Journal of Problem-Based Learning Vol.1, No.1, January, 2014

Developing Post-operative Assessment Skills in Japanese Undergraduate Nursing Students Using High-fidelity Simulator (Sim Man) – A Pilot Study

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ABSTRACT

In this study we attempted to analyse whether or not high-fidelity simulated training was useful for improving the students' abilities of clinical judgment and/or decision-making. Curriculum implementation can be enhanced by offering nursing students an opportunity to perform suites of nursing skills in a simulated environment. It is true that simulation training should not be a substitute for actual practices in the clinical settings, but it can at least give students a chance to convert "knowledge" into "skills" by the use of experiences in the settings that mirror actual practice. The provision of repeated training helped study participants' confidence and improved their clinical judgment.

Keywords: High-fidelity simulator, Simulation based nursing education, Clinical judgment, Decision-making

Introduction

In Japan, while nurses' tasks are becoming more complicated and diversified because of the ever-increasing sophistication of medicine, the aging of the patients, decreasing length of hospital stay, a patient's condition or need for increasing levels of care, providing safe nursing services and medical care are becoming increasingly important issues. In basic nursing education, opportunities for students to learn from one patient at the training hospitals are being sharply reduced in association with decreasing patient hospitalisation stays. Moreover, while there is greater consideration for patients' rights and stricter medical safety guidelines, nursing care provided by unlicensed nursing students in order to acquire practical nursing skills at training hospitals has become limited since medical safety has become the first priority. Newly graduated nurses tend to spend more time acquiring additional knowledge or skills for safe medical or nursing care. Therefore, problems such as difficulty adjusting to the workplace and dropout rates are occurring (Kato, 2003). Furthermore, the disparity between the technical abilities of nurses immediately following graduation and the abilities expected in clinical practice is becoming greater with concerns being raised that the quality and safety of appropriate medical care and nursing services is being affected (Ministry of Health and Welfare Japan, 2004).

Japan is not alone in experiencing this set of challenges. A similar situation has become apparent in basic nursing education in the United States (Jay, 2005). Examination of the background of the introduction of a high-performance simulator in nursing education in the United States shows that

1. Given decreasing hospital stays in clinical centers, opportunities provided at training hospitals for in-depth learning of individual patient cases have decreased sharply.
2. Acquiring practical nursing skills at training hospitals has limitations.

3. Given a serious shortage of nurses, new graduates who have not acquired sufficient practical nursing abilities or have not been adequately trained; high turnover and loss of confidence results.
4. Replicating a patient's clinical situation using the high-performance simulator with repeated learning sessions is useful for improving a nurse's decision-making abilities (Elizabeth, 2005).

In preclinical training in Japan, an analysis of preparation of nurses for judgments about patient care reveals the following: An exercise to describe the appropriate thinking processes is reliant on a paper based patient scenario; an exercise designed for learning about vital signs measuring techniques had students engaged in role plays of nurse/patient situations; a learning exercise using what is called a "dummy" was only performed in technical training using the task trainer as the subject for determining the current patient status.

In order to reduce as much as possible, the disparity between technical abilities of nurses immediately following graduation and the abilities required in clinical practice, a small study was undertaken in a skills laboratory with students about to graduate. It was believed that by providing opportunities for students to acquire and apply a suite of clinical skills using a high-performance simulator their essential skills would be enhanced. The simulated care scenarios enabled re-creation of significant characteristics of actual clinical situations which can be repeated in training to develop students' confidence and competence levels.

Study design

First a survey of nursing technical skills expected of newly employed nurses with three months of experience in Japan was undertaken to gain some insight into the abilities required of them as they enter the workforce. Second, for undergraduate nursing students who have completed 1,260 practice hours as directed by the basic nursing education curriculum in Japan, we investigated how many had acquired the nursing techniques as mandated by Japan's Ministry of Health, Labor and Welfare. For the next element of the investigation, using the same undergraduate nursing students, an exercise was performed in a simulation event in which a patient's condition was set up immediately after surgery using a high-performance simulator. Then those techniques chosen as essential for practice were examined again to see whether they were useful or not for the proposed simulation.

Methods

A Nursing Technique Survey (Ministry of Health and Welfare Japan, 2004) with 103 items was given to the random sample of 75 undergraduate nursing students who completed a total of 1,260 hours of nursing practice. These same students with the same completed hours in the same practice were later asked to participate in a simulation involving an assessment of a patient immediately after surgery.

For the Nursing Technique Survey questions 99 descriptions were extracted from what were perceived as levels of basic nursing technique in clinical practice performed by nursing students.

Level 1 Practice related to matters managed by students themselves according to advice or directions from teachers or nurses. For these fifty items there were three measurements: *practicable oneself, impracticable oneself, and no opportunity.*

Level 2 Practice by students themselves under the direction or supervision of teachers or nurses: For these 41 items there were four measurements: *practicable, impracticable, only observing, and no opportunity.*

Level 3 Practice where students are allowed to observe practices performed by nurses or doctors: 8 items included three measurements: *observed, not observed, although listened to the explanation, and no*

opportunities without explanation. The responses to the Nursing Technique Survey were simply tallied up for each item in each level arranged in descending order, with the highest rate being *practicable.*

Training using the high-performance simulator

Among students who completed 1,260 hours of practice, 10 students who participated in the survey volunteered for the second part of the study. The high performance simulation assessment undertaken over 10–15 minutes involved a patient who underwent surgery (See Table 1). Students were to assess the status of each patient and report on it.

Table 1: Simulation of patient who underwent sigmoid colon cancer surgery scenario

Patient A: Fifty-six-year-old woman with sigmoid colon cancer and lymph node dissection. Returned from operation room 30 minutes after the surgery.
(Setting status)
Respiratory care: oxygen—inhaled with 3l/min mask
Status of wound: patched with gauze, no exudates
IN: Infusion from basilic vein of right forearm. (Soldem 3A, 100 ml/hour)
OUT: Balloon catheter, naso-gastric tube catheter
(Items required of students to conduct in the observation and nursing practice was given)
Observation and report of general condition 30 minutes after returning to recovery room:

1) Measurement of vital signs(blood pressure, respiratory rate, body temperature, chest and abdominal auscultation, SpO2).
2) Fluid management (checking the amount, drip rate)
3) Oxygen management (checking the amount)
4) Observation of exudates
5) Observation of balloon catheter (presence or absence of twisted catheter or evulsion of catheter, urine volume)
6) Observation of naso-gastric tube catheter
7) Presence or absence of pain
8) Status report.

After obtaining permission from the participating students to video record, the outline of the scenario was explained to them and the following guidelines were set:

- The students were to read the scenario carefully and assess the patient's status as per the scenario.
- The students were then to perform a demonstration of the method of general post-operative observation and reporting.
- There were enforced time limitations on students (excluding preparation time and video recording) for: Measurement of vital signs; Respiratory rate and abdominal auscultation; Fluid management (including in, out); Naso-gastric tube management; Drain management; Wound management; Determining presence or absence of pain status report.

Objective debriefing was performed by the students while watching the video of their performance. Students were asked to point out three good points and three bad points after observing themselves on the video. Last, while watching each other's video, students performed a 'Structured debriefing'.

Ethical considerations

The following points were explained to the nursing students and then the researchers obtained their written consent. Their participation and cooperation in this study was described as optional and no penalty would be incurred if they decided not to continue at any time. The data obtained would be used only for this study. Students' privacy would be protected, and data including videotapes was to be discarded after completion of the study.

Results

There were 103 responses to the survey, with more than 70% of responses recognised as the *practicable on my own which included basic bed-making, basic linen exchange,*

Table 2. The choice from 50 items in Level 1 for inclusion in the scenario

		practicable	Impracticable oneself	No opportunity
Items included in scenario	Assessment of respiratory value	97.1	2.9	0
	Record and report on respirations, pulse, body temperature, measurement of blood pressure	95.6	4.4	0
	Observation during insertion of indwelling catheter (property and amount of urine)	82.4	17.6	0%
	Determining symptoms and pathology accurately	60.3	39.7	0
	Assistance and observation of wound care (included surgical wounds)	36.8	52.9	10.3
	Management during inhalation of oxygen (observation, directed amount, moisture)	35.3	41.2	23.5

Table 3. Level 2 (41 items) included in the scenario

		Practicable with irection	Impracticable with direction	Only observation	No opportunity
Items included in scenario	Insertion and control of indwelling catheter	19.1	1.5	72.1	7.4
	Preparation, assistance, and management of intravenous infusion	16.2	4.4	70.6	8.8
	Management of 24-hour cardiac monitor	11.8	2.9	38.2	47.1

and *measuring breathing, pulse, body temperature, and blood pressure accurately.* The *impracticable on my own* category was recognised as involving assessing the patient's condition and providing emergency care such as *assessment for the balance of nutritional status, body fluid and electrolytes, observing the patient's symptoms and pathology accurately,* and *the preparation of an automated external defibrillator and using it correctly.* The items recognised as *practicable on my own,* were basic nursing skills without physical contact. Those recognised as *impracticable on my own* were skills that were rarely experienced in training, such as an explanation of examinations and the conduct of appropriate emergency responses.

The 'Nursing Technique Survey' distributed to 75 students was returned by 68 respondents (90.6%). For the 50 items in Level 1, for practice managed by the students themselves, four items were rated superior and four items were rated inferior; the items used to create the scenario are indicated in Table 2. More than 98% answered Level 1 for *measurement of vital signs,* the basic items for determining a patient's status. In addition, more than half of the subjects answered *impracticable oneself* for the items with a higher degree of physical contact, such as *assistance and observation of wound care or management of oxygen therapy.*

Despite the fact that Level 2 (41 items) contains items which are practised with direction, more than 30% answered *only observation* for 24 of 41 items. For high physical contact items such as *insertion and control of indwelling catheter* and *preparation, assistance, and management of intravenous infusion,* over 60%

attributed Level 3 to all 11 items. For the items requiring examination, *no opportunity for observation* accounted for more than 65% of responses (Table 3).

For Level 3 items (n=8), more than 60% of the students answered ***no opportunity without explanation*** for almost all items (See Table 4).

Training with high-performance simulator

The Nursing Technique Survey revealed that items for which the degree of physical contact is high and medical safety is required were categorised as *impracticable oneself or only observation.*

Using the results of the Nursing Technique Survey,

Table 4. Level 3 (8 items) included in the scenario

	Observed	No observation, although explained	No observation without explanation
Confirmation of blood transfusion, blood type, and name	63.2	19.1	17.6
Observation of oral cavity and foreign body removal	38.2	25.0	36.8
Assistance of haemostasis	22.1	17.6	63.2
Preparation and assistance of endo-tracheal intubation	20.6	16.2	63.2
Preparation of AED and understanding its necessity	17.6	30.9	51.5
Maintenance of patient's airway	14.7	25.0	60.3
Preparation of artificial ventilation and methods	5.9	25.0	69.1
Cardiac compression	4.4	25.0	70.6

Table 5. Questionnaire after debriefing

	Agreeable	Relatively agreeable	Yes and no
Could you understand clearly what this simulation's purpose was?	8	2	0
Was the direction given by the investigator appropriate and suitable to promote your understanding?	9	1	0
Could you understand the necessity of assistance?	6	3	1
Could this simulation assist with the learning process?	9	1	0
Did you have any hopes for success of the high-performance simulator?	8	2	0
Was this simulation helpful for you to better understand the patient?	7	2	1
Was the scenario similar to an actual situation you have experienced?	7	3	0
Was the feedback constructive?	10	0	0

a scenario depicting a patient immediately after surgery was created with a combination of items answered as *impracticable oneself*, including *management of infusion*, *management of oxygen*, *management of catheter*, and *observation of wound* (See Table 1). These situations were set up using the high-performance simulator.

The scenario utilised is shown in Table 1. Vital signs were set within normal limits. After the scenario was explained to 10 volunteer students, they performed the demonstration, then observed the patient and reported on it. The time for each collaborator to go through the scenario was 12 minutes on average. After all of them completed the scenario, a recorded videotape showing the methods and actions of each collaborator was reviewed, and a debriefing was conducted. The debriefing took 40 minutes for the videotape review and 40 minutes for free discussion. The results revealed positive impressions, including "it was good to see own actions objectively", "the lack of confidence in speaking was discovered through the video", "ambiguity in technique was reconfirmed", "unnecessary motions which were unnoticeable during the scenario were discovered through watching own actions objectively", "repeating a few more times will lead to more confidence", "performing before nursing practice may decrease my anxiety", "since debriefing, the technique made me understand what needs to be fixed; I am now aware of it". As for negative points, they included: "because there is a difference between a human patient and the high-performance simulator, performing the scenario before nursing practice may result in feeling there is a gap", "there is a limit to the high-performance simulator with regard to communication", "it may not be useful with regard to a patient's psychological care or observation".

In addition, an objective assessment about simulation training was performed after the debriefing (See Table 5).

Discussion

Training using a high-performance simulator: As a result of the debriefing after reviewing the videos of each student's scenario exercise, a number of additional matters were clarified. Although it was understandable that techniques such as the measurement of blood pressure were performed almost precisely; many other unnecessary behaviours were pointed out. Superfluous actions may indicate that a subject was not able to predict what to do next or did not personally understand what to do. One subject during the review commented that "I have never thought I had done such useless motion". Even though the subjects seemed to understand the items such as "measurement of blood pressure", "confirmation of respiration" and "confirmation of oxygen" as they read the scenario, they did not hesitate about the order of the observation. During the debriefing using video replay, one student mentioned the importance of efficient and adequate observation, and of clearly reporting a patient's condition, even if each of the observed items were understood. In order to fully grasp the techniques or knowledge, it is necessary to internalise the two stages of "understanding" and "satisfied with the outcome". If they perform a repetitive drill without the correct knowledge, it would simply be just a procedure unless there is a concrete understanding of the meaning of the technique, or if they can use their knowledge to assist them in performing the skills correctly; otherwise, it would be impossible to put their intentions into tangible forms (Ymananouchi, 2008). In this case, because an objective debriefing was performed with audiovisual aids to better understand what the subjects did, they found that their actions were performed unconsciously. Moreover, the necessity to find the meaning of each action may be promoted, since the debriefing performed by the students included constructive comments.

Furthermore, there were comments such as "repeated the training a few more times will lead to more confidence", "performing before nursing practice may decrease my anxiety". Although a certain amount of time for education or repetitive drills is indispensable in order to be "practicable", "understandable" and "satisfied" to what degree it is needed was not determined, since it greatly depends on the history, preparation, or endowment of each individual student (Ymananouchi, 2008). For these reasons, an understanding of each student's technique and performing the drills repeatedly until satisfied with the techniques is needed (Huang et al., 2006). Therefore, the use of a high-performance simulator, which possesses these functions, is considered useful (Pamela et al., 2008).

Additionally, a high-fidelity simulator is an effective method to promote the integration of active learning, technique, and sequence of judgment (Moriyama at el., 2006), and since it is reported that simulation also provides an opportunity for the trainee to play a key role for decision-making in medical education clinical practice, aggressive approaches are also needed for nursing education in Japan.

Educational research activities regarding simulation-based medical training in Japan is only beginning with outstanding issues evident in the education system. Moreover, an issue still remains regarding technical support for the operation of the simulation facilities, its maintenance and repairs. However, given that development in both theory and practice are needed and there is no priority (Pamela R .at el, 2008) currently in nursing practice, it is suggested that there is a necessity to aggressively promote simulated medical education in Japan as well.

Limitations of the study

A limitation of this study is the size of the participant cohort. Also there were only a few people that had experienced the training using the high-performance simulator. In the future, it would be necessary to have as many contributors from the program as possible (staff members and students) and analyse the results from the perspective of knowledge acquisition and skill development in order to consider the value of using the high-performance simulator more widely.

Conclusion

To conclude a summary of findings is provided: From the results of the Nursing Technique Survey one can see that in Japan, basic items such as vital measurements can be practised by the students themselves, though findings revealed that high physical contact activities with patients are more difficult to practise alone and may only involve “observation” in clinical situations. The high-performance simulator is not only effective in training of techniques repeatedly, but it was suggested that it is also an effective method to better understand the meaning of actions or decisions made. The use of the high-performance simulator in an education program may significantly reduce the impact on learning of the lack of clinical practice, and the benefits of using the simulator within laboratory practice and classroom work is thought to be significant. Even though education with the high-performance simulator is in its early stages of development and implementation in Japan, it is suggested that aggressive adoption is necessary given the pressures from changing models of care, changing patient profiles and acuity and changing patterns of service delivery.

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