ORIGINAL RESEARCH

Simulation in nursing students' preclinical studies — Does the timing of the simulation matter?

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ABSTRACT

Background: A descriptive case study evaluated second-year undergraduate nursing students' perception of simulations, comparing two curricula.

Methods: Questionnaires were completed post-simulation by 658 students from the classes of 2013/2014 (old curriculum) and the class of 2015 (new curriculum).

Results: The classes of 2013/2014 were more satisfied with the written information than the class of 2015 (mean of 3.83 vs 3.32, $p < .001$). The classes of 2013/2014 were also better prepared (mean of 3.44 vs 3.12, $p < .001$). A significant difference was found between the classes of 2013/2014 and 2015 regarding the benefit of the simulation (mean of 3.94 vs 4.16, $p < .001$). Moreover, the surgical group found simulating with the manikin more beneficial compared to the medical and mental health groups' experience with role-play (mean of 4.33 vs 4.08 vs 4.11, $p < .050$). Finally, male students reported simulation as more beneficial than female students (mean of 4.30 vs 4.01, $p < .005$).

Conclusions: Between-class differences emerged when the curriculum changed, and students found simulation with a manikin directly before clinical practice most beneficial.

Key Words: Curriculum, Nursing education, Learning methods, Simulation, Undergraduate nursing students

1. INTRODUCTION

In Europe, clinical studies comprise 50% of the study program for nurses.[1] The students' clinical studies encompass a variety of health care settings and include many different pedagogical models for supervision,[2–4] the students thus observe a range of ways to perform clinical nursing and practical procedures during their clinical studies. However, in clinical practice, it is seen as unethical for students to train their basic practical skills on patients. Accordingly, there is growing interest in the use of simulation-based learning (SBL), and the International Nursing Association for Clinical Simulation and Learning (INACSL); Standards of Best Prac-

tice is an evidence-based framework to guide simulation.[5]

SBL through role-playing and using low-fidelity, mid-fidelity, and high-fidelity simulation is increasingly seen in nursing education.[6–14] In low-fidelity simulations, simple manikins are used (not computer-driven), and mid-fidelity simulations are standardized manikins (with e.g., heart and respiratory sounds). High-fidelity simulations include full-body computer-driven manikins.

In 2010, SBL began being used systematically as part of the undergraduate nursing program at the university. A standardized manikin (Laerdal Medical AS) was used; in addition,

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simulation through role-play (with students and faculty members playing the role of patient) has been used in parallel with simulation using the manikin.

As simulation scenarios in preclinical studies require considerable faculty members resources, it is necessary to continuously evaluate its effectiveness, particularly in the context of a curriculum change. The aim of this study was therefore to evaluate second-year nursing students' perception of three simulation scenarios in their preclinical studies in an undergraduate nursing program, before and after a change in their curriculum.

1.1 Background

The classes of 2013/2014 had the same curriculum that the undergraduate nursing program had used for many years, which included small simulation scenarios with a manikin in the first year. In the second year, they had three simulation scenarios on the same day, independent of which field of clinical rotation they were about to start (surgical, medical, or mental health). By contrast, the class of 2015 had a new curriculum, which did not include simulation with a manikin in the first year; they also simulated a surgical and mental health case (or a medical and mental health case) one week before the start of their clinical rotation in the surgical or medical ward (see Figure 1). There were several changes to the curriculum. The new curriculum in the second year had a preclinical week just before the clinical rotation (medical or surgical) and this week was included in the student's clinical rotation. There was also a post clinical week, which included reflection after the clinical rotation. Another change was that the mental health clinical rotation was moved to the third year.
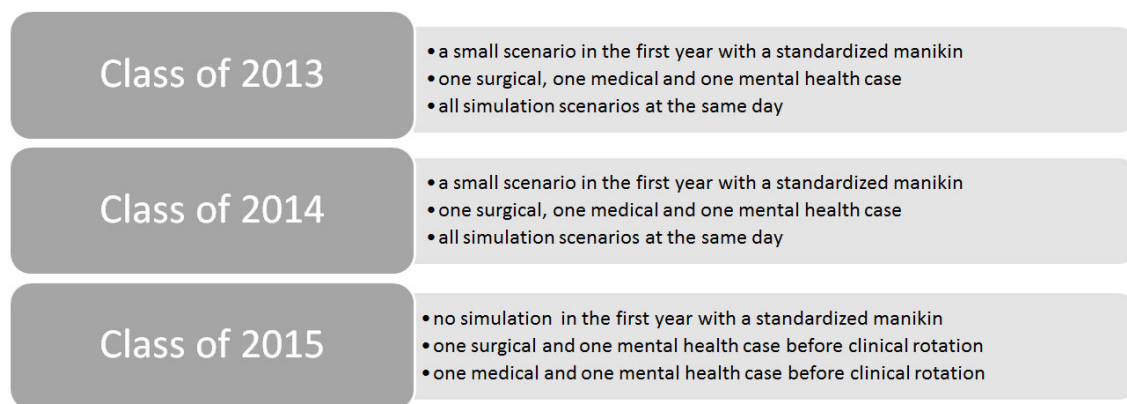

Figure 1. Simulation class of 2013/2014 and class of 2015

Information about the simulation scenarios and the learning goals (based on the curriculum), were presented to the students via a digital learning platform. The students were also given information orally in class. The simulation scenarios were the same for all three classes: a surgical case (a postoperative patient), a medical case (a patient with chronic obstructive lung disease), and a mental health case (a suicidal patient). Participating students were put into groups of 6–12.

The surgical scenario was with the manikin (mid-fidelity simulation); one faculty member controlled the manikin concealed behind a one-way screen and another was present in the simulation room. Two students had the hands-on roles during the simulation scenario and the rest of the group observed (observer roles) the simulation via a video screen. The medical scenario was simulated, with one faculty playing the role of patient. Two students had the hands-on roles, and the rest of the group and the second faculty were seated around the bed in the same room (observer roles). During the mental health scenario, one student played the patient, another played the patient's next of kin, and a third student played the nurse. Two faculty members provided instruction and guidance as needed, and the rest of the group observed.

Each simulation opened with an informational overview about the day, this was then followed by a short briefing about the case and then the simulation scenario took place. The simulation lasted about 20–30 minutes and was followed by a 30–40 minute debriefing session; the total time allocated for the activity was 90 minutes. One of the faculty led the debriefing, in which all students were encouraged to be actively involved.

2. METHODS

2.1 Aim and research questions

The aim of the study was to evaluate the nursing students' perception of the simulation scenarios in their preclinical studies during their second year in an undergraduate nursing program, before and after a change in their curriculum. The research questions were:

Were the students satisfied with the information provided about the SBL and were they prepared?

Did the changes in the curriculum affect the students' perception of the simulation?

Does the SBL contribute to a better realization of the learning goals when the scenario is related to immediate clinical rotation?

Do the students evaluate the SBL differently when it is performed with a manikin vs as a role-play with faculty members or students?

2.2 Design

The study employed a descriptive case study design. The evaluation looked at information, preparation, simulation, and whether or not learning goals were met for three different cases: surgical, medical, and mental health. Data were collected through a questionnaire. The classes of 2013 and 2014 had three simulation scenarios (i.e. surgical, medical, and mental health) on the same day, and answered only one questionnaire the day they had the simulation. The class of 2015, by contrast, answered a questionnaire after each simulation scenario and on different days.

2.3 Participants

Participants were in their second year of nursing education, which included clinical rotation in specialist health services in general medical or general surgical wards—and, for the classes of 2013/2014, mental health practice. The nursing students from the classes of 2013/2014 participated in the simulation during one week in October 2014 and 2015, respectively. The nursing students from the class of 2015 attended the simulation on two different occasions, directly before their clinical rotation in medical or surgical wards; as their clinical rotation was divided into three periods during the year, the simulation scenarios occurred in October 2016, January 2017, and March 2017.

2.4 Data collection

While the questionnaire was developed and used in earlier studies,[15, 16] small changes were made to adapt it to this study's sample. The questionnaire included background data (e.g. gender, age, education, and work experiences), and 10 additional questions: 9 closed-ended and 1 open-ended. Only results from the close-ended questions will be presented in this paper.

The closed-ended questions were accompanied by a 5-point Likert scale with the following possible responses: very small extent, small extent, moderate extent, great extent, and very great extent. Cronbach's alpha was used to estimate the internal consistency[17] of the questionnaire regarding questions three to nine (0.831); here, internal consistency

refers to how closely related a set of items are,[18] and values above 0.8 are preferable.[18, 19]

Information about the study, including about anonymity, the voluntary nature of participation, and how collected data would be used, was published on the university's digital learning platform and was provided to the students orally by the faculty. The faculty distributed the questionnaire immediately following the debriefing. Before the students left the room, the questionnaire was completed anonymously, and returned to the faculty.

2.5 Data analysis

IBM's Statistical Package for the Social Sciences (SPSS) 24.0 was used for statistical analysis. Descriptive statistics, cross-tabulation, an independent samples t-test, the one-way analysis of variance (ANOVA) and Tukey posthoc test, and Cronbach's alpha were used. During analysis, the questionnaire responses were given numbered equivalents: 1 = very small extent, 2 = small extent, 3 = moderate extent, 4 = great extent, and 5 = very great extent. During the calculation of significance, the independent samples t-test[18] was used to calculate p values and the differences between the classes of 2013/2014 and 2015, and the one-way ANOVA was used to calculate p values for differences between the class of 2015's three groups (medical, surgical, and mental health). The Spearman's Rho correlation coefficient is recommended to calculate correlations' ordinal scales and between smaller studies;[20] as such, participants' age and their responses to questions one through nine were analyzed in this way. Correlation coefficients between 0.35–0.65 were interpreted as moderate.[21] The scoring options were dichotomized into two groups: very small and small in one group; and moderate, great, and very great in a second group.

2.6 Ethical considerations

The evaluation of an institution's educational program is mandated by the Act Relating to Universities and University Colleges.[22] The participants received written and verbal information explaining the aim of the study and that participation in the study was voluntary, and the questionnaire was answered anonymously. The heads of the Faculty of Health and Social Sciences, Department of Nursing and Health Sciences at the university gave their permission.

3. RESULTS

The results will be presented in three sections: information and students' preparation for the day; beneficiality of simulation scenario and debriefing; and the day's expectations and learning goals.

In total, 658 students completed the questionnaire: 143 from

the class of 2013; 144 from the class of 2014; and 371 from the class of 2015 (this greater number reflects the fact that they answered the questionnaire after each simulation scenario). Of those who answered the questionnaire, 84.2% (554) were female and 14.7% (97) were male; 1.1% (7) did not answer questions pertaining to gender. Their ages ranged from 18–55 years old (mean of 25.32, MD 22.00), and 51.5% of the students were younger than 22 years of age; 13 did not answer the question regarding their age. Of the 658 students who completed the questionnaire, 150 entered nursing education directly from high school and had no clinical practice experience, 269 had some prior clinical experience, 102 had vocational education, and 136 had higher education (1 student did not provide this information).

The students' (n = 658) mean evaluations of the questions ranged from 3.12 to 3.44 (see Table 1).

Table 1. Student evaluation of the closed-ended questions

Questions	Classes	N	Mean	SD	p values
Q1: Satisfied with the written information	2013/2014	287	3.83	0.74	< .001
	2015	371	3.32	0.91	
Q2: Prepared for the day	2013/2014	281	3.44	0.71	< .001
	2015	369	3.12	0.73	
Q3: Simulation scenario was beneficial	2013/2014	268	3.94	0.93	< .001
	2015	308	4.16	0.75	
Q4: Feedback from peers was useful	2013/2014	282	4.10	0.74	.898
	2015	349	4.10	0.71	
Q5: Feedback from teacher was useful	2013/2014	279	4.47	0.63	.069
	2015	364	4.38	0.62	
Q6: Useful reflection in plenary	2013/2014	281	4.30	0.67	.608
	2015	368	4.33	0.63	
Q7: Day's learning goals realized	2013/2014	283	3.88	0.72	.462
	2015	364	3.92	0.65	
Q8: Day's expectations met	2013/2014	280	3.82	0.74	.326
	2015	365	3.90	0.68	
Q9: Good preparation for clinical studies	2013/2014	278	4.12	0.85	.099
	2015	367	4.22	0.71	

3.1 Information and students' preparation for the day

In total, 658 students provided a response for question 1 (Q1), concerning the information provided about the simulation day; of these, 91.1% (600) were moderately satisfied, greatly satisfied and very greatly satisfied with the written information. There was a significant difference between the classes of 2013/2014 and the class of 2015 regarding this question, as the classes of 2013/2014 scored significantly higher than the class of 2015 (mean of 3.83 vs 3.32, p < .001).

With regards to Q2, of the 658 students (8 were absent), 84.2% (554) indicated that they were prepared for the simulation exercise to a moderate or great extent. As with Q1, the classes of 2013/2014 scored significantly higher than the class of 2015 on Q2 (mean of 3.44 vs 3.12 p < .001).

The students in the classes of 2013/2014 were thus more satisfied with the written information they were provided prior to the simulation and were more prepared for the day than the students in the class of 2015.

3.2 Beneficiality of simulation scenario and debriefing

Of the 576 students who answered Q3, 69.1% (455) reported the simulation scenario as beneficial to a great or very great extent. The class of 2015 considered the simulation scenario more beneficial than the classes of 2013/2014 (3.94 vs 4.16, p < .001). The remaining questions showed no significant differences between these two groups (see Table 1).

Among all the students, 90.1% (593) experienced reflection during the debriefing to be beneficial to a great or very great extent, 79.0% (520) thought feedback from the observers was useful to a great or very great extent, and 91.6% (601) thought feedback from the teacher was useful to a great or very great extent.

A moderate correlation (0.35–0.65) was seen especially between students who benefited from the simulation scenario (Q3) and reported the simulation as good preparation for clinical studies (Q9). In addition, a moderate correlation was found between feedback from the observers (Q4), feedback from the teacher (Q5), the reflection in plenum (Q6), the

realization of the day's learning goals (Q7), and the meeting of the day's expectations (Q8). No significant correlation was seen between Q1 and the rest of the questions or Q2 and the rest of the questions.

In the class of 2015, 119 students (32.1%) had a medical case, 126 (34.0%) had a surgical–postoperative patient case, and 126 (34.0%) had a mental health case. There was a significant difference between these groups with regards to Q1, in that the medical group was more satisfied with the information provided prior to the simulation than the surgical or mental health groups (3.47 vs 3.33 vs 3.17, $p < .37$).

Significant differences were also found for Q3 between the groups; the surgical group thought the simulation scenario was more beneficial than the medical or mental health groups (4.33 vs. 4.08 vs 4.11, $p < .050$). The youngest students (under 25 years of age) scored lower on Q3 (3.97 vs 4.20, $p < .001$), and there was also a significant difference between male and female students for this question: female students scored lower than male students, finding the simulations scenario less beneficial (mean of 4.30 vs 4.01, $p < .005$). Some of the questions were highly correlated: e.g. Q5 (feedback from teacher) and Q6 (reflection in plenary) ($\pi = 0.616$) (see Table 2).

Table 2. Correlations between the questions from all classes

Questions 1–9	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Q1: Satisfied with information		.243**	.160**	.156**	.261**	.181**	.249**	.275**	.209**
Q2: Was prepared	.243**		.070	.125**	.102*	.126**	.184**	.153**	.121**
Q3: Beneficial to simulate scenario	.160**	.070		.411**	.408**	.421**	.435**	.440**	.601**
Q4: Feedback from peers	.156**	.125**	.411**		.586**	.595**	.425**	.409**	.453**
Q5: Feedback from teacher	.261**	.102*	.408**	.586**		.616**	.423**	.405**	.461**
Q6: Reflection in plenary	.181**	.126**	.421**	.595**	.616**		.501**	.430**	.507**
Q7: Realized day's goals	.249**	.184**	.435**	.425**	.423**	.501**		.549**	.521**
Q8: Expectations of day met	.275**	.153**	.440**	.409**	.405**	.430**	.549**		.534
Q9: Good preparation	.209**	.121**	.601**	.453**	.461**	.507**	.521**	.534**	

$**p < .01; *p < .05$

3.3 The day's expectations and learning goals

Among the students, 70.8% (466) responded that their expectations for the simulation exercise were met to a great or very great extent. Of the students who answered Q7, 73.8% (486) responded that they had met the day's learning goals to a great or very great extent. Finally, 81.8% (534) of the students thought simulation was a good preparation for clinical studies to a great or very great extent.

4. DISCUSSION

The aim of the study was to evaluate second-year students' perception of simulation scenarios during their preclinical undergraduate nursing studies, before and after a change in their curriculum. There were significant differences between the classes regarding students' level of satisfaction in relation to the information provided. Although all three classes received the same information prior to the simulation, the classes of 2013/2014 were more satisfied with the information than the class of 2015. The students in the classes of 2013/2014 had familiarized themselves with the simulation manikin and had systematic simulation training during their first year. The class of 2015, however, had a new curriculum that did not include simulation training in their first year; as such, they may have needed even more information prior to the simu-

lation. We know that information is crucial to achieve good learning outcomes,[23] and that stress and anxiety may impede learning.[24] Our findings therefore indicate that when students have no prior experience with simulation, it is even more important to provide them with thorough information beforehand. Moreover, in the class of 2015, there was a significant difference in their responses to Q1, regarding their level of satisfaction with the information provided: between the groups, the medical group was significantly more satisfied with the information than the surgical or mental health groups; this indicates that students need more information when using a manikin for the first time or if the patient cases are unfamiliar, as in the mental health case.

In this study, the students were well-prepared for the day, but when students are not well-prepared for simulations, they can feel unsafe and as though they lack the necessary skills or knowledge,[24] this may be why the students in this study had prepared themselves for the day.

It was essential for the Department of Nursing and Health Sciences to know if the changes in the curriculum had an effect on the students' perceptions of the simulation. Almost 70% of the students' reported that they found the simulation scenario beneficial. Interestingly, there was a significant dif-

ference between the classes of 2013/2014 and the class of 2015, regarding the extent to which the simulation scenario was found beneficial. The class of 2015 considered the simulation scenario significantly more beneficial than the classes of 2013/2014; the class of 2015's simulations took place just before their clinical rotation, and that likely increased the students' motivation. However, Kimhi and colleagues showed that simulation increased self-confidence/self-efficacy equivalently, regardless of whether it occurred before or after clinical rotation.[25] The students' self-confidence and self-efficacy would therefore benefit from further investigation in further studies at this university.

A significant difference was seen between male and female students for Q3 (regarding whether the simulation scenario was beneficial), as the female students scored lower on this question. This finding is in line with Mould et al.'s study,[26] in which male students reported more competence and confidence than female students. It is therefore important for faculty members to be aware of the potential differences between males and females when planning SBL and providing information.

Most of the students (90.1%) experienced the debriefing to be beneficial, which is in line with Ganley and Linnard-Palmer that have found students to be positive towards debriefing. Moreover, a majority of the students (79%) thought feedback from the observers was useful, and over 90% of the students thought feedback from the faculty was useful.[24] These findings indicate that debriefing is an important part of simulation; indeed, active participation in the debriefing has been shown to be more important than role-playing, with regards to the decision-making process.[27]

The students evaluated the simulations differently according to whether they were performed with a manikin or as a role-play with faculty members and/or students. In particular, there were significant differences seen in Q3 between the groups: the students evaluated the simulation as more beneficial when performed with a manikin, as in the surgical–postoperative case, than with role-play, as in the medical and mental health cases. This corresponds to Wotton et al.'s finding that over 90% of students were satisfied with simulations with a high-fidelity manikin,[28] and working with manikins has been shown to improve students' competence and confidence related to critical care.[26]

Simulation as a learning method has also been found to be a satisfying and effective means of increasing knowledge and confidence in students.[29] In the present study, while the students were not explicitly asked about their knowledge or confidence, over 70% answered that the days' learning goals were realized, and over 80% found simulation to be good preparation for clinical rotation. This is in line with a study in which repeated learning in a clinical skills laboratory helped the students feel more prepared for their clinical studies.[30] In the present study, no differences were seen between the classes of 2013/2014 and 2015 regarding a better realization of learning goals when the simulation was related to immediate clinical rotation.

4.1 Methodological considerations
A strength of this study is its use of a questionnaire, as this allowed many respondents to be reached in a short period of time, especially since the simulation days were mandatory. Finally, distributing the questionnaire immediately after the simulation made it easy for the students to complete and return it.

One weakness of the study is that, though some students did not participate in the simulations (e.g. due to illness), this information was not registered. Another potential weakness is that, though the questionnaire was specifically developed for evaluating simulation scenarios in preclinical studies, it was not validated by a panel of substantive experts;[20] however, it was developed by faculty members with considerable experience in SBL in nursing education and has been used earlier.

5. CONCLUSION
Findings indicate that providing information about SBL is essential when changes are made to the curriculum. In this study, the male students found SBL more beneficial than the female students. The surgical group (the class of 2015) found simulation with a manikin to be more beneficial than role-play and evaluated simulation with a manikin directly before clinical rotation as most beneficial. The students' perception of SBL in preclinical studies was positive regardless of the curriculum, and they found feedback from their peers and faculty members during the debriefing to be useful.

CONFLICTS OF INTEREST DISCLOSURE
The author declares that there is no conflict of interest.

REFERENCES

[1] European Parliament. Directive 2005/36/EC- Directive on the Recognisation of Professional Qualifications. 2005. Available from: https://eur-lex.europa.eu/legal-content/EN/AL L/?uri=CELEX:32005L0036

[2] Häggman-Laitila A, Elina E, Riitta M, et al. Nursing students in clinical practice–developing a model for clinical supervision. Nurse Educ Pract. 2007; 7(6): 381-91. PMid:17936544 https:

//doi.org/10.1016/j.nepr.2006.11.011

[3] Manninen K, Henriksson EW, Scheja M, et al. Supervisors' pedagog-ical role at a clinical education ward–an ethnographic study. BMC Nurs. 2015; 14(1): 55. PMid:26549985 https://doi.org/10.1186/s12912-015-0106-6

[4] Mamhidir AG, Kristofferzon ML, Hellström-Hyson E, et al. Nursing preceptors' experiences of two clinical education models. Nurse Educ Pract. 2014; 14(4): 427-33. PMid:24512652 https://doi.org/10.1016/j.nepr.2014.01.010

[5] INACSL Standards Committee. INACSL standards of best practice: SimulationSM simulation design. Clinical Simulation in Nursing. 2016; 12: S5-S12. https://doi.org/10.1016/j.ecns.2016.09.005

[6] Adib-Hajbaghery M, Sharifi N. Effect of simulation training on the development of nurses and nursing students' critical thinking: A systematic literature review. Nurse Educ Today. 2017; 50: 17-24. PMid:28011333 https://doi.org/10.1016/j.nedt.2016.12.011

[7] Eyikara E, Baykara ZG. Effect of simulation on the ability of first year nursing students to learn vital signs. Nurse Educ Today. 2018; 60: 101-6. PMid:29078202 https://doi.org/10.1016/j.nedt.2017.09.023

[8] Haukedal TA, Reierson IÅ, Hedeman H, et al. The Impact of a New Pedagogical Intervention on Nursing Students' Knowledge Acqui-sition in Simulation-Based Learning: A Quasi-Experimental Study. Nurs Res Pract. 2018. PMid:30363931 https://doi.org/10.1155/2018/7437386

[9] Husebø E. Condition for learning in simulation practice: training for team-based resuscitation in nursing education. Stavanger, Norway: University of Stavanger; 2012.

[10] Lavoie P, Pepin J, Cossette S. Contribution of a reflective debriefing to nursing students' clinical judgment in patient deterioration simula-tions: A mixed-methods study. Nurse Educ Today. 2017; 50: 51-6. PMid:28012979 https://doi.org/10.1016/j.nedt.2016.12.002

[11] Ravik M. Practical skill learning in nursing education. Oslo: Univer-sity of Oslo; 2018.

[12] Yu M, ja Kang K. Effectiveness of a role-play simulation program involving the sbar technique: a quasi-experimental study. Nurse Educ Today. 2017; 53: 41-7. PMid:28433731 https://doi.org/10.1016/j.nedt.2017.04.002

[13] Miranda RPR, Chaves ÉdCL, Lima RS, et al. The effectiveness of a simulated scenario to teach nursing students how to perform a bed bath: A randomized clinical trial. Nurse Educ Today. 2017; 57: 17-23. PMid:28686959 https://doi.org/10.1016/j.nedt.2017.06.008

[14] Cant RP, Cooper SJ. The value of simulation-based learning in pre-licensure nurse education: A state-of-the-art review and meta-analysis. Nurse Educ Pract. 2017; 27: 45-62. PMid:28843948 https://doi.org/10.1016/j.nepr.2017.08.012

[15] Flo J, Flaathen EK, Fagerström L. Simulation as a learning method in nursing education-A case study of students' learning experiences

during use of computer-driven patient simulators in preclinical stud-ies. Journal of Nursing Education and Practice. 2013; 3(8): 1-11. https://doi.org/10.5430/jnep.v3n8p138

[16] Flaathen EK, Flo J, Fagerström L. Students' evaluation of a comput-erized patient simulator in nursing education and its effect on the results of preclinical tests. Journal of Nursing Education and Practice. 2015; 5(7): 1-9. https://doi.org/10.5430/jnep.v5n7p1

[17] Polit D, Beck C. Essentials of Nursing Research: Lippincott, Williams & Wilkins; 2014.

[18] Pallant J. SPSS Survival Manual. 5th ed. Maidenhead: Open Univer-sity Press; 2015.

[19] George D, Mallery P. SPSS for windows step by step - a simple guide and reference. 4. ed. Boston: Allyen & Bacon; 2003.

[20] Polit D, Beck C. Nursing research : principles and methods. 7th ed. Philadelphia, Pa: Lippincott Williams & Wilkins; 2004.

[21] Cohen L, Manion L, Morrison K. Research methods in education: routledge; 2013.

[22] Norwegian Ministry of Education and Research. Act relating to Uni-versities and University Colleges 2005-04-01 nr 15 [Lov om univer-siteter og høyskoler (universitets- og høyskoleloven)]. 2005.

[23] Kiat T, Mei T, Nagammal S, Jonnie A. A review of learners' experi-ence with simulation based training in nursing. Singapore Nursing Journal. 2007; 34(4): 37-43.

[24] Ganley BJ, Linnard-Palmer L. Academic safety during nursing simu-lation: Perceptions of nursing students and faculty. Clinical Simula-tion in Nursing. 2012; 8(2): e49-e57. https://doi.org/10.1016/j.ecns.2010.06.004

[25] Kimhi E, Reishtein JL, Cohen M, et al. Impact of simulation and clinical experience on self-efficacy in nursing students: inter-vention study. Nurse Educ. 2016; 41(1): E1-E4. PMid:26218009 https://doi.org/10.1097/NNE.0000000000000194

[26] Mould J, White H, Gallagher R. Evaluation of a critical care sim-ulation series for undergraduate nursing students. Contemp Nurse. 2011; 38(1-2): 180-90. PMid:21854249 https://doi.org/10.5172/conu.2011.38.1-2.180

[27] Loke JCF, Lee BK, Loh S, et al. High fidelity full sized human patient simulation manikins: Effects on decision making skills of nursing students. Journal of Nursing Education and Practice. 2014; 4(7). https://doi.org/10.5430/jnep.v4n7p31

[28] Wotton K, Davis J, Button D, et al. Third-year undergraduate nursing students' perceptions of high-fidelity simulation. J Nurs Educ. 2010; 49(11): 632-9. PMid:20795614 https://doi.org/10.3928/01484834-20100831-01

[29] Foronda C, Liu S, Bauman EB. Evaluation of simulation in under-graduate nurse education: An integrative review. Clinical Simulation in Nursing. 2013; 9(10): e409-e16. https://doi.org/10.1016/j.ecns.2012.11.003

[30] Ewertsson M, Allvin R, Holmström IK, et al. Walking the bridge: Nursing students' learning in clinical skill laboratories. Nurse Educ Pract. 2015; 15(4): 277-83. PMid:25892366 https://doi.org/10.1016/j.nepr.2015.03.006