ABSTRACT

Backgrounds: Evaluation is a critical component of transformative learning of nursing students. Traditional test-based evaluation does not always reflect genuine students’ learning outcomes.

Objective: We report our experiences from using a high fidelity clinical simulation as a method of evaluation of nursing students’ learning outcomes in critical care nursing course.

Participants and Methods: We designed three critical care scenarios, namely, acute exacerbation of COPD, acute myocardial infarction, and hypovolemic shock using interactive SIMMAN. Altogether, 214 third-year nursing students were enrolled in critical care nursing course. These students were assigned to work in a group of 10-11 in a class combining of lecture and problem-based learning. Formative and summative evaluations based on tests were conducted throughout and at the end of the course. The additional simulation-based evaluation was conducted at one week after the traditional summative evaluation. Each group was asked to review the critical care concepts before the simulation. Half of the students in each group participated in a simulation-based evaluation while the rest observed the scenario through the SIM View. The students were blind to the scenes. Eight lecturers who performed the evaluation worked together to develop an evaluation tool to maximize consistency across the lecturers. During the simulation, each lecturer independently assessed the students, later compared and agreed on the evaluation results. Students reflected on their performance and experiences in writing.

Results: The high fidelity clinical simulation-based evaluation allowed the lecturers to correctly and genuinely evaluate the students’ learning, especially clinical decision making and teamwork. Therefore it helped identify students’ learning needs. The evaluations were highly consistent across the lecturers. Students became aware of their current level of knowledge and skills as well as the deficits. They recognized the barriers to the application of their knowledge and skills in clinical scenarios. They identified ways to improve their performance in the future learning.

Conclusion & Recommendation: High fidelity clinical simulation-based evaluation is an effective method of the assessment, especially when it deals with higher-order thinking such as application and decision making.

Keywords: High Fidelity Simulation, Transformative Evaluation, Nursing Students

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Introduction

The nurse is an occupation with various branches and several levels. The role and task of nurse are somewhat similar and different in some extents. The condition in each hospital also diverse, each organization is suggested to create individual and customized evaluation form which suits its goals and personnel’s characteristics the most. However, the competency criteria determined by other organization should be considered as a guideline to standardize Thai’s health service and develop the country in the long run (Pochanakji & Laeheem, n.d). However, within the Thai nursing education is a professional education that involves theoretical and practical learning to provide students with the desirable graduate characteristics and achieve learning outcomes according to the standard framework of the Nursing Bachelor’s Degree. Today’s education requires a paradigm shift to prepare students with the 21st-century skills in which involve transformative learning.

Transformative Learning in Nursing Education

The Transformational Learning Theory initially developed by Jack Mezirow is described as being “constructivist, an orientation which holds that the way learners interpret and reinterpret their sense experience is, central to making meaning and hence learning” (Mezirow, 1991). The theory has two basic kinds of learning: instrumental and communicative learning. Instrumental learning focuses on learning through task-oriented problem solving and determination of cause and effect relationships. Communicative learning involves how individuals communicate their feelings, needs, and desires. It focuses on the larger, deeper, and broader perspective (Mezirow, 2003). This is likely important for the nursing education since nurses are required to gain knowledge which would guide and support them in dealing with real-life situation while being responsible of the patient’s well-being. The students also gain insight through learning outcomes. Students practice their skills such as critical thinking, decision making, and non-nursing skills like teamwork and respect for human value. This results to student’s satisfaction, increase in confidence, good attitude towards patient care, and knowledge retention. Moreover, it lets the students learn in a safe environment which promotes learning (Levine et al., 2013). One of the important steps in learning is repetition in a systematical manner, wherein students train until the application of skills becomes automatic in nature (Chaleoykitti, Kamprow, & Promdet, 2014). Transformative learning is the effective transition of knowledge by connecting past experiences to present learning and into the application of gained knowledge. As seen in Griffin University where in McAllister et al (2006) applied three concepts of learning into the transformation of nursing education. This included teaching to develop critical thinking, develop analytical thinking, and provide visualization for students. Therefore, there is a need for an effective transition of knowledge and an effective application of knowledge. The nursing education adapted the high-fidelity simulation to provide practice for students. And as found in a study on the effects of high fidelity simulation on nursing students’ perceptions and self-efficacy of obstetric skills found that the students felt positive about high fidelity simulation experience which improved the students’ perception of learning (Pinar et al., 2015). Thus, in many cases, high-fidelity simulation is used as a source of evaluation and not a basis for learning.

High-Fidelity Simulation-Based Evaluation in Nursing Education

It is an evaluation strategy that provides students with a holistic patient care experience. Students can practice self-care in multiple simulations without directly harming the patient and protecting the patient's rights. This simulation focuses on the teaching approach that develops
the learner’s ability virtually basing on real-life situations. A human dummy is provided with advance programming controlled by the computer. It can mimic the physiological and psychological aspects of a human. A program is then set depending on the purpose of the simulation. This practice gives a close to real life practice for learners wherein the reaction skills and problem-solving skills of the students are improved due to the changing situation based on the symptoms presented in the simulation. Cordeau (2013) found that such practice provides the medium for the students to practice in high-risk and crisis situations. Learning from this allows learners to apply theoretical knowledge into practice. Learners then receive feedback immediately through reflection. This helps students to open up their minds by reviewing and sharing experiences gained from collaborative learning among learners. The instructor helps with the reflection of the practical performance of the learner. Essentially, it aims to prepare the nursing students in responding to the changing conditions of patients based on the disease and its symptoms.

In line with the study of Chong (2009) which indicated that even though some students were skeptical with reflective practice, they found it useful. Giving the students the medium of self-reflection of their own experiences deepens the acquisition and retention of knowledge. In fact, reflective thinking is defined as the engagement of self-monitoring that occurs during or after a simulation experience. Considered an essential component of experiential learning, it promotes the discovery of new knowledge with the intent of applying this knowledge to future situations. Reflective thinking is necessary for metacognitive skill acquisition and clinical judgment and has the potential to decrease the gap between theory and practice. Reflection requires the creativity and conscious self-evaluation to deal with unique patient situations (Meakim et al., 2013). In addition study conducted by Gordon & Buckley (2009) with fifty medical-surgical graduate students found that medical-surgical graduate nurses’ confidence and perceived technical and nontechnical skills during patient clinical emergencies are enhanced following simulation. The ability of graduates to transfer the increased confidence and seen advanced resuscitation skills following simulation to the clinical environment needs to be investigated. Withal, giving the students the background knowledge not only theoretically but so as practical application gives them more confidence in dealing with real-life situations.

Figure 1: Students assessing SIMMAN
Figure 2: Students performing care
Objective:

The authors aimed to report their experiences from using a high fidelity clinical simulation as a method of evaluation of nursing students’ learning outcomes in critical care nursing.

Method and Participants:

The authors designed three critical care scenarios, namely, acute exacerbation of COPD, acute myocardial infarction, and hypovolemic shock using interactive SIMMAN. The participants included 214 third-year nursing students who were enrolled in critical care nursing course in Boromarajonani College of Nursing, Nakhon Lampang, Thailand in the school year 2016. These students were assigned to work in a group of 10-11 in a class combining of lecture and problem-based learning. The simulation took 15-20 minutes to be completed and supervised by two lecturers. The simulation is then evaluated based on the transformative simulation-based evaluation. In case of inconsistency between the scores given, the eight lecturers later revisit the process to standardize the scorings. The students are oriented about simulation-based evaluation at the beginning of every semester and schedule for the evaluations are given in advance. Therefore, students are aware that they will go through such evaluation but due to the theoretical approach in teaching, it does not provide practice that will support the students in performing the knowledge gain.

Scenario Development

The scenarios were created by eight qualified lecturers using data from case studies of patients which involved three situations of patients having: Acute Exercise COPD, Acute Myocardial Infarction Patients, and Hypovolemic shock patients. After the approval and examination of the scenario, it is then encoded into the computer program.
Table 1: Sample Scenario: Acute Myocardial infarction

<table>
<thead>
<tr>
<th>Summary of Frame / Setting</th>
<th>Mannequin action</th>
<th>Corrective intervention</th>
<th>Cue / Prompt</th>
<th>Transition</th>
</tr>
</thead>
<tbody>
<tr>
<td>First meeting</td>
<td>Department of Internal Medicine Thai men have chest pain, crack to left shoulder, feel good, have to sweat. T 36.5 C, P 100/min, RR 22/min, BP 130/90 mmHg, Spo2 92% Pain score 5 marks</td>
<td>1) Alcohol hand rub 2) Introduce yourself 3) Ask the patient. 4) Head high 5) Measure vital signs and measure oxygen saturation. 6) Assess pain score 7) Give O2 Cannula 3LPM 8) ECG 12 lead.</td>
<td>Faint chest pain</td>
<td>Within 2 minutes Turn to get worse.</td>
</tr>
<tr>
<td>Getting Worse</td>
<td>Patients have cold pale. restless T 36 C, P 126/min, RR 26/min, BP 150/100 mmHg Spo2 90% Pain score 8 marks</td>
<td>1) V / S, SPO2 Pain score 2) SBAR doctor’s report 3) Absolute bed rest 4) Isordil 5 mg SL 5) ASA gr. V chew stat</td>
<td>Oh, my chest hurts so badly. Relative outcry. Help the patient. The patient is dead.</td>
<td>If the nursing care is provided. 4-6 Turn to Improvement If not, turn to Stage 4 for the</td>
</tr>
<tr>
<td></td>
<td>Heart sounds: normal S1, S2 EKG show ST elevation V1-V5 Pain score 8 marks</td>
<td>6) Mo 3 mg V stat 7) CK, CKMB and Troponin T 8) 0.9% NSS Vein KVO 9) ECG &amp; V / S Monitor 10) Psychological care for patients and relatives.</td>
<td>With the phone to take a photo.</td>
<td>patient.</td>
</tr>
<tr>
<td>Patient Improvement</td>
<td>Patients feel-good start to rest, no sweating: T 37.0 C, P 92/min, RR 20/min, BP 120/90 mmHg, Spo2 96% Pain score 3 marks Heart sounds: normal S1, S2 EKG show Normal Sinus Rhythm</td>
<td>1) Lab report 2) V / S &amp; Spo2 3) Observe chest pain 4) ECG Monitor</td>
<td>Some better chest pain</td>
<td></td>
</tr>
<tr>
<td>Arrest</td>
<td>Patients begin to stupor. Pale skin cool Unconscious call EKG show VF</td>
<td>1) Report the doctor using the SBAR</td>
<td>Unconscious no response to pain</td>
<td></td>
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</tbody>
</table>
Evaluation of Learning Outcomes

The learning outcomes (Table 2) were then evaluated using the evaluation tool constructed based on the selected standards of learning. Each item in the evaluation tool reflects the expected learning outcomes (Item 1: LO 2, Item 2 & 3: LO 3, Item 4: LO 4 & 5, and Item 5: LO 1). The ratings are as follows: 4 points indicates 80% - 100% completeness of task; 3 points indicates 70% - 79% completeness of task; 2 points indicates 60% - 69% completeness of task; and 1 point indicates 50% - 59% completeness of task. The evaluators or raters were 8 lecturers who taught the subject and developed the scenarios.

Table 2: Selected standards of learning for transformative simulation-based evaluation

<table>
<thead>
<tr>
<th>Learning outcomes</th>
<th>Indicators</th>
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</thead>
<tbody>
<tr>
<td>1. Moral integration</td>
<td>• Respect the values and dignity of humanity.</td>
</tr>
</tbody>
</table>
| 2. Knowledge | • Knowledge and understanding of holistic nursing care.  
• Knowledge and understanding of the subject matter of nursing science. Factors affecting health status.  
• Have knowledge and understanding of the essential aspects of nursing processes.  
• Apply Cognizant of the global situation affecting health and population. |
| 3. Intellectual skills | • Ability to systematically analyze.  
• Ability to develop a solution that addresses the situation and the change in a health context. |
| 4. Interpersonal skills | • The sense of responsibility for the duty professionally and socially. |
| 5. Information processing skill including numerical analysis skills | • Ability to analyze and present information. To other people effectively. |

Table 3: Evaluation Tool

<table>
<thead>
<tr>
<th>Behavior Indicator</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
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<tbody>
<tr>
<td>1. Can assess the condition of patients with symptoms. / Patient manifestations</td>
<td></td>
<td></td>
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<tr>
<td>2. Show the patient's practical skills to solve the problem.</td>
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<td>3. Have problem-solving skills.</td>
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<td>4. Communicate effectively with the team</td>
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<tr>
<td>5. Treat patients with generosity, respect human values in a dignified way.</td>
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<tr>
<td>Total score (full score = 20 points)</td>
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</table>
Students and Lecturers’ Reflections

All 96 students who participated passed during the simulation-based evaluation. The students scored the highest with items 4 and 5 reflecting moral integration, interpersonal skills, and information processing skills. Meanwhile, they scored the lowest in items 1, 2, and 3 indicating knowledge and intellectual skills. There was a relatively high consistency of the learning outcomes evaluation results among eight raters. The students manifested high communication skills with moral integration during the simulation which indicates that the students performed teamwork wherein they were able to communicate effectively with each other. On the other hand, the student showed limited.

The high fidelity clinical simulation-based evaluation allowed the lecturers to correctly and genuinely evaluate the students’ learning, especially clinical decision making and teamwork. Therefore it helped identify students’ learning needs. The evaluations were highly consistent across the lecturers. Students became aware of their current level of knowledge and skills as well as the deficits. They recognized the barriers to the application of their knowledge and skills in clinical scenarios. They identified ways to improve their performance in the future learning. Thus reflected the knowledge and intellectual skills gained in lectures are not enough to support the students during simulation.

Overall, the high-fidelity evaluation tool provided an accurate and effective evaluation of the knowledge, skills, and attitudes of the students when confronted with specific scenarios. It was able to provide learning reflection for the students to realize their strength and weaknesses through the guidance of the lecturers. The students were able to communicate effectively with each other. The high fidelity clinical simulation-based evaluation allowed the lecturers to correctly and genuinely evaluate the students’ learning, especially clinical decision making and teamwork. Therefore it helped identify students’ learning needs. The evaluations were highly consistent across the lecturers. Students became aware of their current level of knowledge and skills as well as the deficits. They recognized the barriers to the application of their knowledge and skills in clinical scenarios. They identified ways to improve their performance in the future learning. Thus reflected the knowledge and intellectual skills gained in lectures are not enough to support the students during simulation.

Conclusion & Recommendation

High fidelity clinical simulation-based evaluation is an effective method of evaluating, especially when it deals with higher-order thinking such as application and decision making. Thus, as discussed, the theoretical teaching within the class was not enough to support the student’s knowledge in dealing with the presented scenario. Therefore, the authors recommend the application of transformative-based learning to establish the application of gained knowledge into practice.

Reference:


Pochanakji, C. & Laheem, K. (n.d). *Nurses competency*. Retrieved from [http://fs.libarts.psu.ac.th/research/sar/%E0%B8%9C%E0%B8%A5%E0%B8%87%E0%B8%B2%E0%B8%99%E0%B8%95%E0%B8%9E%E0%B8%A8%E0%B8%81%E0%B8%A9%E0%B8%B2/21-NURSES%20COMPETENCY.pdf](http://fs.libarts.psu.ac.th/research/sar/%E0%B8%9C%E0%B8%A5%E0%B8%87%E0%B8%B2%E0%B8%99%E0%B8%95%E0%B8%9E%E0%B8%A8%E0%B8%81%E0%B8%A9%E0%B8%B2/21-NURSES%20COMPETENCY.pdf)