ORIGINAL ARTICLE

The effects of illness script method on clinical reasoning of undergraduate nursing students: A quasi-experimental study

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ABSTRACT

Introduction: The improvement of clinical reasoning in nursing students is a benchmark for students' abilities in carrying out nursing care. Disease script-based learning can help students recognize the information. The purpose of this study was to determine the effect of illness scripts on the clinical reasoning ability of nursing students.

Methods: The research design used was a quasi-experimental with a non-equivalent control group. A consecutive sampling technique was applied. The number of samples in each group is 35 respondents, the outcome was measured using Clinical Reasoning Assessment Tools. Data were analysed using Wilcoxon Signed Rank test.

Results: The results of this study indicate that there is an increase in the clinical reasoning ability of nursing students in the experimental group from the average value of 40.6 to 50.3. Most of the respondents in the experimental group had clinical reasoning at the intermediate learner level. The results of the Wilcoxon test showed that the Z-count value in the experimental group was 5.092 with a p-value < 0.001.

Conclusions: The primary finding in this study is that there is an effect of the illness script method on the clinical reasoning of undergraduate nursing students. The application of illness scripts in the nursing learning process at as early stage as possible is very relevant. This model helps students in increasing critical thinking about patient nursing problems.

Keywords: critical thinking; efficacy; learning strategy; nursing study

Introduction

Clinical reasoning is defined as an ability of decision-making, problem-solving, critical thinking, and clinical judgment (Hunter and Arthur, 2016). Good clinical reasoning skills improve the performance of safe and effective nursing care delivery (Alamouti *et al.*, 2020). Several studies have found that nurses with poor clinical reasoning skills were incompetent to synthesize a patient's worsening prognosis, leading to decision-making errors in inpatient care (Graan, Johanna and Williams, 2017; Guerrero, 2019). According to World Health Organization data, about 5% of outpatients experience diagnostic errors (World Health Organization., 2019). Some of the patients' diagnostic errors as caused by a lack of clinical reasoning (World Health Organization, 2016). Study from Iran showed the average score of clinical reasoning skills of nursing

students is too weak at about 46% (Alamouti *et al.*, 2020). In Indonesia, the accuracy of nursing diagnoses reaches 64% as a-sufficient category (Trisno, Nursalam and Triharini, 2020). Research has found that the accuracy of nursing diagnoses is related to good clinical reasoning ability (Paans *et al.*, 2012).

Clinical reasoning ability needs to improve since taking formal nursing education. Nursing students are required to be agile in clinical reasoning. Clinical reasoning is a cognitive process and strategy used to identify, diagnose, and make clinical decisions regarding a patient's condition. Based on the cognitive perspective theory, it's explained the importance of cognitive structure in clinical reasoning. It consists of knowledge about pathophysiology, patient complaints, signs, symptoms, and other clinical information relevant to the context of the disease (Schmidt, Norman and Boshuizen, 1990). Various learning methods have been implemented

to improve cognitive structures in nursing students' clinical reasoning and are still unclear (Brown, Tyo and McCurry, 2019). A few educational models to improve the knowledge structure of clinical reasoning such as reflection and feedback models (Choi *et al.*, 2020), contextual learning (Yauri, Nash and Ramsbotham, 2019) and problem-based learning (Ju and Choi, 2017) were applied but still cannot overcome the knowledge structure clinical reasoning of undergraduates students. These learning approaches only produce hypotheses in the assessment process, problem formulation, diagnosis and outcome criteria, and intervention (Levett-Jones *et al.*, 2010). The reasoning process is very conceptual, and the thought process is slow (Peters *et al.*, 2017).

A strategy is needed to provide the ability to organize their specific knowledge and more efficiently, called script (Boushehri, Arabshahi and Monajemi, 2015). Undergraduate nursing students often struggle to develop these requisite skills (Blakey, Guinea and Saghafi, 2017). Scientific evidence found that interventions are underway to enhance clinical reasoning named illness script (Lee *et al.*, 2010). In medical education, illness scripts have a role in improving clinical reasoning abilities. However, studies in nursing education regarding the application of illness scripts in clinical reasoning are few. A study showed illness scripts proved to be effective and active learning strategies in improving clinical reasoning. The illness script needs to be adapted to nursing education (Lee and Bagnardi, 2010). The qualitative studies found that the illness scripts increased nurses' knowledge about patient problems and medical components of the disease scripts were also relevant in nursing (Vreugdenhil *et al.*, 2022).

Illness scripts play a role in recognizing information, comparing, and predicting information from a disease (Lubarsky *et al.*, 2015). An illness script is a specific script about the disease that consists of enabling conditions, faults, and consequences. Based on illness scripts theory, the reasoning process is led by the structure of knowledge in memory. It can easily interpret the prognosis of a complex health condition (Lubarsky *et al.*, 2015). Students need to understand the process of organizing knowledge about clinical and biomedical to improve the quality of nursing care. Therefore, it is the main reason to investigate the impact of illness scripts training on the clinical reasoning of undergraduate nursing students. This study aims to determine the effects of illness script methods on the clinical reasoning skill of nursing students.

Materials and Methods

Study Design

This quantitative study used a quasi-experimental approach with a control group pretest-posttest design. This design involves two groups of participants, and outcome data are collected before and after implementing an intervention. This design called controlled trials without randomization involves an intervention but lacks randomization (Polit and Beck, 2012). The independent variable in this study is the illness script method. Illness script means disease schemas into knowledge memory consisting of epidemiology, time course, pathophysiology, and medical conditions. The illness script stimulation is applied in the learning process. The dependent variable in this study is clinical reasoning. Clinical reasoning is defined as a complex and consequential cognitive process in managing and evaluating a patient's health problem (Pelaccia *et al.*, 2011).

This research was carried out during the COVID-19 pandemic, with a policy of limiting distance and use of personal protective equipment. Classes were carried out in a hybrid manner, where the intervention group conducted face-to-face learning meetings outside the network. The control group carried out face-to-face learning meetings online. The experimental group was given an illness script stimulation intervention, while the control group received a standard intervention carried out in the learning process. Pretest was conducted on both groups before being given the intervention. The intervention was given once a week for 14 weeks. The posttest was carried out after the illness script stimulation intervention at week 14.

Respondent

The population covered in this study were all second level nursing students. The number of samples in this study was 70 people, 35 respondents to each group. The sample size was determined by using a hypothesis test on the mean of two independent groups (Sastroasmoro and Ismael, 2014). A consecutive sampling technique was applied. The sample criteria in this study were determined based on the representative characteristics of the affordable population. After the prospective respondents met the inclusion and exclusion criteria of the study, then the researcher asked the prospective respondents' willingness to participate after receiving an explanation of the aims, objectives, benefits, research procedures, as well as the rights and obligations of being a respondent. For prospective respondents who were willing, the researcher then asked them to sign an informed consent form, then randomly divided them into experimental groups and control groups. The sample inclusion criteria of the respondents were: the students completing the medical surgical nursing course 1; completing the basics nursing science courses; a minimum grade point average 3. The exclusion criteria for this study are the students who are not willing to complete 14 face-to-face meetings.

Intervention

The intervention given is the illness script. In the learning process, practice is not carried out to the hospital, case stimulation is carried out theoretically and in laboratory practice. The intervention was carried out during the learning process. The duration of the intervention was once a week until 14 weeks. The illness script method steps are happened in series (Lee and Bagnardi, 2010; Lee et al., 2010).

First step. The tutor will provide stimulation in the lecture by introducing an overview of the disease scenario from the patient's clinical condition. Students simulate the clinical details of anatomy and physiology, etiology, pathophysiology, physical, and examination. The main components of the illness script are enabling conditions (such as age, sex, current medication, previous medical history, occupation, risk behavior, hereditary, and environment affect the probability of someone getting a disease); fault (pathophysiological malfunctioning); and clinical consequences (complaints, signs, and symptoms) (Yazdani and Abardeh, 2019).

Second step. Students identify possible conditions, errors, and clinical consequences. Students were guided to identify key findings and assist them. Students are allowed to explore relevant journals and references to strengthen literacy in simulated cases.

Third step. Students will represent and compose illness scripts based on their ability to memorize the information. Students represent illness script for three probable illnesses, inclusive of epidemiology, time course, signs and symptoms, pathophysiology, and pharmacology.

Fourth step. Student will analyze the illness script, looking for differentiating features. Fifth step. Students prioritizing care for the patient and determining how to evaluate the effectiveness of care.

Instrument

The instrument used in this research is Clinical Reasoning Assessment Tools (CRAT). The validity test of the CRAT instrument showed good and stable validities with an accuracy value of 72%. CRAT is also stable in the reliability test, with a Cronbach's alpha value of 0.821 (Arisudhana et al., 2019). The clinical reasoning dimensions used in this measuring instrument are according to the theory proposed by Schmidt, Norman and Boshuizen in 1990 and Harasym, Tsai and Hemmati in 2008 (Yazdani and Abardeh, 2020). The dimensions are dispersed knowledge structure (DK), elaborated causal network (EC), encapsulation knowledge structure (EK), and illness script knowledge structure (IS) (Yazdani and Abardeh, 2020). The four dimensions turn into 25 statements in vignette form. Each has four answer choices. Answers that represent dispersed knowledge (DK) a score of 0, elaborated knowledge structure (EC) a score of 1, encapsulation knowledge structure (EK) a score of 2, and illness script knowledge structure (IS) a score of 3. The minimum score of all 25 items is 0, and the maximum value is 75. Furthermore, clinical reasoning is interpreted into four categories according to the theory proposed by Drefyus and Drefyus in 1980 and Benner's theories in 2005 (Yazdani and Abardeh, 2020). The clinical reasoning categories based on the calculation of the mean value are the Expert category (score > 58.3), Advance beginner (score 51-58.3), Novice (score 42-50) and Surface learner (score < 42).

The level of clinical reasoning based on the knowledge structure model starts from the surface learner to the expert level. In the first level, surface learners were defined as students only focused on understanding the main points and memorizing them. They don't like the material, feel pressured and rush to retain information. They only focus on memorizing information and do not understand the meaning behind the materials. They cannot remember information effectively (Gopakumar et al., 2016). Research has found that students who adopt surface learning will receive less information (Gurpinar et al., 2013). In the second level, a novice learner is defined as a student who does not have experience and understanding of clinical situations. Novice learners have difficulty understanding the clinical situation, such as difficulties paying attention first (Benner, Kyriakidis and Stannard, 2011). In the third level, advanced beginner learners had high awareness of feedback on any knowledge gained (Benner, Kyriakidis and Stannard, 2011). At this level, nursing students have good attention to learning materials. The student was active and had a good ability to identify aspects of clinical conditions (Benner, Kyriakidis and Stannard, 2011). The fourth level is defined as students at the expert learner level who have good skills in developing strategies for information management and improving practical skills (Benner, Kyriakidis and Stannard, 2011).

Data Collection

Respondents willing to participate in this study filled out a characteristic questionnaire with the assistance of the researcher. For both experimental and control groups, filling out questionnaires on the characteristics of respondents was done by online method. The next stage, respondents in both groups were asked to attend outside the network to campus to pretest clinical reasoning variables with clinical reasoning assessment tools. After the pretest, the experimental group received the illness script method in the learning process, while the control group used the conventional methods. The illness script method is an intervention in the learning process in the form of disease script stimulation with the dimensions of enabling factors, faults, and clinical consequences while the conventional method is a standard intervention in the learning process without case stimulation. The experimental group received an intervention for 14 weeks online, while the control group received a standard

intervention for 14 weeks online. At week 15, both groups conducted a posttest using clinical reasoning assessment tools.

Analysis

The data analysis used bivariate and univariate tests. A univariate test used analysis of the respondent characteristics such as ages, gender, grade point averages, senior high school background, and distribution of level clinical reasoning. A bivariate test was carried out on clinical reasoning variables using the Wilcoxon Signed-Rank Test (α = 0.05).

Ethical Consideration

This study was conducted in Badung Regency Bali Province over 14 weeks in 2021. This research has been reviewed and declared ethically feasible by the Health Research Ethics Commission of STIKES Bina Usada Bali based on the Ethics Pass Certificate Number: 362/EA/KEPK-BUB-2020. Researchers maintain the confidentiality of all information obtained from questionnaire. As a guarantee of anonymity, the respondent's name was not put in the questionnaire. Data are not disseminated to anyone to enforce the principle of non-maleficence.

Results

Table 1 shows age average in the experimental group is 20 years old, and the control group is 20.14 years old. Gender in the experimental and control groups is dominated by females, 86% and 88%, respectively. The educational background of both groups is majority senior high school at about 22% and 24%, respectively.

The p-value in the experimental group was said to be significant with a p-value < 0.001 (P<0.05). In the control group, the p-value shows 0.069 (p>0.05), which means that the intervention is not significantly giving some effect. The results of the comparison test of the pre-post difference between groups got a p-value <0.001. It showed that the illness script learning method had a significant effect on clinical reasoning skills.

Table 3 shows that, after receiving treatment in each group, it is known that 31 respondents (89%) in the experimental group had an intermediate level of clinical reasoning. In the control group, 18 respondents (51%) had a novice level of clinical reasoning.

Discussion

Illness script content is presented in case vignettes. There was an increase in the average value of clinical reasoning in the experimental group who received illness script-based learning materials. Students in the experimental group had better abilities than students in the control group in understanding epidemiology, pathophysiology, and medical conditions. A study found that illness scripts can help students recognize information, compare, and predict prognoses of a disease. Illness script describes the information process being structured and retrieved from long-term memory to interpret, analyze and envision new information (Lubarsky et al., 2015). Illness scripts worksheet is a form of case-based learning with a knowledge-oriented approach to the patient's clinical condition. Few studies were found that improving clinical reasoning skills used intervention as knowledge-oriented (Chamberland et al.,

Table 1. Respondent characteristics (n = 70)

Variable	Mean±SD		n (%)	
	Experiment	Control	Experiment	Control
Age	20±0.54	20.14±0.60		
Grade Point Average	3.56±0.20	3.55±0.18		
Gender				
Male			5(14%)	4(12%)
Female			30(86%)	31(88%)
Senior High School Background				
Senior High School			22(63%)	24(69%)
Vocational High School			13(27%)	11(22%)

Table 2. The effects of illness script method on clinical reasoning of undergraduate nursing students (n = 70)

Variable	Group	Mean±SD	Z	P-value
Clinical Reasoning	Control			
	Pre	39.8±2.5	-1.523	0.128
	Post	40.8±3.1		
	Experiment			
	Pre	40.6±3.02	-5.092	<0.001
	Post	54.3±3.7		

Table 3. Level of Clinical Reasoning (n = 70)

Clinical Reasoning Level	Control Group n (%)		Experimental Group n (%)	
	Pretest	Posttest	Pretest	Posttest
Surface Learner	29(83)	17 (49)	25(71)	
Novice	6(17)	18 (51)	10(29)	
Intermediate				31 (89)
Expert				4 (11)

2011; 2013; Schmidt and Mamede, 2015; Keemink *et al.*, 2018).

Based on script theory, illness scripts make it possible to integrate acquired information with existing knowledge, understand irregular and complex patterns of symptoms, identify similarities and differences in conditions between diseases, and predict the likelihood of disease progression. Knowledge will enhance through experience and learning. Teaching clinical reasoning using illness scripts can help students improve their skills in making diagnoses and interpreting clinical data (Lubarsky *et al.*, 2015). In the nursing process, providing stimulation based on illness script affects students' cognition of a patient's clinical condition and increases reasoning level. Meanwhile, another impact of reasoning enhanced students' proficiency in performing nursing care. Good levels of clinical reasoning include the process of revealing visible problems, determining nursing care goals, identifying appropriate actions, and evaluating the achievements of evidence-based nursing care. Nursing practice emphasizes good skills in assessment and comprehensive decision-making skills through critical thinking processes. Making decisions based on clinical conditions was the noteworthy element in nursing practice (McCartney, 2017).

The study found that the illness script was an interesting method as a form of learning approach and stimulating students' critical thinking (Lee and Bagnardi, 2010). In the concept of critical thinking, clinical reasoning has a broader nature. Clinical reasoning was a way for nurses to observe patient status, process relevant data/records, understand patient problems, plan and implement nursing care, evaluate outcomes, and reflect on results. The barometer of clinical reasoning includes control, recognition, and response to significant information, specific symptoms, use of questions that lead to pathophysiological reasons, asking questions in a chronological direction, focusing on agreement with the patient, summarizing, and understanding body semantics. These skills were learned by undergraduate nursing students, requiring involvement and willpower during practice. To acquire these skills, students must improve their critical thinking skills and understanding of care (McCartney, 2017).

Illness script also helps students understand the difficulty of learning materials (Lee and Bagnardi, 2010). Through illness script stimulation, the process of applying the knowledge, skills, and expertise of nursing students in the form of clinical reasoning gets better. A nurse needs to be guided by appropriate clinical reasons to get good results and prevent the risk of harm to patient safety (Guerrero, 2019).

This study contributes to outlining the illness script in the context of nursing and relates to the clinical reasoning in nursing. This study has several limitations. First, the participants were recruited from a single institution, perhaps limiting the generalizability of our findings. Second, the sample size is relatively smaller than necessary. Third, some variables cannot be measured, such as study habits and literacy levels which can affect the reasoning process.

Conclusions

The use of illness scripts in nursing education is very relevant. Effective and innovative teaching approaches are needed in nursing education. Based on the results of this study, the use of illness scripts is effective to improve the ability of nursing students in filtration of clinical information, analysis, clinical reasoning process, and making clinical decisions. This method helps educators evaluate the readiness of nursing students to face the nurse competency test and the Objective Structured Clinical Examination. In particular, this approach can assist in preparing nursing students for practices that require collaboration with multiple health disciplines.

The main finding of this research is the influence of disease text on the clinical reasoning of undergraduate students. The illness script can improve students' ability to memorize information, and increase knowledge, enhance clinical performance in the quality of nursing diagnoses, interventions, and outcomes. Using a clinical reasoning knowledge structure's model approach can help identify the stage of development of nursing students' thinking processes since the first semester.

Acknowledgement

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