Evaluating the Effectiveness of a Continuing Education Program for the Improvement of Clinical Reasoning Skills among Nurses using the Early Warning Scoring Protocol

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Abstract

This pilot study evaluates the effectiveness of a continuing education (CE) program on nurses' clinical reasoning skills in utilizing the Early Warning Scoring (EWS) protocol. The CE program aimed at improving nurses' competency in using the EWS protocol for early warning detection through clinical reasoning skills training. The CE program involved a two-hour session that included an overview of the clinical reasoning framework, three simulated patient scenarios, and a reflective dialogue. Due to COVID-19 restrictions, a convenience sample of seven registered nurses participated in the program. Simulated scenarios were given to the participants to complete before and after the CE program. A clinical reasoning rubric based on Levitt-Jones' clinical reasoning framework, Benner's novice to expert theory, and Dreyfus model of skill acquisition measured the competency level before and after the CE program. The study shows that the CE program was effective in improving the clinical reasoning skills of nurses.

Background

      The Early Warning Score (EWS) system is a protocol developed by the Central Manchester University Hospitals National Health Service Foundation Trust in the United Kingdom to detect patient deterioration that is commonly preceded by several hours of severe physiological changes (Fang et al., 2020; Gerry et al., 2017; Alam et al., 2014; Morgan et al., 1997). Early Warning Scores are obtained by allotting points to patients' routine vital sign measurements based on physiological derangement from a predetermined normal range to obtain summed scores (Mohammed et al., 2008). The score is calculated based on numerous physiological indicators, including the heart ate, systolic blood pressure, respiratory rate, and consciousness level (Carberry et al., 2014). However, individual interpretations during a patient assessment may limit their accuracy (Downey et al., 2017). As a result, the use of an EHR integrated EWS system with best practice alerts for patient deterioration have not yet yielded the desired impact on patient clinical outcomes citing clinician related challenges, such as compliance and alert fatigue (Bedoya et al., 2019; Horton et al., 2019; Alam, 2014). Sound clinical judgment and clinical decision-making skills when evaluating a patient's situation, lack of enforcement of therapy or transfer to a higher level of care, and lack of evidence on best practice after an alert were among other cited factors explaining these results. An overreliance on clinical decision support systems (CDSS) may potentially jeopardize the quality of patient care when a system does not fully integrate with the workflow, and may affect nurses' competence in early detection and their timely response, undermining patient safety (Jensen et al., 2019; Sutton et al., 2020). This poor performance in supporting clinical decision-making provides insight into the importance of addressing clinician related challenges. Therefore, enhancing nurses' competence in critical thinking and clinical reasoning may increase Early Warning Scores' accuracy.

      Accurate patient assessment requires analytical skills, sound clinical judgment, and the ability to think like a nurse using broad knowledge of practice and context, including ideas, theories, and concepts. Several factors affect the acquisition, retention, and promotion of nurses' clinical competence (Tajvidi et al., 2019). These factors are imperative for critical thinking and clinical reasoning, two skills essential for nurses' ability to make sound clinical decisions competently. Critical thinking is defined as the mental process of active and skillful perception, analysis, synthesis, and evaluation of

collected information through observation, experience, and communication, leading to a decision for action (Papathanasiou et al., 2014). It is one of the factors influencing nurse's clinical competence, an essential component of clinical decision-making and professional competence using cognitive and intellectual capabilities (Tajvidi, 2019). Strong critical thinkers demonstrate several characteristics including inquisitiveness; being well-informed; readiness to use critical thinking; self-confidence in ability to reason; open-mindedness regarding divergent worldviews; flexibility in considering alternatives and opinions; understanding of the opinions of other people; fair-mindedness in appraising reasoning; honesty in facing one's own biases, prejudices, stereotype, or egocentric tendencies; prudence in suspending, making, or altering judgments; and willingness to reconsider and revise views where honest reflection suggests that change is warranted (Facione, 2007). A clinical decision support system cannot fully replace any of these clinician characteristics.

The purpose of the continuing education program is to improve nurses' competency in using the EWS protocol for early warning detection through a training in clinical reasoning cycle. The goal is to achieve more accurate patient-specific early warning scores and ultimately improve patient outcomes.

Theoretical Framework

As the nursing profession continues to strive to find ways to measure the concepts of critical thinking and clinical reasoning, nurses must identify these terms and understand the difference between them. Both of these concepts represent an essential set of processes that allow nurses to exhibit sound clinical judgment. Obtaining measurable outcomes for nurse education and competencies is possible through strategies designed to evaluate how nurses analyze, apply, and act in a clinical situation.

Critical thinking is a cognitive process used to analyze clinical situations based on evidence, science, and sound judgment; clinical reasoning applies critical thinking to a clinical situation. Critical thinkers utilize the following cognitive skills of analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting, and transforming knowledge (Shoulders et al., 2014).

Clinical reasoning refers to a set of cognitive processes used to discern the relevance of the evidence and scientific knowledge as it applies to a particular patient (Victor-Chmil, 2013). Clinical reasoning is a systematic and cyclical process that guides clinical decision-making, particularly in unpredictable, emergent, and non-routine situations, leading to accurate and informed clinical judgments. It is defined as "the process by which nurses collect cues, process the information, come to an understanding of a patient problem or situation, plan and implement interventions, evaluate outcomes, and reflect on and learn from the process" (Levitt-Jones, 2018, p. 4). The clinical reasoning process is an iterative cycle by which nurses may combine one or more steps or move back and forth between them before reaching a diagnosis, taking action, or evaluating outcomes. There are eight steps of the clinical reasoning cycle (Levitt-Jones, 2018).

The first step of the clinical reasoning cycle is to **consider the patient situation** in which a nurse acquires an initial impression of the patient that may be negatively influenced by the nurse's preconceptions, assumptions, and biases. As with critical thinking, in order to have an effective and accurate initial patient assessment, a nurse must develop independence of thought, fairness, insight into the personal and public level, humble intellect and crisis deferral, integrity, perseverance, self-confidence, and research interest (Papathanasiou, 2014).

Step two of the cycle is to **collect cues and information**. This important step involves the collection of relevant information about the patient. This information is acquired from the handover report's available resources, the patient's medical and social history, clinical documentation, and electronic medical records. The third step is process information through which the nurse **interprets the cues** that have been collected and identifies significant aberrations from normal. Cues are then grouped into meaningful clusters, clinical patterns are identified, inferences are made, and hypotheses are generated (Levitt-Jones, 2018).

The fourth step is to **identify problems and issues** where nurses synthesize the data that has been collected and processed in order to identify the most appropriate nursing diagnosis. In the fifth step, to **establish goals**, the nurse clarifies and prioritizes care goals depending on urgency. Goals must be SMART (Specific, Measurable,

Achievable, Realistic, and Timely) and designed to address the nursing diagnosis and ensure nursing interventions' effectiveness (Levitt-Jones, 2018).

In the sixth step of the clinical reasoning process, to **take action**, the nurse selects the most appropriate course of action to achieve the goals of care and address the nursing diagnoses. Once this step is implemented and completed, the nurse must **evaluate outcomes**, which is the seventh step. This requires the nurse to reexamine objective and subjective data (patient cues) to evaluate how effective the nursing interventions have been and whether the patient's problem has improved. If it is concluded that the patient's condition has not improved, the nurse reconsiders the patient's situation and seeks to identify a more appropriate course of action, which may be the need to engage in a new cycle of clinical reasoning (Levitt-Jones, 2018).

The eighth and final step in the clinical reasoning cycle is to **reflect on the process and new learning**, which requires nurses to critically review their practice to refine, improve, or change. Reflection is intrinsic to learning as the nurses begin to examine: *What happened and why? What was done well? What should be done differently if presented in the same or similar situation? What was learned that could be used when caring for another patient? What is needed to improve future practice, for example, more knowledge about a specific condition or more practice in particular skills?* (Levitt-Jones, 2018).

Besides implementing and applying the clinical reasoning cycle to EWS protocol, it is essential to question and understand errors. Nurses must develop insight and self-awareness by reflecting on their biases and preconceptions. Nurses must have defined dispositions that influence critical thinking. These include open-mindedness, which allows the willingness to seek new evidence or possibilities, and fair-mindedness, which is an unprejudiced examination of evidence that might question beliefs or a viewpoint contrary to the nurse's own beliefs. These skills are gained through on-going continuing education, clinical experience, open communication, and most importantly, time. This pilot study examines the effectiveness of a clinical reasoning simulation program on nurses' competency in using the EWS protocol. The study will compare nurses' skill level in EWS before and after training them on the clinical reasoning cycle in the context of using the EWS protocol.

Methods

        A convenience sample of seven registered nurses currently working on a telemetry unit participated in the education program voluntarily through a direct invitation by the principal investigator after obtaining the IRB approval from Kean University. Data collection and management procedures ensured the anonymity and confidentiality of recorded participants' scores on the achievement rubric. The COVID-19 restrictions limited the sample size and any further enrollments in the study.

        Data analysis was performed using the Statistical Package for Social Sciences (SPSS Ver.22.0; SPSS Inc., Chicago, USA). All data were described using frequency tables, central tendency measures, and variability measures. Moreover, a paired t-test was used to examine the effectiveness of the continuing education program to improve participants' application of clinical reasoning skills. P-Value of less than 0.05 was considered as a significant level.

        The participating nurses completed three simulated patient scenarios based on their current nursing knowledge level and skill, followed by a two-hour training program. The training program included

- an overview of the clinical reasoning cycle,
- handouts containing a description of the case scenarios, and
- a collaborative review of the body systems and a discussion of critical incidents using problem-based learning and simulated mannequins.

A reflective dialogue was undertaken to allow the nurses to assess their practice and explore their reactions. Discussions were conducted with the nurses after the rubric was completed.

        The program's problem-based learning component involved a presentation and analysis of patient cases for the nursing staff to determine the best course of action to take in the care of that specific patient. Encountering a similar situation in the future, the nurse would critically think it through while applying clinical reasoning and make an appropriate clinical judgment (LaMartina et al., 2014). Using simulated mannequins alongside these clinical activities enhances critical thinking and provides a safe, controlled environment, allowing the learner to make mistakes without actually harming a patient (LaMartina, 2014). The goal is to have nurses acquire knowledge and skill to apply when encountering real practice, improve EWS accuracy, and ultimately yield

positive patient outcomes.

Each body system was reviewed using a standard head to toe assessment, and any deviation from the normal was discussed. The patient's neurological status was the first to be assessed. Changes in the patient's baseline mentation were reviewed. Changes and deviations were discussed. The patient's cardiac status was assessed, followed by the respiratory status. The potential causes for any deviation, i.e., bradycardia, tachycardia, hypotension, and hypertension, were explained and reviewed. Lung sounds were reviewed with the various oxygen modalities that the physician ordered. The patient's gastrointestinal system was assessed as well as their urinary tract system. Three patient simulations were reviewed, lasting approximately thirty minutes each. After the three simulations were completed, the nurses engaged in a reflective dialogue. The following questions were asked: *After completing the course, did you change any clinical decisions in the scenarios? What decisions did you make differently, and why? How did the clinical reasoning cycle impact the change in your clinical decisions? Was the rubric clear, concise, and fair? If not, why?*

A Clinical Reasoning Rubric was developed to evaluate the nurses' application of clinical reasoning skills to the given scenario questions after receiving training in Early Warning Scoring. This rubric is based on nurse theorist Patricia Benner and her utilization of the Dreyfus Model of Skill Acquisition to nursing. The Dreyfus model posits that, in acquiring and developing a skill, one passes through five levels of proficiency: novice, advanced beginner, competent, proficient, and expert (Benner, 2001). Each step of the clinical reasoning cycle was incorporated into the rubric as a skill and evaluated using a 5-point Likert scale level of competency that ranges from "Novice" to "Expert."

According to Benner, Level I and II, novices and advanced beginners can take in little of the situation; it is too new, too strange. They have to concentrate on remembering the rules they have been taught. Level III, Competent nurses are typically nursing on the job for two to three years. At this level, the nurse begins to see his or her actions in terms of long-range goals or plans. Level IV, the proficient nurse, characteristically perceives situations as wholes, rather than in terms of aspects, and performance is guided by maxims. Experience teaches the proficient nurse what typical events to expect in a given situation and how to modify plans in response to these

events. The expert nurse, level V, has an enormous background of experience, has an intuitive grasp of the situation, and zeros in on the accurate region of the problem without wasteful consideration of a large range of unfruitful possible problem situations (Benner, 2001).

Using Benner's Novice to Expert theory, nurses' critical thinking and clinical reasoning education can be targeted and specialized according to experience level. A nurse's expertise level reflects changes in two general aspects of skilled performance. One is a movement from reliance on abstract principles to past, concrete experience as paradigms (Benner, 2001). There was a post-grading discussion and analysis of the rubric and a question and answering session.

The nurses completed a qualitative post-course evaluation one month after the course was conducted. They were asked about the *knowledge they obtained from this course and how it changed their nursing practice, whether the course improved their patient outcomes, what they found valuable with the course, and any areas that could be improved*.

Before implementing the program, a retrospective chart review of all rapid response information sheets and data from the previous month was obtained from the clinical resource educator who populates the data. Currently, the rapid response team and information technology departments are in the process of automating the data into a clinical support system. This data will be entered into an EWS spreadsheet, which will contain the patient's demographics, admitting diagnosis, the change in patient's condition, patient's vital signs, and the numerical EWS. The data will also include the primary nurses' years of experience, level of education, age, and gender caring for the patient and the unit the patient is on. Once this data is populated, it can be determined which unit has the greatest number of rapid responses. The data will be examined for a correlation in inaccuracies and the nurse's demographics and years of experience. After this information is collected, the correlation between years of nursing experience and the EWS accuracy will be examined.

The nurses on the unit with the greatest number of inaccurate EWS will be asked to participate in this continuing education program, which will be offered to 20 nurses voluntarily for three months. The nurses will be asked to sign an informed consent form explaining the study's purpose, any potential risks, and benefits, and that their

participation is voluntary and will remain anonymous. The training for each nurse will focus on the eight steps of clinical reasoning and incorporate simulated patient situations. The nurse will demonstrate their knowledge by completing a simulated assessment on a mannequin. After completing the course, there will be a survey for the nurses to complete that will comprise the amount of knowledge they believe they have acquired. They will also have a form to sign informing them that they will be participants in a clinical study on the implementation of critical thinking and incorporation of the clinical reasoning cycle into EWS.

Results

Due to the COVID-19 Pandemic, this pilot study was conducted with the participation of seven registered nurses working in a telemetry unit. The majority of the participants were female (5/7) with a BSN degree (5/7) and between the age of 28 and 32 years old (6/7). The participants' nursing experience ranged between 2 to 42 years, with the majority (6/7) having between 2 and 10 years of nursing experience.

The paired t-test was used to examine the continuing education program's effectiveness in improving nurses' clinical reasoning skills in the context of using the EWS protocol to assess patients. The continuing education program in the clinical reasoning cycle improved nurses' competence in the use of early warning scoring protocol. Statistically significant differences were found between nurses' scores before and after participating in the continuing education program. The pre-program grade mean score was 26.1, and the post-program mean score was 30.7, with a p-value of 0.015. Considering the small sample size (N=7), a repeat of this pilot study with larger sample size is recommended.

Following the three-month training that is offered, the rapid responses on the unit will simultaneously be tracked for three months, utilizing the documentation that is currently in use. Comparisons will be made in the number of rapid responses that are called, the numerical scores that are applied, and the accuracy of the scores, the patient's condition change, and the outcome of the rapid response. This data will be compared to the previous rapid response data for the unit that was collected. The goal is to observe better and more accurate scoring. In addition, an increase in positive patient outcomes will be tracked and documented. The necessity of a higher level of

care for the patient will be observed and documented. The researcher (XX) will perform that data collection with the current resource nurses who act on rapid responses. The planned rapid response will be gradually populated by the RR teams and provide easy data access and retrieval. This collection will be over a span of three months. With this information, there will be follow up with the individual nurses that triggered a rapid response and discuss their rationale in determining the patient's EWS. Improvement in accuracy of the patient's assessment, the EWS, and patient's outcome will be documented. A mixed method, larger sample size, longitudinal study could yield generalizable findings.

Conclusion

The goal of this pilot study is to evaluate the effectiveness of a continuing education program on improving nurses' competency in using the EWS protocol for early warning detection through clinical reasoning skills training. The CE program involved a two-hour session that included an overview of the clinical reasoning framework, three simulated patient scenarios, and a reflective dialogue. Results show that the CE program was effective in improving nurses clinical reasoning skills.

When COVID-19 restrictions are lifted, the researchers plan to obtain a larger sample size to further validate the results of this pilot study. Institutional permission will be obtained for approval of this continuing education program for teaching newer telemetry nurses as well as incorporating it into the mandatory yearly nurse competencies training. Furthermore, the researchers plan to expand the scope of future study to validate the impact of the CE program on patient outcomes.

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