additionally, 77.4% of small and medium-sized hospitals had no guidelines or checklists about nursing handover [3]. As such, the absence of systematic handover education in nursing education suggests the necessity of university education for handover [6].
For an effective handover, the ability to select patient information that needs handover and communication ability to efficiently transmit information is required [7]. What to do must be decided [8]. The Outcome-Present State-Test (OPT) model is one of the methods used to logically and systematically apply the nursing process by improving the clinical reasoning ability of nursing students. The nine components for clinical reasoning are 'Client in context', 'Cue logic', 'Keystone issue', 'Framing', 'Test (Testing)', 'Present-state', 'Outcome-state', 'Decision making/Intervention', 'Judgment' [9]. The thinking strategy consisted of knowledge work, self-talk, pattern recognition, juxtaposing, reframing, and reflection checks. The thinking strategy of this OPT model has well-defined nursing outcomes and provides judgments on outcomes in complex patient nursing situations. This promotes a shift in thinking so that we can rethink the role of interventions [10]. The OPT model provides a clinical reasoning framework that can improve the clinical reasoning competency of nursing students by focusing on how the patient's current health status changes to the expected outcome status [11]. As a result of previous studies, nursing students who used the OPT model thought at a higher level and thought of nursing problems from a different perspective [12, 13], the knowledge level of understanding, treatment, and nursing intervention of the patient's disease have increased, as have the habit of thinking, self-efficacy [10] and problem-solving process [12, 14] in clinical practice.

The SBAR protocol, a well-known handover tool, consists of four steps: situation, background, assessment, and recommendations related to the problem that occurred [15]. The accuracy of information transmitted during patient transfer in the medical field [16] and improvement of communication quality [17, 18], and shorter handover [19] have been recognized as best practices for delivering information about patients in critical situations [20]. However, it is pointed out that it is insufficient to capture the context of nursing when taking over shift work between nurses [21], and that it is difficult to apply it to complex clinical cases that require multifaceted clinical reasoning such as intensive care unit (ICU) patients [22]. A nurse's clinical reasoning competency is not only a driving force for making clear decisions in nursing performance but also a dynamic way of collecting and analyzing patient information, evaluating the importance of the analyzed information, and deciding alternative actions. process [23] is an important factor in handovers. However, most nursing students lack clinical reasoning skills [24] and have difficulties organizing and accurately delivering important clinical clues and data [2], they are unsure of the handover context and lack confidence [25].

Therefore, for effective handover education, it is necessary to include strategies to improve the clinical reasoning competency of nursing students in the practical training course of the Faculty of Nursing.

Therefore, this study was conducted to verify the effectiveness of training using the OPT model and SBAR protocols in nursing colleges.

**Methods**

*Research design*
This study used a non-equivalent control group pretest-posttest design to verify the effect of a practical training program using the OPT model and SBAR protocol on communication clarity, communication confidence, problem-solving process, and team efficacy with a quasi-experimental research design (Figure 1).

**Study participants**

Participants were recruited from the nursing departments of two universities located in Gyeonggi-do and Chungcheong-do, and after posting a recruitment notice on the nursing notice board and community explaining the purpose and contents of the research. All participants who agreed to participate in the study were selected from among those who understood the purpose of the study, provided written consent, and met the study selection criteria. The inclusion criteria were as follows: (1) completed the fundamentals of nursing and health assessment within the department of nursing science, (2) had no previous experience with the OPT model and SBAR protocol education, and (3) the students who participated in adult nursing clinical practice as a third-year nursing student.

The sample size was calculated as 20 for each group by setting the number of groups = 2 (u = 1), significance level (α) = .05, power (1-β) = .70, and effect size (d) = .40 as per Cohen's table (Cohen, 1988). This study recruited a total of 75 subjects - 43 in the experimental group and 30 in the control group, considering the drop-out rate; two subjects in the control group were excluded due to late attending. Thus, the final number of participants was 73 (43 for the experiment group and 30 for the control group). The experimental group was assigned to an in-school practice group using case-study, whereas the control group was assigned to students participating in the internal medicine ward of adult nursing during clinical practice (Table 1). However, the study participants were not provided with information about the group to which they belonged.

**Research tools**

**Demographic characteristics**

The demographic characteristics of the participants included sex, age, grade point average (GPA), major satisfaction, and clinical practice satisfaction. The scores on the major satisfaction and clinical practice satisfaction measurement tools ranged from 5 ('very satisfied') to 1 ('very dissatisfied'). The higher the score, the higher the satisfaction with the major and clinical practice.

**Communication clarity measurement tool**

The communication clarity measurement tool developed by Marshall et al. [26] and modified and supplemented by Cho [27] was used in this study. This tool consists of a total of 14 items that employs a Likert scale from 1 ('not at all') to 5 ('strongly agree'), with the total possible points ranging from 14 to 70. The higher scores indicating higher communication clarity. The tool reliability at the time of development was Cronbach's α .77 [27] and Cronbach's α was .95 in this study.
Communication confidence measurement tool

The communication confidence measurement tool refers to the level of confidence in reporting the clinical situation to medical staff according to the standardized SBAR protocol (situation, background, evaluation, and recommendation). The tool used in this study is a score measured on a 10-point numeric rating scale developed by Kim [28], with 0 at the left end being 'not at all confident' and 10 at the right end being 'very confident', with the total possible points ranging from 0 to 50. The higher the score, the more confident the user is in communicating. The reliability at the time of development of this tool was Cronbach's α.95 [28], and Cronbach's α was .98 in this study.

Problem Solving Process Measurement Tool

The problem-solving process measurement tool developed by Lee [29] and modified and supplemented by Woo [30] was used in this study. This tool consists of a total of 25 items: 'discovery of problems (5 items), problem definition (5 items), problem solution design (5 items), problem implementation (5 items), and problem-solving review (5 items). Each item was measured on a Likert scale ranging from 1 point for 'not at all' to 5 points for 'almost always', with the total possible points ranging from 25 to 125. The higher the score, a higher problem-solving ability. The reliability at the time of development of this tool was Cronbach's α.89 [30] and Cronbach's α was .98 in this study.

Team efficacy measurement tool

The team efficacy measurement tool developed by Marshall [26] and modified and supplemented by Kwon [31] was used in this study. This tool consists of a total of eight items and a 5-point Likert scale. The score ranges from a minimum of eight points to a maximum of 40 points, with a higher score indicating a higher sense of team efficacy. The reliability at the time of development of this tool was Cronbach's α.97 [31], and Cronbach's α was .92 in this study.

Experimental situation and data collection

The experimental treatment in this study was carried out for 2 weeks over 2 sessions from April 25 to May 20, 2022. As shown in Table 2, the experimental and control groups consisted of the same learning content and instructor guidance times for each session. The program education applied to the experimental group consisted of a total of 80 hours (including 15 hours of instructor guidance) for two weeks and was conducted as a classroom practice at Y University. The control group participated in clinical practice for a total of 80 hours (including 15 hours of instructor guidance), similar to the experimental group.

Experimental treatment

Pre-Education and Pre-Survey: On April 18, 2022, 43 people in the experimental group and 30 in the control group were given a program orientation (experimental group) and a clinical practice orientation (control group) for 60 minutes each. Regarding the contents of the pre-orientation, a pre-investigation was
conducted after explaining the introduction of practice education for each group, the pre-learning method, and the practical operation method. The experimental group consisted of a smaller group of fewer than five students who participated in discussion, cooperative learning, and self-directed learning. The program for experimental group was provided two patient cases. One was related to the basic stage respiratory disease and the second was related to advanced stage cardiovascular disease, similar to the clinical practice in the adult nursing internal medicine ward for the control group. As for the procedure for each session, as shown in Table 2, the experimental and control groups had the same practice time, a total of 80 hours for 2 weeks, including a total of 15 hours of the instructor’s guidance time for 2 weeks.

The program provided to the experimental group was advanced according to knowledge work, self-talk, pattern recognition, juxtaposing, reframing, and reflection checks, based on the thinking strategy for mastery of clinical reasoning [10].

Step 1 Knowledge work: On the first day of the experimental treatment, it is very difficult to infer nursing problems for a patient case without knowing the definition and classification of disease states or the area of nursing knowledge that provides the basis of academic knowledge for nursing providers [10]. Specifically, on the first day of the experimental treatment, 60 minutes of training was provided on the preparation of the OPT model clinical reasoning web worksheet showing the basic patient assessment method, OPT model, and causal relationship to the nursing problem. In addition, for a basic understanding of the patient's disease, a lecture related to respiratory diseases was provided for 60 minutes, and then through self-directed learning, the participants were asked to study to find detailed evidence about symptoms and signs, treatment and nursing intervention based on given respiratory cases by using various references such as books, internet and so on.

Step 2 Self-talk: On the second day of the experimental treatment, ‘self-talk’ was conducted to express thoughts through self-directed learning. In other words, self-talk or think-loudness is useful for weaving clinical reasoning webs [10]. Using the provided respiratory disease cases, each individual wrote OPT models and clinical reasoning web worksheets to speak aloud about meaningful nursing problem clues, infer causal relationships, and connect diagnostic hypotheses and their links. During the instruction time of 60 minutes, the instructor encouraged the participant to think like a nurse using guideline-based Q&A after identifying whether the participant could recognize appropriate clues to deduce the clues about key nursing problem.

Step 3 Pattern recognition and juxtaposing: On the third day of the experimental treatment, a major part of clinical reasoning is to link pattern recognition between what has been known and experienced, and what has been observed and assessed [10]. Step 3 concentrated on peer-feedback time with only team activities learning without instruction time to improve the participant’ clinical reasoning ability. Participants were asked to perform team discussions and cooperative learning activities to whether they wrote the OPT model and clinical reasoning web worksheet correctly or not through self-directed learning on the Step 2. During team discussions and cooperative learning activities were induced by focusing on the theoretical basis for deriving nursing problems and whether the assessment was made in accordance
with the theoretical basis. Through this course, we provided the opportunity to revise the OPT model and clinical reasoning web worksheet by self-discovering errors in nursing problems derived during self-directed learning. In addition, the participants participated in the nursing skill lab and practiced for three hours to nursing intervention and core fundamental nursing skills to solve the respiration patient's priority nursing problems. In other words, by directly performing the nursing intervention learned through the theory, significant patient status change patterns and changes between the subject's current status and outcome status were recognized.

Step 4 Reframing and reflection check: On the 4th day of the experimental treatment, Frame reconstruction is a thinking strategy that gives different meanings to content and context through a series of clues, decisions, and judgments. On the step 4, the instructor held a conference for 90 minutes and gave feedback on the results of writing on the OPT model and clinical reasoning web. The instructor held the conference sequentially according to the flow chart of the nine steps of the OPT model (client in context, cue logic, keystone issue, framing, testing, present state, outcome state, decision-making–intervention, judgment), and by analyzing the patient's situation and context according to each step, the patient's condition was comprehensively identified, and the opportunity was given to revised. Through reflection on the integrated process, self-correction becomes possible, and as a prospective nurse, this helps improve clinical reasoning competency and professionalism.

Step 5 Handover: On the 5th day of the experimental treatment, after 60 minutes of training on the purpose and method of using the SBAR protocol, the nursing problems and priorities of patients with respiratory disease at the basic level were identified and written on the SBAR protocol worksheet for each individual. In addition, through role-play with peers were asked to perform handover practice on the patient's situation, and then the instructor provided direct feedback for 60 minutes.

The applying of advanced cases with complex patient's condition promotes the development of clinical confidence and competency and fosters sensitivity to patterns of changes in patient status [10]. On the 6th to 10th days of the experimental treatment, cardiovascular disease patient's cases were provided as advanced cases, which is recognized to be most difficult by nursing students. The process method was the same as in Days 1–5. As a total of five steps–knowledge work, self-talk, pattern recognition and parallelization, reframe and reflection check, and handover–were repeated to promote critical and simultaneous thinking, which Nursing students’ clinical reasoning competency was also-strengthened.

**Control group**

The control group participated in 80 hours of clinical practice for two weeks (10 days) in the internal medicine ward of adult nursing at Hospital Y in Gyeonggi-do and Hospital H in Chungcheong-do in Korea. The nursing students assessed one of their patients with respiration and cardiovascular diseases and identifying the nursing problems as usual. During clinical practice, the control group comprised less than five individuals in each team and the instructor gave a total of 15 hours of instruction for two weeks, including a meeting, similar to the experimental group (Table 2).
**Ethical considerations**

This study was conducted after obtaining ethical approval from the Institutional Review Board of the researcher's affiliated university (IRB No. 1041078-202201-HR-031).

**Data Analysis**

The collected data were analyzed using SPSS statistics (version 25.0; Chicago, USA).

1) The general characteristics of the participants were analyzed as real numbers, percentages, means, and standard deviation.

2) To verify the homogeneity of the experimental group and the control group, $\chi^2$-test and t-test were performed.

3) Differences in communication clarity, communication confidence, problem-solving process, and team efficacy between the experimental and control groups were analyzed using a paired t-test.

**Results**

**General characteristics and homogeneity of experimental and control groups**

The general characteristics of the experimental and control groups are presented in Table 2. The experimental group comprised 7 (16.3%) male and 36 (83.7%) female students, and in the control group comprised 6 (20.0%) male and 24 (80.0%) female students. The average age of the participants in the experimental and control groups was 24.21 (5.43) and 27.60 (11.05) years, respectively. Regarding GPA of the experimental group, 12 (27.9%) students scored less than 3.0, 27 (62.8%) had a score of 3.0 or higher and less than 4.0, and 4 (9.3%) had scores $\geq$ 4.0. The average GPA in the control group was 5 (16.7%) less than 3.0, 22 (73.3%) 3.0 or more and less than 4.0, and 3 (10.0%) more than 4.0. In the experimental group, 18 patients (41.9%) were less than 60, 20 (46.5%) 60 or more and less than 80, and 5 (11.6%) 80 or more, and in the control group, 8 patients were less than 60. (26.7%), 13 (43.3%) of 60 or more and less than 80, and 9 (30%) of 80 or more. Satisfaction with clinical practice in the experimental group was 3 patients (7.0%) very satisfied, 20 patients (46.5%), and 20 patients (46.5%) averaged satisfaction. (33.3%), satisfaction was 11 (36.7%), and average was 9 (30.0%). There were no significant differences between the experimental and control groups for all variables of general characteristics (Table 2).

**Pre-and post-comparison of communication clarity, communication confidence, problem-solving process, and team efficacy between the experimental group and the control group**

The experimental group showed significantly better communication clarity ($t$=-12.262, $p$=<.001), communication confidence ($t$=-12.486, $p$=<.001), problem-solving processes ($t$=-13.100, $p$=<.001), and
team efficacy \( t = -6.197, p = <.001 \) compared to before the intervention. However, there was no significant difference between the pre- and post-intervention scores of the control group (Table 3).

**Discussion**

Nursing students often face situations where they lack opportunities to engage in handover because they do not directly face patients. This has particularly increased with the onset of the COVID-19 pandemic. Handover between nurses in a hospital is a process of transferring patient information, and is an essential element for nursing continuity and patient safety [32].

In this study, in a situation where nursing students did not have the opportunity to face patients directly due to the COVID-19 pandemic, a practical education program using the OPT model and SBAR protocols was found to be effective in improving nursing students' communication clarity, communication confidence, problem-solving processes, and team work.

Clear and accurate communication is essential for nurses' handovers [33]. The OPT model provides a framework for improving the clinical reasoning competency of nursing students [11], and the SBAR protocol is a structured communication method that can systematically deliver information about the patient [15]. In this study, a significant increase in the clarity of communication was observed in the experimental group to which the handover education program was applied using the OPT model and SBAR protocols compared to the control group, which only implemented traditional clinical practice. These results of this study are similar to those of another study by Collins [25], which indicated an improvement in communication accuracy by applying the SBAR protocol in handover and interdisciplinary reporting for nurses. This is also similar to the results of a study by Moseley et al. [16] that reported improvements in communication accuracy and completeness. Nursing students in the experimental group learned about the patient's condition by learning the process of judging the patient's situation, nursing diagnosis, rationale, nursing intervention, and expected results through an educational program that conceptualizes the clinical reasoning process of the OPT model. This helps them make clearer decisions.

Nurses are required to have clinical reasoning ability, a dynamic thinking process to determine nursing priorities, by analyzing patient information [23]. High-level clinical reasoning ability can be cultivated through the OPT model [11], and communication confidence can be increased by facilitating a change in thinking through an accurate analysis of the patient by the nurse in charge [10]. In this study, the experimental group showed a significant increase in communication confidence compared to the control group. These results suggest that the quality of communication was improved by applying the SBAR protocol to nurses [34], and clinical competency and communication confidence improved by applying the OPT model. This result is similar to that of a previous study [14]. In addition, the SBAR protocol step-by-step education program based on Bloom's Revised Taxonomy for nursing students was found to improve communication ability in another study [35]. Communication confidence is an important part of accurate communication in the handover. By using the structured communication method of the SBAR
protocol for complex patients, clarity of communication can be secured, and confidence in communication can be increased through an accurate understanding of disease processes, current nursing problems, and possible problems in the future.

In this study, the experimental group showed a significant improvement in problem-solving processes compared to the control group. This result is similar to the result of a study by Seo and Eom [14] that reported an improvement in nursing students’ problem-solving processes after implementing a simulation nursing education program using the OPT model. In addition, the patients in the experimental group, who applied the SBAR protocol to 106 patients with infectious diseases to improve the problem-solving process, had better social status, development prospects, and mental health compared to the control group. The study by Ji et al. [36] also showed significant improvement in professional recognition. Thus, the OPT model helps apply the knowledge acquired based on the provided patient information to the problem-solving process by focusing on nursing outcomes [37]. In addition, the SBAR protocol facilitates problem-solving through accurate information delivery [19] and improvement in quality communication [17] through a four-step process involving analyzing the situation, background, assessment, and recommendation. This can help improve the handover process. In this study, the experimental group could also improve their problem-solving processes by systematically identifying patient information through the OPT model and organizing the information to be provided to others through the SBAR protocol.

This study is meaningful in that it developed a handover education program using the OPT model and SBAR protocols in a difficult situation in clinical practice and confirmed its effectiveness. However, there are some limitations that must be acknowledged. First, because this study was conducted in a limited clinical practice environment due to COVID-19, the study results cannot be generalized. The OPT and SBAR protocols were applied to only those students who wished to participate in the study and were recruited through the bulletin board of the College of Nursing; however, it was a non-randomized controlled trial, and there was a possibility of selection bias.

**Conclusion**

The SBAR protocol can improve the accuracy and quality of communication during handovers, and the OPT model can improve the clinical reasoning reversal of nursing students. In a situation where clinical practice is difficult for nursing students, the handover education program using the OPT model and SBAR protocols can help improve nursing students' communication clarity, communication confidence, problem-solving process, and team efficacy. Further studies are required to confirm these results.

In future research, repeated experiments should be performed with randomly selected participants. Education and data collection were conducted during the practice period in the internal medicine ward of adult nursing for third-year nursing students. However, further research on whether the same effect is effective in special ward environments, such as emergency rooms and intensive care units, is needed. It is necessary to study whether it is helpful for continuous improvement of the effectiveness of
communication clarity, communication confidence, problem-solving processes, and team efficacy of prospective nurses by including OPT and SBAR protocols in the nursing curriculum in the long term rather than a one-time program.

Abbreviations

OPT: Outcome-Present State-Test

SBAR: Situation, Background, Assessment, Recommendation

ICU: intensive care unit

GPA: grade point average

Declarations

Ethics approval and consent to participate

This study was conducted after obtaining ethics approval from the Institutional Review Board of Chung-Ang University (IRB No. 1041078-202201-HR-031). All methods were performed in accordance with the relevant guidelines and regulations. In addition, we conducted the study after obtaining written consent from all study participants.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available because all authors do not consent to disclosure but are available from the corresponding author on reasonable request.

Competing interests

All the authors declare that they have no competing interests.

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Author’s contributions

YH. S. and JW. A. conceived and designed the study, K. J. analysed the data, and YH. S. and K. J. wrote the manuscript. YH. S. recruited the study participants and collected the data. JW. A. and K. J. were
involved in the interpretation of the data and contributed to the manuscript preparation. YH. A. and K. J. were involved in title selection, data analysis, and drafting of the manuscript and approved the final manuscript. All authors have read and approved the final version of the manuscript.

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**Tables**

Table 1. Intervention of the experimental group and the control group
<table>
<thead>
<tr>
<th>Program Topics</th>
<th>Week 1 (Hr)</th>
<th>Week 2 (Hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exp. - Program orientation and Prior Education: OPT model and Clinical Reasoning Web Education</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Step 1: Knowledge work**

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Lecture</th>
<th>OPT model and clinical reasoning web-based education</th>
<th>1</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Respiratory diseases</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Self-directed learning</td>
<td>Pre-learning of respiratory disease</td>
<td></td>
</tr>
</tbody>
</table>

**Step 2: Self-talk**

| Self-directed learning | Understanding the patient situation and recognizing nursing problems using the OPT model | 1 | 1 |

**Step 3: Pattern recognition & Juxtaposing**

<table>
<thead>
<tr>
<th>Discussion and cooperative learning</th>
<th>Understanding the patient situation and recognizing nursing problems using the OPT model</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Web-based clinical reasoning of nursing problems</td>
<td></td>
</tr>
</tbody>
</table>

**Step 4: Reframing & reflection**

<table>
<thead>
<tr>
<th>Discussion and cooperative learning</th>
<th>OPT Model and Clinical Inference Web-Worksheet feedback</th>
<th>3</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nursing intervention and core basic nursing skills practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Learning medical terminology</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step 5: Handover practice**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Education on SBAR protocol</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-directed learning</td>
<td>SBAR protocol pre-learning</td>
<td></td>
</tr>
<tr>
<td>Discussion and cooperative learning</td>
<td>Handover practice and feedback through role play</td>
<td>1</td>
</tr>
</tbody>
</table>

Week 2: Repeat steps 1 to 5 using advanced cases of patients with cardiovascular disease

Cont. Week 2 clinical: Orientation of clinical practice on medical ward | 1 |
Practice

<table>
<thead>
<tr>
<th>Core basic nursing practice</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-learning and initial assessment after selecting a case study patient</td>
<td>2</td>
</tr>
<tr>
<td>Deriving patient’s nursing problems, learning medical terminology and practicing handover</td>
<td>2</td>
</tr>
<tr>
<td>Meeting: Presentation of case study and feedback</td>
<td>3</td>
</tr>
</tbody>
</table>

Exp.=experimental group; Cont.=control group; Hr=hour; OPT= Outcome-Present-State-Test; SBAR= Situation-Background-Assessment-Recommendation.

*The professor’s instruction time was 15 hours each for the experimental and control groups for 2 weeks.

Table 2. Homogeneity test of general characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Exp. (n=43)</th>
<th>Cont. (n=30)</th>
<th>χ² / t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>7 (16.3)</td>
<td>6 (20.0)</td>
<td>0.683</td>
<td>0.760</td>
</tr>
<tr>
<td>Women</td>
<td>36 (83.7)</td>
<td>24 (80.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>24.21 (5.43)</td>
<td>27.60 (11.05)</td>
<td>12.204</td>
<td>0.128</td>
</tr>
<tr>
<td>Average GPA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 3.0</td>
<td>12 (27.9)</td>
<td>5 (16.7)</td>
<td>1.640</td>
<td>0.650</td>
</tr>
<tr>
<td>3.0–3.9</td>
<td>27 (62.8)</td>
<td>22 (73.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0 or higher</td>
<td>4 (9.3)</td>
<td>3 (10.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of Satisfaction of major</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 60</td>
<td>18 (41.9)</td>
<td>8 (26.7)</td>
<td>4.295</td>
<td>0.117</td>
</tr>
<tr>
<td>60–79</td>
<td>20 (46.5)</td>
<td>13 (43.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 or higher</td>
<td>5 (11.6)</td>
<td>9 (30.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of Satisfaction of clinical practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Very satisfied</td>
<td>3 (7.0)</td>
<td>10 (33.3)</td>
<td>8.509</td>
<td>0.140</td>
</tr>
<tr>
<td>Satisfied</td>
<td>20 (46.5)</td>
<td>11 (36.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>20 (46.5)</td>
<td>9 (30.0)</td>
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</tbody>
</table>

Cont.=control group; Exp.=experimental group; GPA=Grade Point Average; SD=standard deviation.

Table 3. Differences between pretest and posttest in experimental group and control group
<table>
<thead>
<tr>
<th>Variables</th>
<th>Pretest</th>
<th>Posttest</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication clarity</td>
<td>Exp. 43.56 (8.59)</td>
<td>61.51 (5.72)</td>
<td>-12.262</td>
<td>&lt;.001</td>
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<tr>
<td></td>
<td>Cont. 61.70 (9.02)</td>
<td>60.67 (10.34)</td>
<td>0.417</td>
<td>0.680</td>
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<tr>
<td>Communication confidence</td>
<td>Exp. 15.77 (8.26)</td>
<td>35.98 (7.96)</td>
<td>-12.486</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Cont. 34.07 (8.73)</td>
<td>33.30 (8.85)</td>
<td>0.359</td>
<td>0.722</td>
</tr>
<tr>
<td>Problem solving process</td>
<td>Exp. 70.53 (13.19)</td>
<td>101.09 (10.27)</td>
<td>-13.100</td>
<td>&lt;.001</td>
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<tr>
<td></td>
<td>Cont. 92.63 (12.97)</td>
<td>91.73 (13.11)</td>
<td>0.394</td>
<td>0.696</td>
</tr>
<tr>
<td>Team efficacy</td>
<td>Exp. 28.05 (6.03)</td>
<td>35.28 (5.85)</td>
<td>-6.197</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Cont. 33.93 (5.78)</td>
<td>34.80 (5.57)</td>
<td>-0.752</td>
<td>0.458</td>
</tr>
</tbody>
</table>

Cont.=control group; Exp.=experimental group.

**Figures**

![Figure 1](Study process)

**Figure 1**

Study process