Effective Design of High Fidelity Simulation for Nursing Students

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Abstract

The high fidelity simulation (HFS) has been used in nursing education to promote nursing students' essential skills before handling with real patients. However, little if any, has been known what an effective design of HFS looks like. This article, therefore, aims to review existing four frameworks for designing the HFS in nursing education. Then it attempts to synthesize these frameworks into a single framework. The synthesized framework points out three main important roles in the effective HFS design: instructor roles, student roles, and technical support. The instructor roles are to set clear objectives of the simulation, provide a realistic and problem-specific context, and give student support. The roles of nursing students include debriefing through individual and group reflections after experiencing with the simulation, practicing the role of observer, as well as taking a role play to make the scenario more realistic and to understand different roles more deeply. Finally, technical support such as setting up computer and preparing medical materials is crucial to make the HFS effective.

Keywords: high fidelity simulation, nursing education

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บทคัดย่อ

        การจำลองสถานการณ์โดยใช้หุ่นสมรรถนะสูงได้รับความนิยมในการศึกษาพยาบาลเป็นอย่างมาก โดยมีวัตถุประสงค์เพื่อส่งเสริมทักษะพื้นฐานที่จำเป็นของนักศึกษาพยาบาลก่อนการขึ้นฝึกปฏิบัติการพยาบาลกับผู้ป่วยจริงบนหอผู้ป่วย หากแต่ว่าความรู้ความเข้าใจในการออกแบบการจำลองสถานการณ์โดยใช้หุ่นสมรรถนะสูงที่มีประสิทธิภาพนั้นยังมีอยู่อย่างจำกัด บทความนี้จึงมีวัตถุประสงค์เพื่อรวบรวมกรอบความคิดในการออกแบบสถานการณ์จำลอง โดยใช้หุ่นสมรรถนะสูงที่เหมาะสมต่อการศึกษาทางการพยาบาล และทำการสังเคราะห์ออกมาในรูปแบบของบทบาทที่สำคัญต่อการสร้างสถานการณ์จำลองโดยใช้หุ่นสมรรถนะสูง ซึ่งประกอบด้วย บทบาทครูผู้สอน บทบาทของนักศึกษา และบทบาทของเจ้าหน้าที่เทคนิค โดยที่ครูผู้สอนทำหน้าที่กำหนดวัตถุประสงค์ที่ชัดเจนของสถานการณ์จำลอง ออกแบบสถานการณ์เสมือนจริงที่ตรงกับบริบทเฉพาะของผู้ป่วย และการให้การสนับสนุนอื่นๆ ที่จำเป็นแก่นักศึกษา ในส่วนของนักศึกษามีบทบาทเน้นหนักไปที่การอภิปรายสะท้อนคิดภายหลังจากการเข้ากิจกรรมจำลองสถานการณ์ทั้งแบบรายบุคคลและแบบกลุ่ม การฝึกฝนการเป็นผู้สังเกตการรวมถึงบทบาทอื่นๆ เพื่อความสมจริงและเพื่อให้นักศึกษาเกิดความเข้าใจในสถานการณ์มากยิ่งขึ้น และอีกหนึ่งบทบาทเป็นของเจ้าหน้าที่เทคนิคที่จะทำหน้าที่ในส่วนของการตั้งค่าคอมพิวเตอร์และการจัดเตรียมอุปกรณ์ทางการแพทย์เพื่อให้การจำลองสถานการณ์โดยใช้หุ่นสมรรถนะสูงนั้นมีประสิทธิภาพมากยิ่งขึ้น

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High Fidelity Simulation in Nursing Education

High Fidelity Simulation (HFS) is one type of Human Patient Simulation which has been widely used as a teaching strategy in many areas of nursing education. The HFS is "a full scale computerized manikins"[1-3] which responds immediately up actions of practitioners[1]. In addition, it can be programmed to provide realistic patient responses to students' actions[2] and is able to provide a high level of interactivity of manikins to practitioners[3].

Why is the HFS so important? This is because of its competency to simulate the real situations and enhance critical-thinking, problem-solving and decision making skills[4-5]; by using it, students can make mistakes without any harm to real patients[6] and they can learn after their mistakes[5]. This will boost up students' readiness before handling with real patients. In addition, it encourages students to be more active in learning by providing various experiences from low level to high level of complication of different cases.[4] Not only hands-on practices, but students also receive feedback immediately after learning both from instructors and camera records.[4] It prompts students to think more critically in a systematic way.[6] Furthermore, students can link their experiences in the simulation to the real clinical settings.[7]

Review of useful frameworks for HFS design

The effectiveness of High Fidelity Simulation cannot be displayed without its effective design. However, the design of an effective use of HFS is little if any, has known in the existing literature and different people have different strategies. Therefore, this article sets its aim to review a number of published works concerning the design of activities with HFS, composing of frameworks discussed by Jeffries and Rogers[8], Nevin, Neill and Mulkerrins[9], Seropian[10] and Lestander, Lehto and Engstrom[11] and then synthesize these into a single framework.

To begin with Jeffries and Rogers[8], five characteristics of simulation design are proposed. First, clear objectives are needed when instructors use simulation to support students' learning. Second, simulation should be as realistic to real-life situations as possible. Third, scenarios in the simulation need to demand problem solving skills. Fourth, student support is an attribute that gives information to assist students to succeed in the simulation. Fifth, debriefing is a tool that encourages reflective thinking skills and gives a chance for students to express feelings and to share their experience to others.

The second framework is drawn from Nevin, Neill and Mulkerrins[9] which focuses on the steps of problem-based approach to use with the HFS. This approach consists of eight steps. The first step is to identify programs, levels, course objectives and curriculum. In step 2, priority health problems and issues have to be pointed out. Step 3 concerns the selection of a priority problem and development of problem drawn from actual clinical cases. Step 4 allows for the development of supplementary resources and materials. Step 5 is then set for seeking evaluative feedback and revision as appropriate. After developing the problem package (steps 1-5), step 6 is to implement a pilot work. Know-how from the pilot work can then be revised and refined in order to make a better problem package in step 7 which can then be integrated into the course curriculum in step 8.

The third framework is taken from Seropian[10] which points out eight components of an effective design of a scenario for HFS. The first component is an objective which contains scenario title, intended audience and expected learning outcomes. The second component is personnel and equipment, patient preparation and make ups are to be prepared for students by instructors. The third component is computer set-up and operator instructions in which physiological changes of the simulation and expected treatments that are required in the simulation are to be set before learning by

technical staff. In the fourth component, paperwork and supporting documentation such as patients' files and investigation results are to be prepared for students to interpret and practices how to deal with clinical data. The fifth component is the context which concerns information about the chosen scenario including actors' and patient's script and students' briefing information, and others that can make the scenario realistic. The sixth component is knowledge and teaching information that assist instructors to guide students in debriefing. The seventh component concerns with references that need to show the source of teaching information to instructors. The last component is notes and comments taken by the instructor that collect necessary data such as students' difficulties and failures in the current simulation for further improvement.

Furthermore, the framework described by Lestander, Lehto and Engstrom[11] is taken into consideration which emphasizes on debriefing. It is suggested that verbal and written debriefing can facilitate the expression of nursing students' experiences after experiencing with the simulation. A three-step post-simulation reflection model is proposed to help students become more explicit in their practices. The 3 steps compose of, first, individual written reflection that instructors ask students to answer the question freely at the end of HFS day about their feeling, knowledge and experience that they gained after using the HFS. In this step, students can take their own time to reflect on the questions and can crystallize their ideas into a piece of written work. Then the second step is verbal group reflection that allows students to share any experience to others. In this step, not only sharing their reflection from the first step, but students can also learn from experiences of others who may view the same thing differently. This group discussion and reflection can broaden student perspectives in many ways. In the third step, students are asked to revisit their written task after the group discussion. However, this time, students can embed the others' ideas into their answers which can help them see different meanings of things.

Of course, each of these recommended frameworks provides useful information for new users of HFS. However, considering them in isolation may not yield the best guidance. Therefore, this article attempts to synthesize the aforementioned frameworks and to present it as a single framework. In this synthesis, three main categories are proposed composing of instructors' roles, students' roles, and technical support.

The synthesized framework of HFS design
Instructor roles

The first point for consideration as an instructor or trainer is to set objectives of the HFS activities. An appropriate objective should be matched with the course objective and the level of students who use the simulation.[8-10] The function of objectives is to guide students to the expected outcome achievement in the simulation activity.

Apart from the objective, an effective design has to display a specific context in which an actual case and real environment are to be set.[8-10] In some cases, patients' and actors' script are important to make it more realistic.[10] Setting a context should be realistic and problem-specific because students can practice how to take care an imitated patient (the simman) that functions as a real patient without harm. In addition, specific problems help students understand how to take care patients with various cases such as stroke, congestive heart failure, and asthma. These different cases have different nursing care so that students can exercise different skills.

In addition, the design should concern additional supports for students. For example, the instructors have to provide the essential information and materials that help students learn more effectively in the HFS.[8] These materials have to provide opportunities for students to make connections between knowledge and their experience with the HFS

in order to further develop critical thinking as well as problem-solving skills.[9]

Student roles

Turning from instructor to student roles, it is known that learning is two-way communication and thus students are required to take an active role in the lessons. One of the roles is reflection of their experiences in the use of HFS through debriefing. Debriefing can stimulate the perspective of simulation experiences of students and link clinical theories to practices.[8] When students face with problems in the simulation, they can share in the debriefing activity with their peers as well as instructors. It helps students to reformulate their ideas in nursing care by nursing instructors who observe them during the simulation. Moreover, this process can give valuable feedback for instructors themselves as they learn what difficulties are faced by students and what needs to be improved in the next simulation.[9]

Traditionally, debriefing is done only after using the simulation due to the fact that students' thoughts, live experiences and feelings still remain. However, a series of debriefing is suggested by Lestander, Lehto and Engstrom[11] for more effective feedback. In addition, forms of debriefing can be varied. Apart from oral debriefing, written debriefing can be also effective as students can spend more time to reflect on the activities and their contribution to them.

Lestander, Lehto and Engstrom[11] therefore, suggest breaking down debriefing into three steps. First, students are asked to write a reflection individually about their feelings, experiences and new knowledge acquired from the activities, and how they will use these to develop their nursing profession in the future. After that, the students will be gathered as a verbal group discussion in which open-sharing is welcome. In this group discussion, the instructors will collect topics and point out some good topics for consideration. Finally, the same question in the first step is used for the individual nursing students to ponder more in the form of writing. Surprisingly, the finding shows that the students become more socially concerned by thinking of the others apart from themselves.

Not mentioned in the four frameworks, however, it is important to consider two other additional points for student roles which is taken from Hober and Bonnel[12] and Redden[13]. The two additional points are observation and role play. First, an observer is one character of students who practices with the HFS. Each group of students should have at least one observer who can reflect on how the group works proceeds. This external observer can provide feedback including strengths and weaknesses for those who work in group which they may miss some other important issues while doing. The discussion between the observer and the other group members can develop students' learning skills through dialogue. In addition, not only look at what the others are doing, but the observer can also learn and gain knowledge by seeing others.[12]

The second additional point is student role play. It cannot be denied that to make the simulation realistic, the quality of HFS is one thing and the role play of those students working in group is the other. Thus, simulation with role play is recommended by Redden.[13] Instructors can assign students to act in different roles such as parents, relatives, doctor, lead nurse, supportive nurses and so on. In the simulation, the instructors will provide scripts for each character. The finding shows that students enjoy the activity and understand about each role of people in the clinical team more properly. Also, the students can exercise their patience and effective communication when encountering with difficult people. Furthermore, students can improve their knowledge and communication skills among the team after they learn simulation with role-playing.

Technical support

Besides the roles of instructors and students, technological support plays its part in HFS activities. The first concern is computer

setup in which a detailed script of the expected physiological changes of patient in simulation from nursing instructors will be set to help staff use the computer that links to the high fidelity simulation correctly and make the scenario go more smoothly. The second concern is to prepare medical equipment necessary for students to learn in the simulation which has to be linked to the context that is set previously.[10]
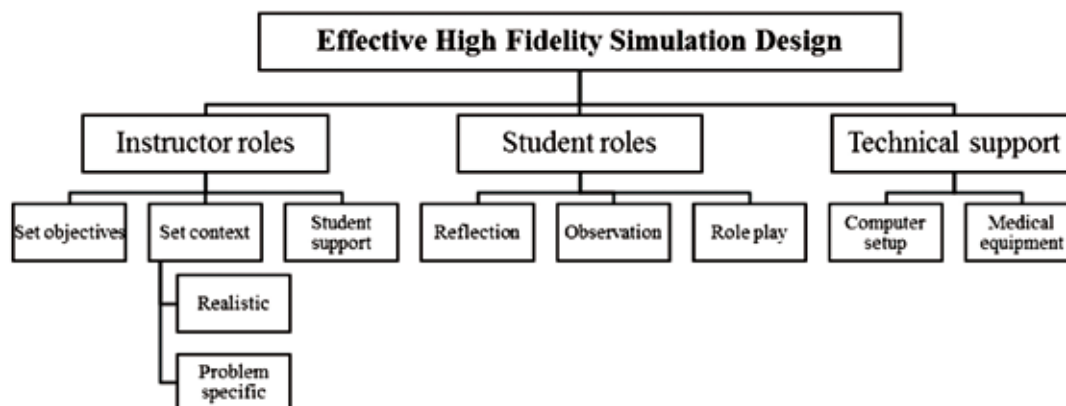

Fig 1: Diagram of the synthesized framework for effective high fidelity simulation design

Summary

The high fidelity simulation (HFS) has been widely used in nursing education. A number of frameworks suggesting how to design the HFS lessons have been published. However, a new user might not be able to deal with such variety of recommendations. Therefore, this article provides a brief review of four useful frameworks and synthesizes them into a single framework for designing high fidelity simulation. It proposes that there are three main roles to consider when designing the HFS activities: instructor roles, student roles and technical support which can be broken down into minor points of consideration. This article also adds the roles of students as observers and actors/actresses into the synthesized framework to make it more complete. Invitation is given to other researchers and instructors who may want to try to incorporate this synthesized framework into their practices. Contributions regarding the effectiveness of this frameworks or suggestions for further improvement are greatly welcome to develop the effective use of the HFS in nursing education.

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