

## Development and validation of a chronic disease nursing education program for enhancing clinical reasoning ability in undergraduate nursing students

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### ABSTRACT

This study developed a chronic disease nursing educational program to enhance clinical reasoning in nursing students and then tested it for effectiveness. Before and after completing the program's five 90-minute sessions, 54 second-year students in a four-year nursing degree program at a university completed a self-administered survey to evaluate their clinical reasoning ability. The measure used was the Scale to assess the Critical Thinking of Clinical Nurses. Results showed significant improvement in total scores and in the reasoning subscale scores, indicating the overall effectiveness of the program. However, no significant improvement was found in any of the measure's subscales other than reasoning. Those skills could, potentially, be enhanced through clinical practicum.

Keywords: undergraduate nursing students, clinical reasoning, exercise lesson-based educational program

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### INTRODUCTION

With the passage of the Act on Assurance of Work Forces of Nurses and Other Medical Experts in Japan in 1992, the number of nursing universities has been growing at a rate of about 10 schools annually. As of May 1, 2018, that number had reached 263.<sup>1</sup> The Japanese Nursing Association<sup>2</sup> has proposed that training to develop clinical reasoning ability should be added to the basic nursing curriculum for nurses to be able to provide appropriate support when facing diverse and complex cases in their care.

According to Ritter et al<sup>3</sup>, nurses' clinical reasoning is important in four ways: for 1) understanding the significance of data; 2) identifying and diagnosing actual or potential patient problems; 3) making clinical decisions to assist in problem resolution; and, 4) achieving positive patient outcomes. The Ministry of Education, Culture, Sports, Science and Technology<sup>4</sup> mandates the inclusion of clinical reasoning in nursing undergraduate programs, as a skill valuable in nursing practice, based on learning the mechanics and functions of the body that are necessary to understand humans physiologically and psychologically. However, in the Japanese undergraduate

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Received: September 9, 2019; accepted: November 14, 2019

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nursing curriculum, it is not treated as a separate subject.

Previous studies<sup>5-8</sup> of intervention programs for enhancing clinical reasoning in nursing undergraduates have mainly been published in Europe and the US. No similar studies appear to have been conducted in Japan. However, clinical reasoning is a skill habitually used in nursing practice<sup>9,10</sup> that can be learned before entering practice.<sup>11</sup> Therefore, it should be more actively taught as a part of undergraduate nursing programs at Japanese universities.

Studies of interventions to enhance clinical reasoning in nursing students have included trials of various approaches, such as working with scenario-based case studies,<sup>8,12</sup> exercises using a second-generation simulation mannequin,<sup>6</sup> and scenario-based simulations.<sup>13,14</sup> However, as testing for intervention effectiveness has mainly been performed retrospectively, more intervention studies are needed with designs that will provide higher-quality evidence. Thus, although clinical reasoning ability is an important skill to acquire for students in undergraduate nursing programs, no Japanese studies testing potential training approaches have been conducted and few of the studies published overseas have provided high-quality levels of evidence.

This study aimed to develop a chronic disease nursing training program for enhancing clinical reasoning in undergraduate nursing students consisting of five 90-minute sessions and to test its effectiveness using a pre-post intervention study design. The study hypothesized that pre-post comparison of scores on the Scale to Assess the Critical Thinking of Clinical Nurses for nursing students completing the five-session program would show improvement in clinical reasoning ability.

## MATERIALS AND METHODS

### *Subjects*

Targeted participants consisted of the 83 second-year students in the nursing department of a four-year university who had completed self-management nursing theory in the previous term. Of them, 54 consented to participate in the study.

### *Interventions*

Training was provided in five 90-minute sessions regarding the nursing care process in cases of patients with chronic stage type 2 diabetes. As to format, session 1 was a lecture, sessions 2 through 4 consisted of group work, and in session 5, the groups recapped their work in presentations. The goal of session 1 was to deepen understanding of how a normally healthy person develops type 2 diabetes and what the recovery process involves. The goal of session 2 was to present a case of a type 2 diabetes patient and have students perform nursing assessments. The goal of session 3 was for students to integrate the assessment results into a diagram to clarify the nursing care problems and then determine an approach to care. The goal of session 4 was for students to draft a nursing care plan based on that approach. Finally, in session 5, each group was asked to share their results by reporting on their work during sessions 2 through 4.

As to the teaching materials used in each session, that used in session 1 covered the functions of a healthy pancreas, decline in one of those functions, insulin production, consequences of allowing this decline to progress, recovery process, conditions on which the recovery process depends, and indicators used to confirm recovery. In session 2, the case of a patient who developed type 2 diabetes in late middle age owing to poor diet and lack of exercise was presented, and students were asked to record on a form their assessment of the patient's condition and then provide an assessment using Gordon's 11 functional health patterns.<sup>15</sup> Form headings reflected the steps generally involved in a developing case to help students perform an assessment. In session

3, students were asked to determine the nursing care problems and an approach to use to address them by identifying keywords from the assessment, which would capture an overall picture of the patient, and using them to create a descriptive diagram. In session 4, students were asked to draft an individual nursing care plan for the patient based on their approach to addressing the nursing care problems. In session 5, all of the participants completing the program were given a hardcopy summary of each group's work, and each group was asked to share their work in a presentation to the other students.

#### *Measurement Instruments*

Measurement was performed using the 33-item seven-point response version of the Scale to assess the Critical Thinking of Clinical Nurses.<sup>16</sup> The seven-point Likert scale consists of "1= completely disagree," "2= disagree," "3= slightly disagree," "4= neither agree nor disagree," "5= slightly agree," "6= agree," and "7= strongly agree". To calculate the total score, all items are summed (range 33–231). The reliability and validity of the scale has been demonstrated for use in nursing students. It consists of six subscales: reasoning (8 items; range: 8–56), open-mindedness (7 items; range: 7–49), perseverance (5 items; range: 5–35), reflection (5 items; range: 5–35), creativity (5 items; range: 5–35), and intuition (3 items; range: 3–21). Higher scores indicate better critical thinking skills. In the present study, the scale was used operationally to measure clinical reasoning ability. Permission for its use was obtained from its authors.

#### *Data Collection*

On the first day of the five-session program, the researchers asked the 83 second-year students majoring in nursing at a four-year university to complete a self-administered survey. A written explanation and a verbal summary of the study and explanations of the ethical considerations were provided. Students consenting to participate were asked to drop their completed survey in a collection box set up in an office on the university campus. The second survey was distributed at the end of session 5. Similarly, students were asked to drop their completed surveys in the same collection box. To identify each student's first and second surveys, they were instructed to write a four-digit number of their choosing on both forms.

#### *Statistical Analyses*

Paired *t*-tests were performed on the pre- and post-program scores. The significance level was set at  $P < 0.05$ . Analyses were carried out using the Japanese version of IBM SPSS Statistics Version 22 (IBM, Armonk, NY, USA).

#### *Ethical Considerations*

Participants were recruited with verbal and written explanations of the study's purpose and methodology. Those who consented to participate were asked to complete the self-administered surveys and drop them in a collection box in the nursing school office. It was explained to the students that anyone not participating in the study would not be disadvantaged in any way and that they did not have to complete the surveys. However, all of the students were included in the program, regardless of whether they participated in the study or not, because program attendance was required as part of the nursing program. Regarding the obligation to maintain the confidentiality of participant information and data, the ethical principles of the Declaration of Helsinki were followed.<sup>17</sup> The ethics committee of Nagoya City University Graduate School of Nursing, Nagoya, Japan, provided approval for the study (approval no. 18004-3).

## RESULTS

### *Study Subjects and Baseline Characteristics*

Of the 83 second-year students taking the program at a four-year university who were asked to participate in the study, 54 completed the first survey. At the end of the program’s five sessions, the second survey was distributed, and responses were again received from all 54. All participants were female and the average age was 20. During the program’s five sessions, there were no absences. Participants were assigned into 13 groups of 6 and one group of 5 students. The program was held from October 15 to December 3, 2018.

### *Intervention Outcomes*

Table 1 shows the within-group comparison of scores for the total scale and for each subscale before and after the intervention. Paired t-tests showed a significant improvement in critical thinking scores within groups, compared with the baseline scores ( $p < .05$ ). Scores for the reasoning subscale also significantly improved ( $p < .01$ ).

**Table 1** Evaluation index and change before and after intervention (within-group comparisons)

| Evaluation index        | Coursework group (n = 54) |            | Paired t-test | Effect level |
|-------------------------|---------------------------|------------|---------------|--------------|
|                         | Before                    | After      | p-value       | Cohen’s d    |
| Critical thinking score | 156.3±15.4                | 159.4±16.4 | .045          | .195         |
| Reasoning score         | 30.3±5.0                  | 32.3±5.3   | .008          | .388         |
| Open-mindedness score   | 39.1±4.5                  | 38.6±4.3   | .264          | .114         |
| Perseverance score      | 25.3±3.6                  | 26.2±3.6   | .067          | .250         |
| Reflection score        | 26.3±3.8                  | 26.2±4.1   | .836          | .025         |
| Creativity score        | 24.0±3.3                  | 24.6±3.2   | .206          | .185         |
| Intuition score         | 11.3±2.5                  | 11.6±2.5   | .369          | .120         |

Note: Numbers appearing in the table show average values (standard deviation).

## DISCUSSION

The results showed significant pre- to post-intervention improvement in critical thinking scores and in scores for the reasoning subscale, indicating that the clinical reasoning ability of the participating students improved as a result of the program. The program consisted of five 90-minute sessions, and the content of each will be discussed.

In session 1, a handout was used that explained the process by which a healthy person develops type 2 diabetes and what the recovery process involves. Research<sup>18</sup> has suggested that teaching materials used in nursing education should include the factors influencing change. The use of educational tools to increase knowledge can enhance clinical reasoning.<sup>19</sup> Further, good clinical reasoning involves the correctness of not only the reasoning process but also the theory on which the reasoning is based.<sup>20</sup> The handout used in this session summarized the information students would need to develop their type 2 diabetes patient case. This handout could be described as an educational tool presenting the theoretical progression from health to type 2 diabetes and vice versa. Thus, using this handout in the development of their case may have contributed to enhancing their clinical reasoning ability, mainly by improving their theoretical thinking.

In sessions 2 through 4, the students were asked to do group work during which they

developed a nursing care process based on a case and then recorded it on the prescribed form. Previous research<sup>21</sup> has suggested that using case-based simulations may enhance nursing students' clinical reasoning ability. The mutual cooperation involved in group work may further enhance clinical reasoning ability.<sup>5</sup> Moreover, verbalizing one's thought process may promote understanding of one's reasoning.<sup>6</sup> Thus, the use of group work to develop a nursing process for a case in this intervention program may have been an effective way to enhance students' clinical reasoning ability.

In session 5, the students presented the results of their group work to the class. Previous research<sup>22</sup> has shown that comparing oneself with others, for example, picking up on others' strengths from their experiences or learning skills from others, is necessary to bolster self-confidence in one's clinical reasoning. In the present program, by having each group share their work with the class, the students were able to compare their group's work with that of the others. Thus, through discovery of the strengths of other groups' ideas, their own understanding of how to reason clinically may have improved.

Research<sup>13</sup> has suggested that clinical reasoning in nursing students follows an eight-stage cycle of discovering the patient situation, collecting cues/information, processing the information, identifying nursing problems/issues, establishing goals, taking action, evaluating outcomes, and reflecting on the process and new learning. As the learning in this program took place in a classroom, students were not able to "take action" or "evaluate outcomes," but their reasoning did include the five stages of discovering the patient situation, collecting information, processing the information, making a plan, and reflecting on the process and new learning. As a result, overall, this program could be considered an effective way to enhance clinical reasoning ability in nursing students.

When considering training to improve clinical reasoning ability, it is important to take into consideration the cost-benefit of the approach.<sup>11,14</sup> This program consisted of only five 90-minute sessions; thus, it could be integrated into a curriculum and implemented it at low cost. Accordingly, the program could be actively integrated into the undergraduate nursing curriculum going forward.

Meanwhile, the results showed no improvement in the subscale scores for open-mindedness, perseverance, reflection, creativity, and intuition. Research<sup>23</sup> has suggested that clinical reasoning improves through behaviors such as reflecting on patient response and nursing practices. As this program was a classroom-based case development exercise, no nursing practice was involved. Therefore, it is possible that these scores could, potentially, be improved through clinical practicums. Thus, more research would be needed in future to examine changes in clinical reasoning ability before and after completing a clinical practicum. This research was conducted in lectures and exercises that one of the researchers is in charge of the curriculum. That may have influenced the study results.

## CONCLUSION

In this study, a five-session training program for enhancing nursing students' clinical reasoning ability was developed and tested for effectiveness. Results showed improvement within groups in critical thinking ability and in reasoning, one of its components. Overall, the program was considered reasonably effective. However, no improvement was shown in the critical thinking component factors other than reasoning. Nursing practicums were suggested as a potential source of improvement for those other factors.

## ACKNOWLEDGEMENT

We are grateful to all of the participants of the study.

## AUTHOR DISCLOSURE STATEMENT

None of the authors have conflicts of interest to declare. This work was supported by JSPS KAKENHI grant number 17K12220.

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