ORIGINAL PAPER

Simulation in Clinical Nursing Education

Konstantinos Koukourikos[1,2], Areti Tsaloglidou[1], Lambrini Kourkouta[1], Ioanna V Papathanasiou[3], Christos Iliadis[4], Aikaterini Fratzana[5], Aspasia Panagiotou[2]

[1]Nursing Department, Alexander Campus, International Hellenic University, Thessaloniki, Greece

[2]Nursing Department, University of Peloponnese, Tripoli, Greece

[3]Nursing Department, University of Thessaly, Larissa, Greece

[4]Private Health Center of Thessaloniki, Greece

[5]"G. Papanikolaou" General Hospital of Thessaloniki, Thessaloniki, Greece

Corresponding author: Konstantinos Koukourikos, Lecturer, MSc, PhD (c), Nursing Department, Alexander Campus, International Hellenic University, P.O. BOX 141, T.K. 57 400, Sindos, Thessaloniki, Greece. Tel: +302310013831 E-mail: kokaea@yahoo.gr, ORCID ID: https://orcid.org/0000-0003-1973-2773.

ABSTRACT

Background: Simulation constitutes a teaching method and a strategy for learning and understanding theoretical knowledge and skills in the nursing and medical field. **Objective:** To review and present modern data related to this issue. **Methods:** Literature review of data related to the issue derived from Medline, Cinhal, and Scopus databases, in English, using the following keywords: nursing, simulation, simulator, nursing laboratory. **Results:** The implementation of simulation enables students to practice their clinical and decision-making skills for some significant issues they may face in their daily work. The protected environment and the sense of security enhance students' self-esteem and confidence, thus promoting learning. In this way, the gap between theory and practice is substantially reduced. **Conclusion:** The further development of simulation, along with other instructional techniques, can significantly help the efforts made by the students to become integrated and successful healthcare professionals.

Keywords: nursing, simulation, simulator, nursing laboratory.

1. INTRODUCTION

One of the major problems of nursing education is the lack of co-ordination between theory and practice. Nursing students encounter difficulties in the practical implementation of theoretical knowledge and this is a problem seen on an international scale (1, 2). The distance created between theory and practice complicates the learning process and the lack of understanding of nursing terms and concepts affects the professional integration of a student (3). This is achieved through real knowledge and understanding of healthcare science, where nursing theory is harmoniously combined with practical skills. A teaching technique contributing to this direction is simulation.

Simulation is defined as "the process by which we are trying to achieve results approximating clinical practice as closely as possible". It is a technique for replacing or completing real-life experiences with guided experiences, which area faithful imitation of the real world

in a fully interactive way (4). It is a teaching method where, following a certain scenario, students experience the actual dimensions of their future professional roles, which helps them to be more quickly integrated into the workforce of the healthcare sector (5, 6)

In nursing science, simulation is used for teaching theoretical and clinical skills, while focusing on the promotion of the critical thinking of students (7, 8). Simulation enables students to work in an environment closely resembling that of a hospital and helps them to gain healthcare and nursing experiences, even before they start working as professionals. The students are able to put everything they have been taught into practice, cope with any difficulties and problems, and even make mistakes without causing damage, and all that in a safe environment, without any risk whatsoever for patients (9, 10). An increase in the use of simulation is due to the lack of clinical structures for student training, lack of professors, and also due to

the increased quality of training provided through this method (11).

2. OBJECTIVE

The aim of this study was to review and present modern data related to this issue.

3. METHODOLOGY

This is descriptive study based on searched and used literature data related to the issue derived from on-line databases: Medline, Cinhal, and Scopus (in English), using the following keywords: nursing, simulation, simulator, nursing laboratory.

4. RESULTS AND DISCUSSION

Simulation-based learning

Simulation constitutes a teaching and training technique for healthcare professionals aiming at the substantial understanding, enhancement and dissemination of knowledge, skills and attitudes of healthcare professionals at all levels. Through this technique, students experience an actual hospital setting and interact in it, thus significantly reducing the probability of errors in the performance of their duties (4, 12).

Simulation-based education and learning is an answer to the mainly theoretical training of students to date and helps them to develop knowledge, skills and attitudes, while creating a sense of security both for the patient and for the healthcare professional (13). This technique rebuilds a skill or clinical experience, in full or in part, without exposing the patients to any risk whatsoever (14, 15). It is used for applying structured learning experiences (e.g., venipuncture, patient resuscitation) based on a certain action protocol, and for enhancing the team spirit and spirit of cooperation, mostly in countries with limited educational resources (16, 17). This technique minimizes errors, increases the satisfaction of students from the educational process, and enhances their self-confidence, self-esteem, and comfort in skill performance. Now, the students are familiar with the successive steps required to acquire a skill, perfect their technique, and reach the optimal clinical outcome. Simulation-based education and learning becomes interactive and experiential, the main benefit being the consolidation of skills acquired and knowledge taught (18-20). The setting where the simulation is performed promotes learning and, through the repetition of a skill, this skill becomes fully understood and clear. In their work Wellard et al. (21) report that the protected setting of a laboratory practically drives students to learn and understand certain skills, while Freeth et al. (22) argue that clinical laboratories and simulation substantially reduce student anxiety and fear. By choosing rare or unusual examples or scenarios, a student becomes acquainted with a wide range of interventions and skills, thus enhancing the effectiveness of education (23). In a research by Croxon et al. (24) the students made positive comments and strongly argued that simulation and the clinical laboratory procedure have prepared them for what they will later face in the hospital.

The basic nursing skills including intramuscular and intravenous drug administration, venipuncture, nasogastric catheter placement, colostomy care, bladder catheterization, oxygen therapy, and basic life support lessons can be taught by the use of simulation.

Another basic parameter of simulation is the possibility of assessing student performance, since the step-by-step learning of a skill allows repetition and testing thereof (25).

Simulation Types in Nursing Education

Through the use of simulation, an attempt is made to replace real patients with virtual standardized patients, or technologies and methods capable of reproducing actual clinical scenarios for therapeutic and educational purposes. These processes include, among others, plain demonstration of a certain scenario on a computer (cognitive test), simulation of a nursing skill, or carrying out of an integrated process. The basic types of simulation in nursing education include the following (15, 25, 26, 27):

Use of high-fidelity mannequins or technologies. These constitute body blocks or body part blocks with characteristics of life, which can respond to actions or interventions by the students. They are used for representing the clinical reactions-symptoms of a patient and for describing any conditions surrounding a case, for example, tool stocks available (e.g., dressings, syringes, etc.) and time limits available.

Low-fidelity mannequins. Use of low-fidelity mannequins capable of performing a small number of particular tasks or processes, for example, a limb for catheterization of a vessel, or mannequin for CPR learning.

Partial task simulators. This category includes models (e.g., hands-arms) used for implementing a clinical skill-task that may be repeated by students. Typical examples include "limbs" for intravenous catheterization of a vessel, head and chest mannequins for placing an airway and faux leather cushions for practicing wound suturing.

Virtual reality. Virtual reality is increasingly being adopted as a simulation tool. In health professions, the simulation of virtual reality uses computers and standardized patients to create a realistic learning and evaluation setting.

Standardized patients - Volunteers playing the roles of patients. These are trainees behaving in a particular way for realistic clinical interactions. They are widely used for teaching and assessment in nursing education, especially for communication purposes and for the acquisition of skills, and they may provide feedback when requested.

E learning (usually knowledge testing, e.g., multiple tests). Computer-generated simulators are representations of tasks or settings used for facilitating learning. These include a simple computer program demonstrating the operation of a device, e.g., anesthetic machine, or something highly complicated, e.g., a detailed setting for virtual reality, where the participants interact with virtual patients or other healthcare professionals.

Hybrid Simulation. This type of simulation is defined as a type where two or more simulation types are combined to produce a more realistic simulation experi-

ence. A typical example is the use of portable devices by standardized patients, where students are able to perform certain procedures while interacting with a real person. For example, a standardized patient may fix a suture training model (cushion) on his/her arm, where the trainee can suture a wound; thus, while giving the trainee the opportunity to obtain informed consent, explain the procedure, etc.

Benefits of patient simulation in Nursing Education

Simulation, as an evidence-based educational technique and process, firstly appeared when it became difficult for nurses working in a hospital to acquire clinical experiences. Simulation helps to address any limitations related to the clinical setting (including availability of patients, security issues etc.), promote teamwork and solidarity among students, and implementation of a protocol for the attainment of a skill. It is based on a scenario, where learning becomes interactive, allows feedback between the educator and the other members of the team, and promotes clinical reasoning and critical thinking in the team (28).

The majority of students are familiar with advanced computer technology and computer games. As a result, there is relative comfort with certain types of simulation using computers, mainly in providing audio and video feedback in real time, thus helping a student even more to perform a skill. The controlled and totally safe setting (both for the patient and for the student) of a laboratory that a professor may operate, constitutes another factor leading a student to success and knowledge. In addition, an activity may be interrupted for discussion and correction and be continued later. Video recording of a skill significantly contributes to the evaluation of an activity by both the student and the professor (29).

According to Cook et al., (30) health care systems are reinforced by simulation, because there is an interprofessional development of the team of healthcare professionals, an overall improvement in the performance of activities and health care skills, and an enhancement of the competence of healthcare professionals in a safe setting. Error analysis, discussion on communication-related issues, and missed opportunities for optimizing health care may become topics for feedback.

Simulation helps to develop different scenarios requiring the use of both clinical skills and critical thinking skills by nurses, in order to solve problems. In addition, according to Savarese (31) there is a trend towards replacing the clinical experience of the hospital with simulation programmes, even by fifty per cent, in the curricula of nursing schools.

The factors that may determine the attainment of learning outcomes and promote the self-confidence of students include the area where simulation is performed, psychosocial contact and interaction of students, organization and elements of teaching (32). Teaching focuses on students, and it is a process of experiential exercise centered on training and cooperation with others (33).

Through simulation, nursing students may practice their abilities and clinical skills, make errors that will not be fatal for the patients, and repeat the process (more than once) leading to mastery. In addition, they have time to reexamine and reflect on their performance, and reach a kind of review, which is necessary for completion of the process (34, 35).

This process provides an opportunity for active participation of students, and it is focused on error prevention, immediate feedback, and creation of an appropriate training environment, where students will feel and actually be psychologically safe, will communicate among them, and be able to review the process. Participation in small groups allows the students to directly monitor the attempts made by their classmates, improve their methods and enhance solidarity among them (36, 37). Simulation establishes a bridge between theory and clinical practice. Students are able to understand a skill, because they can see it and apply it on a patient simulator. Thus, critical thinking develops and clinical decision-making skills lead to substantial learning experiences (38).

It is well documented that simulation-based training helps to enhance communication skills, the ability to cooperate with other members of the interdisciplinary team, the ability to manage complex situations, and to enhance self-efficacy and understanding of interpersonal relations (39, 40).

According to a study by Crowe et al.,(41) through simulation it is possible to enhance nursing knowledge and skills, promote communication skills, and enhance confidence and self-reliance of nurses in the exercise of their duties. Therefore, this reduces their stress, makes them feel more confident, enhances their psychomotor skills, and makes them ready to apply nursing interventions in a clinical setting.

Currently, simulation-based training as an educational tool in nursing science has multiple uses. The most recent applications include continuing vocational training, just-in-time training, and development of a team spirit. Educators play a significant role in regulating the entire procedure and through their knowledge and skills, they facilitate learning. Educators also ensure that an atmosphere of psychological safety is created, in order to enable students to act in this setting, thus reducing other concerns and problems they may have (42).

Limitations on the use of simulation in Nursing Education

There is a widespread use of simulation in nursing schools and it continues to spread, since the benefits are enormous. However, there are certain limitations in the teaching of nursing skills through simulation, the most significant of which include the following:

Simulation as technique and holistic nursing care as philosophy constitute two different components of nursing courses, which have been merged in the process of acquiring knowledge and skills required for patient care. Simulation provides opportunities for acquiring and applying knowledge and skills through the use of simulators, standardized patients and virtual settings. However, it is impossible to approach a patient as a whole, as a biopsychosocial human being (43).

Another limitation of simulation training is that some-

times not all variables related to an emergency in a live environment are included. Simulation training is carried out in a controlled setting managed by the educator, who may stop and restart a process, which is impossible in real life (29).

Simulation is a process trying to resemble real life, but it is not real. Its realism depends on the fidelity of the simulator, the setting, and the description of the scenario. As advanced simulation models may be, there will always bean imperfect imitation of human systems. As well trained the students may be, whenever they are called to apply a skill in real time and conditions, they often are extremely stressed or "freeze", being unable to successfully complete the procedure. Therefore, schools are trying to update different simulation programmes, investing in machinery, or using actors in roles of patients, in order to add plausibility in their reactions. In addition, training of professors in simulation processes and technological issues is required. As realism increases, the effectiveness of simulation and scenario as a training tool also increase (44, 26).

Training of nurses in whatever way possible, especially if such training is achieved by means of simulation, is not a low-cost effort. The equipment and operation of a modern laboratory demand quite large expenses. Purchase of computers and high-fidelity simulation models and maintenance there require considerable funds. Amortization of such equipment will be achieved through an appropriate and rapid training of students and, consequently from the health care provided to patients by well-trained nurses (45, 46).

Familiarization of educators with technology, in general, is a necessary condition for smooth operation of the simulation programme and appropriate training of students. Being a simulation educator is different from being a professor in a nursing school. However, such distinctions are rarely made and health educators are inadequately trained and have limited skills as a result, such training is ineffective (47).

Incomplete training is another significant limitation that may appear in simulation. A poorly designed scenario may result in negative learning. For example, if certain physical reactions are missing during the simulation process, the students may neglect them and fail to test them. Frequently, due to time constraints, simulation fails to assess some essential parameters of the health care procedure and communication. Thus, the students fail to ask for or obtain the consent of the patient to the implementation of a medical procedure, or fail to follow basic rules of communication, which are necessary for establishing personal contact and creating a healing environment (26).

The attitude of trainees is of great interest. The participants will always approach a simulator different from when they are in real life. There will be anxiety and concern, on the one hand, because one is aware that a certain event will occur and, on the other hand, one may not pay attention, because no one's life is in danger (48)

Educators and Simulation

Educators play a significant part in the successful implementation of simulation programmes. It is not assumed that a nursing professor is identified with a simulation educator. Knowledge of technology and technological applications is necessary for successfully teaching the parameters of nursing science. A study by Simes et al., (49) aiming at investigating the factors affecting the comfort of simulation educators in an Australian university, reported that there are four factors affecting educators: 1. Personal Barriers (including excessive stress from students' expectations), 2. Structural Barriers (including understanding of educational material, access to teaching and learning resources), 3. Human Resource Barriers (e.g., when there is no prior information and discussion on simulation programmes, and the students were simply given these programmes and they were told to use them), 4. Suggestions to address barriers (they provided suggestions for ways of addressing such barriers, including presence of a mentor, more training in simulation-related issues, carrying out of a rehearsal and creation of backup copies).

In addition, the availability or lack of resources affects the ability of educators to join simulation activities in all courses of study, according to a study by MacKinnon et al (50).

Some students report that the role of an educator in simulation programmes is very significant and that it must combine the role of a clinical nurse and that of an educator, because this is the only way to enhance learning and the realism of different scenarios (51).

McAllister et al., (52) present a series of suggestions for overcoming any barriers and limitations appearing in simulation and maintaining quality in clinical training, while taking practical and pedagogical issues into account. These suggestions include: providing assistance to educators in their work, enabling students to have direct access to clinical skills videos, focusing on teaching clinical skills, utilizing teams in the documentation on skill learning, learning communication skills in an entertaining and imaginative way, and improving time management and prioritization of needs for students.

3.6. The Future of Simulation in Nursing Education

Nursing science and art constitutes a highly significant and integral part of the health care system. Nurses and their training are fundamental elements of the effectiveness of the system; therefore, special attention is paid and must be paid. Any changes in the training of nurses are interwoven with technological advances, and their training is directly affected by any technological means available for teaching.

The use of simulation as an educational strategy represents a great challenge for nursing education. Simulation may improve health care and patient safety. No patient who is alive is put at risk at the expense of the trainee. Simulation provides standardization of cases, promotes critical thinking, allows supervision of patient care, provides immediate feedback, and helps students to assimilate knowledge and experience. It is an ideal composition learning experience (53).

Probably the greatest change in nursing education is the introduction of virtual simulation. Continuation and

development of virtual simulation constitutes a focal point for nursing science and for the progress of nursing students. This requires investment of funds in the establishment of appropriate laboratories by nursing schools, time for simulation as provided for in the curricula, and educators who are properly trained to create various scenarios and operate simulators. (54)

The use of virtual simulation must become a part of the overall simulation programme. Despite the fact that virtual and augmented reality are at a quite early stage, this option will rapidly spread, as soon as simulation-related technology becomes available and affordable. The quality of simulation devices will provide opportunities for training of students in skills that used to require actual educators in the past, thus opening up new opportunities for schools to reallocate their financial resources.

5. CONCLUSION

The objective of nursing education, apart from the acquisition of solid theoretical knowledge, is the acquisition of clinical skills, which are necessary for graduate nurses to be promptly integrated into the workforce. Integrated learning, critical thinking, and optimal decision-making skills help nurses to provide quality health care. This can be achieved through the inclusion of simulation in the education process. Further development of simulation, along with other educational methods may be of great assistance in the attempt made by students to become integrated and successful healthcare professionals.

REFERENCES

1. Ekebergh M, Lepp M, Dahlberg. Reflective learning with drama in nursing education – a Swedish attempt to overcome the theory praxis gap. Nurse Education Today. 2004 Nov; 24(8): 622-628

2. Maginnis C, Croxon L. Transfer of learning to the nursing clinical practice setting. Rural and Remote Health. 2010 Apr-Jun; 10(2): 1313.

3. Kim JH, Park I, Shin S. Systematic review of Korean studies on simulation within nursing education. J Kor Acad Soc Nurs Educ. 2013 Aug; 19(3): 307–319 http://dx.doi.org/10.5977/jkasne.2013.19.3.)307-319.

4. Gaba DM. The future vision of simulation in health care. Quality & Safety in Health Care. 2004 Oct; 13 (Suppl 1): i2-10 doi: 10.1136/qhc.13.suppl_1.i2.

5. Waxman KT. The development of evidence-based clinical simulation scenarios: Guidelines for nurse educators. Journal of Nursing Education. 2010 Jan; 49(2): 29-35. doi: 10.3928/01484834-20090916-07.

6. Lane AJ, Mitchell CG. Using a train-the-trainer model to prepare educators for simulation instruction. The Journal of Continuing Education in Nursing. 2013 May; 44(7): 313-317. doi:10.3928/00220124-20130515-33.

7. Blevins S. The impact of simulation on patient care. Med surg Nurs. 2014 Mar- Apr; 23(2): 120-121.

8. Goris S, Bilgi N, Korkut Bayındır S. The use of simulators in nursing education. Düzce University Health Sciences Institute Journal. 2014; 4(2): 25-29.

9. Gore T, Hunt CW, Parker F, Raines KH. The effects of simulated clinical experiences on anxiety: Nursing students' perspectives. Clinical Simulation in Nursing. 2011 Sept; 7(5): e175-e180. http: //dx.doi.org/10.1016/j.ecns.2010.02.001.

10. Kapucu S. The Effects of Using Simulation in Nursing Education: A Thorax Trauma Case Scenario. International Journal of Caring Sciences. 2017 May-Aug; 10(2): 1069-1074.

11. Horsley TL, Wambach K. Effect of nursing faculty presence on students' anxiety, self-confidence, and clinical performance during a clinical simulation experience. Clinical Simulation in Nursing. 2015 Jan; 11(1): 4-10 http://dx.doi.org/10.1013/jecns.2014.09.012.

12. Sarfati L, Ranchon F, Vantard N, Schwiertz V, Larbre V, Parat S, et al. Human-simulation-based learning to prevent medication error: a systematic review. J Eval Clin Pract. 2019 Feb; 25(1): 11-20. doi:10.1111/jep.12883.

13. Hoffmann RL, O'Donnell JM, Kim Y. The effects of human patient simulators (HS) on basic knowledge in critical care nursing with undergraduate senior baccalaureate nursing students. Simulation in Health Care: Journal of the Society for Simulation in Health Care. 2007 Summer; 2(2): 110-115. doi:10.1097/SIH.0b013e318033abb5.

14. Maran NJ, Glavin RJ. Low- to high-fidelity simulation – A continuum of medical education? Med Educ. 2003 Nov; 37 (Suppl 1): 22-28. doi: 10.1046/j.1365-2923.37.s1.9.x.

15. Pai D. Use of simulation for undergraduate medical education. 2018 Jun; 5(1): 3-6.

16. Reeves S, Goldman J, Oandasan I. Key Factors in Planning and Implementing Interprofessional Education in Health Care Settings J Allied Health. 2007 Winter; 36(4): 231-235.

17. Pitt MB, Eppich WJ, Shane ML, Butteris SM. Using Simulation in Global Health: Considerations for Design and Implementation. SimulHealthc. 2017 Jun; 12(3): 177-181. doi: 10.1097/SIH.0000000000000209.

18. Shapiro MJ, Morey JC, Small SD, Langford V, Kaylor CJ, Jagminas L, et al. Simulation based teamwork training for emergency department staff: does it improve clinical team performance when added to an existing didactic teamwork curriculum? Qual Saf Health Care. 2004 Dec; 13(6): 417-421.

19. McGaghie W, Issenberg S, Barsuk JH, Wayne DB. 2014. A critical review of simulation-based mastery learning with translational outcomes. Med Educ. 2014 Apr; 48(4): 375–385 doi: 10.1111/medu.12391.

20. Bowling AM, Underwood PW. Effect of simulation on knowledge, self-confidence, and skill performance in the USA: A quasi-experimental study. Nursing and Health Sciences. 2016 Sep; 18(3): 292–298. doi:10.1111/nhs.12267.

21. Wellard SJ, Woolf R, Gleeson, L. Exploring the Use of Clinical Laboratories in Undergraduate Nursing Programs in Regional Australia. International Journal of Nursing Education Scholarship. 2007 Jan; 4(1). doi:10.2202/1548-923x.1355.

22. Freeth D, Fry H. Nursing students' and tutors' perceptions of learning and teaching in a clinical skills centre. Nurse Education Today. 2005 May; 25(4): 272-282. doi: 10.1016/j.nedt.2005.01.007.

23. Jeffries PR. A framework for designing, implementing, and evaluating simulations used as teaching strategies in nursing.

Nursing Education Perspectives. 2005 Mar-Apr; 26(2): 96-103.

24. Croxon L, Maginnis C. Total Learning Environment and the Implications for Rural Student Nurse Retention. The Australian Journal of Rural Health. 2006 May; 14(3): 132-133. http://dx.doi.org/10.1111/j.1440-1584.2006.00776.x.

25. Ryall T, Judd BK, Gordon CJ. Simulation-based assessments in health professional education: a systematic review. J Multidiscip Healthc. 2016 Feb; 9: 69–82. doi: 10.2147/JMDH.S92695.

26. Weller JM, Nestel D, Marshall SD, Brooks PM, Conn JJ. Simulation in clinical teaching and learning. Med J Aust. 2012 May; 196 (9): 594.

27. Honey MLL, Diener S, Connor K, Veltman M, Bodily D. Teaching in Virtual Space: An interactive session demonstrating Second Life simulation for haemorrhage management. In Same places, different spaces. Proceedings Ascilite Auckland. 2009; 1222-1224.

28. Waxman KT, Bowler F, Forneris SG, Kardong-Edgren S, Rizzolo MA. Simulation as a Nursing Education Disrupter. Nurs Adm Q. 2019 Oct-Dec; 43(4): 300-305. doi: 10.1097/NAQ.0000000000000369.

29. Hughes K. Simulation in Nursing Education. AJN, American Journal of Nursing. 2018 Jul; 118(7): 13. doi:10.1097/01.naj.0000541416.90476.1a.

30. Cook DA, Andersen DK, Combes JR, Feldman DL, Sachdeva AK. The value proposition of simulation-based education. Surgery. 2018 Apr; 163(4): 944–949. doi: 10.1016/j.surg.2017.11.008.

31. Savarese V. Simulation for Home Care Settings. American Journal of Nursing. 2016 Aug; 116(8): 13. doi:10.1097/01.naj.0000490153.06253.3f.

32. Flott EA, Linden L. The clinical learning environment in nursing education: A concept analysis. Journal of Advanced Nursing. 2016 Mar; 72(3): 501–513. doi:10.1111/jan.12861.

33. Rajesh KS. Emerging innovative teaching strategies in nursing. JOJ Nursing Health Care. 2017 Apr; 1(2): 555-558.

34. Lavoie P, Clarke SP. Simulation in nursing education. Nursing. 2017 Jul; 47(7): 18–20. doi:10.1097/01.nurse.0000520520.99696.

35. INACSL Standards Committee. INACSL standards of best practice: simulation - debriefing. Clin Simu Nurs. 2016 Dec; 12 (S): S21-S25. http://dx.doi.org/10.1016/j.ecns.2016.09.008.

36. Sofer D. The Value of Simulation in Nursing Education. AJN, American Journal of Nursing. 2018 Apr; 118(4): 17–18. doi: 10.1097/01.naj.0000532063.79102.19.

37. Lillekroken D. Nursing students' perceptions towards being taught the fundamentals of care by clinical nurses within a simulated learning environment: A qualitative study. Nurse Educ Pract. 2019 Mar; 36: 76-81. doi: 10.1016/j.nepr.2019.03.010.

38. Nelson R. Replicating Real Life. AJN, American Journal of Nursing. 2016 May; 116(5): 20-21. doi:10.1097/01.naj.0000482956.85929.d8.

39. Shin S, Park JH, Kim JH. Effectiveness of patient simulation in nursing education: Meta-analysis. Nurse Education Today. 2015 Jan; 35(1): 176-182. doi:10.1016/j.nedt.2014.09.009.

40. Norman J. Systematic review of literature on simulation in nursing education. ABNF J. 2012 Spring; 23 (2): 24–28.

41. Crowe S, Ewart L, Derman S. The impact of simulation based education on nursing confidence, knowledge and patient outcomes on general medicine units. Nurse Education in Practice. 2018 Mar; 29: 70–75. doi:10.1016/j.nepr.2017.11.017.

42. Morse CJ, Fey M, Kardong-Edgren S, Mullen A, Barlow M, Barwick S. The Changing Landscape of Simulation-Based Education. AJN American Journal of Nursing. 2019 Aug; 119 (8): 42–48. doi: 10.1097/01.NAJ.0000577436.23986.81.

43. Cohen BS, Boni R. Holistic Nursing Simulation: A Concept Analysis. J Holist Nurs. 2018 Mar; 36(1): 68-78. doi: 10.1177/0898010116678325.

44. Seropian MA. General concepts in full-scale simulation: Getting started. Anesth Analg. 2003 Dec; 97(6): 1695–705. doi: 10.1213/01.ane.0000090152.91261.d9.

45. Jeet G, Prinja S, Aggarwal AK. Cost analysis of a simulation-based training for health workforce in India. Indian J Public Health. 2017 Apr- Jun; 61(2): 92-98. doi: 10.4103/ijph.IJPH_189_15.

46. Haerling KA. Cost-Utility Analysis of Virtual and Mannequin-Based Simulation. Simul Healthc. 2018 Feb; 13(1): 33-40. doi: 10.1097/SIH.0000000000000280.

47. Krishnan DG, Keloth AV, Ubedulla S. Pros and cons of simulation in medical education: A review. International Journal of Medical and Health Research. 2017 Jun; 3(6): 84-87.

48. Datta R, Upadhyay KK, Jaideep CN. Simulation and its role in medical education. Med J Armed Forces India. 2012 Apr; 68(2): 167-172. doi: 10.1016/S0377-1237(12)60040-9.

49. Simes T, Roy S, O'Neill B, Ryan C, Lapkin S, Curtis E. Moving nurse educators towards transcendence in simulation comfort. Nurse Education in Practice. 2018 Jan; 28: 218-223. doi: 10.1016/j.nepr.2017.10.024.

50. MacKinnon K, Marcellus L, Rivers J, Gordon C, Ryan M, Butcher D. Student and educator experiences of maternal-child simulation-based learning. JBI Database of Systematic Reviews and Implementation Reports. 2017 Nov; 15(11): 2666–2706. doi: 10.11124/jbisrir-2016-003147.

51. Reid-Searl K, Eaton A, Vieth L, Happell B. The educator inside the patient: students' insights into the use of high fidelity silicone patient simulation. Journal of Clinical Nursing. 2011 Oct; 20(19-20): 2752–2760. doi: 10.1111/j.1365-2702.2011.03795.x.

52. McAllister M, Levett-Jones T, Downer T, Harrison P, Harvey T, Reid-Searl K,….Calleja P. Snapshots of simulation: Creative strategies used by Australian educators to enhance simulation-learning experiences for nursing students. Nurse Education in Practice. 2013 Nov; 13(6): 567–572. doi: 10.1016/j.nepr.2013.04.010.

53. Aebersold M. The History of Simulation and Its Impact on the Future. AACN Advanced Critical Care.2016 Feb; 27(1): 56–61. doi:10.4037/aacnacc2016436.

54. Aebersold M. Simulation-Based Learning: No Longer a Novelty in Undergraduate Education. OJIN: The Online Journal of Issues in Nursing. 2018 Apr; 23(2). doi: 10.3912/OJIN.Vol-23No02PPT39.