Impact of concept mapping on the development of clinical judgment skills in nursing students

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Abstract
Helping nursing students learn to use sound clinical judgment has become a primary goal of nursing programs. Concept mapping has been shown to promote meaningful learning and critical thinking. The purpose of this study was to explore how junior baccalaureate nursing students perceive the effect of a concept mapping educational strategy on the development of clinical judgment skills. Concept mapping was taught using an adaptation of Gerdeman, Lux, and Jacko’s (2013) Clinical Judgment Self-Evaluation Rubric (CJSR) that uses simplified wording. One hundred six students developed concept maps and completed a CJSR rubric to evaluate their concept maps each week during their clinical experience in a medical–surgical nursing course. The CJSRs were reviewed and evaluated by the clinical instructors. Students also completed a clinical evaluation tool at the end of the course. First, students did a self-evaluation, and then, the clinical instructor evaluated them. A descriptive data analysis was performed after the course was completed. The findings revealed that the use of concept mapping provided an interactive way to foster the growth of clinical judgment skills in nursing students. © 2016 Organization for Associate Degree Nursing. Published by Elsevier Inc. All rights reserved.

Introduction
Helping nurses and nursing students learn how to think critically and use sound clinical judgment has become a primary goal of nursing education programs, nationally and internationally (American Association of Colleges of Nursing (AACN), 2014; Institute of Medicine (IOM), 2011; National League of Nursing (NLN), 2011). Because of the complexities of patient care situations, student nurses need to develop the ability to respond appropriately to illness as experienced by the patient and family, to the burdens of caring for multiple patients with frequent interruptions, to information and privacy requirements, to changing levels of care, and to complex admission and discharge criteria (Lasater, 2007; Tanner, 2006). According to Boghossian (2012), critical thinking is purposeful conceptual thinking that includes the processes of interpretation, evidence-based analysis, contextualization, and self-correction and...
regulation. Applying critical thinking to care situations necessarily means utilizing the fundamental problem-solving skills of nursing, traditionally expressed in terms of assessment, diagnosis, intervention, and the evaluation of nursing intervention effectiveness (Tanner, 2006). Both critical thinking and clinical judgment involve active questioning of assumptions, dialog (in this case with teachers, patients, staff, and others), interaction, and continual reflection and self-evaluation (Benner, Sutphen, Leonard, & Day, 2010; Victor-Chmil, 2013).

Concept mapping has been found to be effective in promoting critical thinking and meaningful learning by enhancing the active engagement of students in the organization and interpretation of data, the comparison and correlation of relevant information, and the synthesis of ideas (Hussain & Shamsuar, 2013; Schuster, 2012). Concept maps provide a graphic or pictorial arrangement of a specific subject matter in terms of relevant concepts, shown as shapes, and the interrelationships of concepts, shown as connecting lines (Novak, 1998). The mapping can also be used as a formative assessment tool that identifies relevant information about learners’ depth of understanding (Daugherty, Custer, & Dixon, 2012; Lee et al., 2013). Concept maps have been found to enable students to recognize how factors are connected in patient care and to anticipate problems (Harrison & Gibbons, 2013).

Recognizing the close relationship between critical thinking and clinical judgment, recent research has focused on identifying better means of defining, measuring, and improving clinical judgment through teaching techniques that emphasize critical reasoning such as concept maps. In a survey of the literature on clinical reasoning, Tanner (2006) proposed that clinical judgment is the fundamental basis for nursing knowledge of the patient, the clinical context/culture, and their own capabilities and biases.

Based on these principles and Lasater’s (2007) rubric for measuring clinical judgment, Tanner (2006) developed the Clinical Judgment Model (the TCJM), with four phases in clinical judgment: noticing, interpreting, responding, and reflection (Gerdeman, Lux, & Jacko, 2013). Clinical judgment can be developed by leveraging the learning advantages of interactive reflection and the guidance offered by a nursing domain-specific rubric like Tanner’s. In fact, Lasater (2007) developed her Lasater Clinical Judgment Rubric after finding that the only previous instrument for measuring clinical judgment relied on self-report, with no rubric to guide the clinical thinking process.

Using a pretest–posttest design, Chen, Liang, Lee, and Liao (2011) conducted a systematic study on the effects of concept mapping on critical thinking and learning among nursing students. The 47 students in the experimental group were introduced to concept maps in the first week of class. They used concept maps to examine case studies and course content. The control group (n = 48) used traditional teaching methods. Critical thinking was measured based on Cheng et al.’s Critical Thinking Scale, which included five subscales: inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments. In this study, using concept maps was found to significantly enhance critical thinking and learning. Chen et al. noted that incorporating reflection in the course often led to the difference between taking a “surface approach” to learning and taking a “deep approach” that looked for patterns, checked evidence against conclusions, and examined logic, although the positive correlation between critical thinking and reflection was relatively weak, and thus, the findings were inconclusive (p. 469).

Other researchers have assessed the effectiveness of concept mapping on both critical thinking and clinical judgment. Bridging these two areas has required integrating both critical thinking and clinical judgment. For example, Gerdeman et al. (2013) conducted a pilot study of an educational innovation that utilized concept mapping as a teaching strategy to develop the critical thinking and clinical judgment skills of junior undergraduate nursing students. A concept mapping rubric, the Clinical Judgment Self-Evaluation Rubric (CJSR), designed based on Tanner’s (2006) TCJM, was used to guide a small sample of students (n = 8) in the construction of concept maps describing clinical cases involving chronic obstructive pulmonary disease (Fig. 1). Students, both individually and in groups, developed maps and evaluated the concept mapping exercise under the guidance of instructors. Students provided feedback on the rubric and its impact on their understanding of the clinical situation and their clinical judgment skills. They concluded that concept maps provide students with a tool to understand the relationship between client data, care delivery, and developing clinical judgment.

Although many of the students who completed the survey in the pilot expressed the view that the language used in the assessment tool was easy enough to understand, the authors did recommend that future use of this teaching strategy should shorten the wording and descriptions for each stage of evaluation to promote increased ease of use for the student in the growth of clinical judgment skills (Gerdeman et al., 2013).

**Purpose**

The purpose of this study was to explore how junior baccalaureate nursing students perceive the effect of concept mapping on the development of clinical judgment skills. This study utilized an adaptation and simplification of Gerdeman et al. (2013) CJSR with a larger sample size (106 vs. 8).

**Methods**

**Sample**

Participants consisted of a convenience sample of third-year baccalaureate nursing students who were enrolled at a
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university in the northeast of the United States in a medical–surgical nursing course. This course was offered at the end of the junior year. Of the 110 students contacted, 106 (96%) voluntarily agreed to participate in the study. None of the participants had previous experience in the use of concept mapping. The sample included 76 (71%) students who self-reported as White, 19 (18%) as African American, 8 (8%) as Asian, and 3 students (3%) who did not identify their ethnicity. Ninety-four (89%) of the participants were female, and twelve (11%) were male. The participants’ ages ranged between 21 and 37 years.

Procedures

The study was approved by the institutional review board for the protection of human subjects. Participants were provided with detailed verbal and written explanations of the study that made clear their voluntarily choice of participating or withdrawing from the study at any time. All participants provided written informed consent. Participants were reassured that the data were confidential. To insure confidentiality of data, identification codes were given to the participants who used them in the demographic survey and the clinical judgment tool. Only the researcher had access to the list of the participants and their specific codes.

Training

Prior to the course, all clinical instructors underwent a 2-hour refresher/training on concept mapping. This training was facilitated by the research assistant (RA). During the first 2 weeks of the course, the RA provided instruction to the students on concept mapping and the correct use of the CJSR. The RA was a nursing faculty member who was experienced in the use of concept mapping in classroom and clinical settings. Training consisted of two sessions per week, each lasting 3 to 4 hours. Teaching methods included case studies on hypertension, diabetes, stroke, and asthma in a human–patient simulation laboratory. Each student made one concept map during each session for a total of two per week. Training classes began with an individual activity such as development of a concept map for about 1 hour. This was followed by a peer activity for another hour to share ideas and provide feedback on the concept maps. The final portion of the session (1–2 hours) was dedicated to whole group discussion during which students presented their findings and the RA provided verbal feedback to individual students in front of the class so that all could benefit from the feedback and enhance their learning from the activity.

During each training session, participants were given case study scenarios and asked to prepare nursing care plans using concept maps, which included objective and subjective assessment information, possible diagnostic tests and results, laboratory values, important medications, possible treatments and interventions, and cultural/psychosocial issues. The RA facilitated the concept mapping training by providing guidance and feedback on the assessment data, the prioritization of information, the appropriateness of the interventions, and the thought process used by each student. During the discussions, the RA helped students to apply their individual concept maps to different situations in their clinical practice. The RA facilitated students’ construction of concept maps for patients with common disorders of diabetes, asthma, and hypertension. The RA also instructed students on the use of CJSR. During the training, students used the CJSR to guide them with appropriate interventions and clinical judgment skills. Understanding and evaluating the concept mapping rubric thus constituted a major focus of the training. The RA helped students learn how to evaluate themselves using the rubric and provided examples of what would constitute each level of performance in the rubric.

Posttraining Clinical Work

For the remainder of the course, students were exposed to clinical experiences during which they provided care to patients and received instruction from hospital-based clinical instructors. These instructors guided them in the creation of a concept map each week based on the students’ clinical experiences. Each student provided patient care at a hospital 2 days a week for a total of 12 hours per week for 12 weeks. Based on the diagnosis of his or her patient, each student completed one concept map each week. This provided opportunities for each student to critically assess and evaluate multiple clinical situations and allowed each student to understand the rationale behind successful interventions for a variety of diagnoses. To insure that students were exposed to a variety of experiences, the students identified new learning objectives each week in collaboration with their clinical instructors.

Data Collection and Analysis

The authors contacted the primary rubric originator (Gerdeman) and received permission to reduce the concept mapping/clinical judgment rubric’s wording. Neither the researcher nor the RA who collected the data was involved in teaching the medical–surgical nursing course.

Data were collected in part from scoring sheets that relied on the CJSR. For each of the four dimensions identified by Tanner (2006)—noticing, interpreting, responding, and reflecting—the rubric provided descriptors to guide students. A scoring column was added to the CJSR, which was also used by students at the end of the course as a supplement to the clinical evaluation tool. The scoring sheet assigned CJSR evaluation criteria to an ordinal scale, with 1 representing poor clinical judgment, 2 representing marginal clinical judgment, 3 representing good clinical judgment, and 4 representing excellent clinical judgment. The concept map assignment did not affect students’ clinical evaluation.
The CJSR served as the working tool for each student during his or her care. The students evaluated their concept maps once a week (a total of 12 concept maps per student per course) using the scoring sheet. The clinical instructor graded and compared the students’ scores to validate students’ self-evaluation and then provided written feedback on the appropriateness of their concept maps. If the instructor’s evaluation did not agree with the student’s self-evaluation, the student was asked to adjust the concept map. On the 12th and last week of the course, this tool served as a final overall evaluation of each student’s concept mapping, clinical judgment, and learning.

Final descriptive analyses of the data were performed by the RA after the course was completed. The data were analyzed with the Statistical Package for the Social Sciences software, Version 22. Only the RA had access to the data, which were stored on an external device and kept in a locked drawer in the RA’s office.

**Findings**

The results reflect data taken from the overall CJSR completed at the end of the course by students.

**Noticing**

Eighty-six participants (81%) evaluated their noticing as “excellent” on the rubric and indicated that concept mapping helped them to gather both subjective and objective data.
They said that concept mapping also helped them focus on the most important information and form ideas for appropriate interventions. Seventeen participants (16%) rated their noticing as “good” on the rubric and indicated that concept mapping helped them to actively seek information about clinical situations but not to completely explore important leads in developing ideas for interventions. Three participants (3%) answered “marginal” on the rubric and indicated that concept mapping helped them to focus on the main topic, but they were overwhelmed by the data collection.

**Interpreting**

Ninety participants (85%) rated their interpreting as excellent on the rubric and indicated that concept mapping helped them to develop ideas for prioritizing interventions in the clinical situation. Fourteen participants (13%) rated themselves good on the rubric and indicated that they included information that was not relevant and needed guidance when developing and interpreting data to prioritize interventions. Two participants (2%) answered marginal on the rubric and indicated that they had focused on information that was less relevant or useful.

**Responding**

Eighty-seven participants (82%) rated their responding as excellent on the rubric and indicated that concept mapping helped them assume responsibility for clinical decisions and be effective in directing peers. The concept mapping also helped them to confidently make decisions regarding construction of the concept map, to communicate effectively,
and to explain interventions. Finally, concept mapping helped them use critical thinking skills to fully assess the situation and use appropriate clinical judgment to produce the best concept map. Nineteen participants (18%) rated themselves good on the rubric and indicated that concept mapping helped them to generally communicate well and to be effective in directing peers and accountable for decisions made in the clinical situation.

Reflection

Ninety-one participants (86%) rated their reflection as excellent on the rubric and indicated that their concept map was organized and complete. Concept mapping assisted them to reflect critically, evaluate the concept map for successful and appropriate interventions, and identify strengths and weaknesses in their clinical judgment skills. Twelve participants (11%) rated themselves good on the rubric and indicated that their concept map was easy to read and understand and was helpful in the development of their clinical judgment skills. Three participants (3%) answered marginal on the rubric and indicated that their concept map was organized but was vague and incomplete in some areas. They rated that they were self-protective in evaluating personal clinical judgment skills.

Discussion

This study examined the impact of concept mapping on baccalaureate nursing students’ perceptions of their clinical judgment skills. Based on the results of this study, the majority of the participants reported that the application of concept mapping increased their ability to focus on the most important information and form a plan of care based on the concept map’s information. The majority of the participants also reported that concept mapping helped them develop ideas for prioritizing care plans for the clinical situation, use critical thinking skills to fully assess the situation, and use clinical judgment skills to produce the best concept map. Participants reported that the concept map improved their decision-making and cohesion in clinical judgment skills.

In Gerdeman, Lux and Jacko’s study (2013), only 50% of the students were satisfied with the depth of the rubric, and many found it wordy or overwhelming when they were attempting to identify important elements in patient care. This aspect relates most closely to the “noticing” phase. In the current study, 81% of the participants gave themselves an excellent rating on the rubric in this category, an important improvement in this area. The simplified wording may have increased the clarity and utility of the concept maps during the initial noticing phase.

The current study’s result of 85% of the participants indicating that concept mapping helped them to develop ideas for the prioritization of interventions relating to the clinical situation represents a boost in the effectiveness of the concept mapping techniques used in teaching. These results are similar to those of Gerdeman et al. (2013) who found that the students were particularly satisfied with the way the concept mapping and rubric helped them prioritize information. For example, 75% of the students in their study reported that the rubric they used aided them in identifying the information most relevant to their clinical situation, and 62% indicated that the rubric was most helpful in prioritizing information related to the patient and in making decisions and interventions confidently. These comments were closer to the interpreting dimension in the current study. Findings with the dimension of “responding” in the current study were reflected by its high evaluation as 82% of the participants indicating that concept mapping helped them assume responsibility for clinical decisions. Similar findings occurred in the study by Gerdeman et al. (2013). In that study, 62% of the students rated their rubric as helpful with team building and developing clear and effective communication, finding many opportunities for group discussion in terms of help with team building, and developing clear and effective communication with patients and peers. For example, one student noted, “I learned the most from talking about all the maps. I got a chance to learn about many diagnoses, assessments, interventions, and decisions about care based on different situations” (Gerdeman et al., 2013, p. 14). This comment was similar with the dimension of the “responding” phase in the current study.

In the current study, the results for the “reflection” phase demonstrated an overall high sense of the positive effects of the reflective aspects of the course. Gerdeman et al. (2013) did not give details on factors related to reflection. However, they mentioned that with the accumulation of clinical experience during the course, students felt that they could more confidently evaluate their concept maps and their performance, and these discussions about self-evaluation became easier as the class progressed. Similarly, Chen et al. (2011) noted the time and labor required learning a new technique like concept map creation.

Finally, the overall satisfaction with the course and rubric lends further support for the use of such simulation techniques in efforts to meet the needs of patients with a variety of illnesses of different severity, although admittedly much more research is needed. The clinical learning experience partially relied on human–patient simulated situations. These were relatively new when Lasater began promoting them in connection with the Lasater Clinical Judgment Rubric tool, but its reliability has more recently been demonstrated (Adamson, Gubrud, Sideras, & Lasater, 2012).

Recommendations

Teaching effective clinical judgment skills to nursing students is a high priority. In this study, the majority of the nursing student participants agreed on the effectiveness of concept maps, combined with a formal rubric, in the
development of critical judgment in clinical settings. The current study included a larger class size than the pilot study of Gerdeman et al. (2013), but the concept mapping teaching strategy needs to be applied to an even larger number of students in a variety of clinical settings. Utilizing concept mapping and the clinical judgment rubric in other courses such as maternity, pediatrics, community health, mental health, and critical care nursing would help to increase students’ knowledge, clinical judgment skills, and competencies in a variety of settings. In addition, including a larger and more diverse student sample would help to determine whether the concept mapping approach is applicable to all clinical settings and whether particular dimensions of judgment might correlate more with specific types of setting. Using a larger and more diverse student sample would also enable a more effective analysis of the potential relationship between sociocultural and demographic factors and the effectiveness of concept map with rubric teaching strategy.

This type of study could be replicated with associate degree, hospital-based, and other baccalaureate nursing programs. Conducting qualitative studies examining nursing students’ perspective on clinical judgment development in nursing education is also recommended. It is imperative that both quantitative and qualitative research guide nursing faculty in program planning and curriculum development to determine best practices in promoting development of clinical judgment.

Finally, questions remain about the extent to which intuition and experience influence the learning, development, and exercise of critical thinking and clinical judgment. Further research is needed to determine whether individuals with greater clinical experience take advantage of the concept mapping technique less experienced peers.

Limitations

The authors identified a number of limitations that may impact the generalizability of this study. The sample size was small; only 106 nursing students participated in this study. The lack of pre–post testing in this study was another limitation that made it difficult to assess change in skills. Moreover, no follow-up was conducted after the initial use of the concept mapping strategy. So, it is not clear whether there was a lasting change in clinical judgment skills of students.

Conclusion

Despite the limitations of this study, the results suggest that concept mapping with a rubric is an effective teaching strategy in nursing education. This strategy worked from the perspective of the majority of nursing students who participated in this study. Concept maps helped students to develop clinical judgment and meaningful learning and promoted self-directed learning and the development of clinical judgment in nursing students. Faculty may choose to introduce concept maps through lectures, simulation, clinical practice, and providing examples and instruction.

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