



## Use of simulation in professional learning based on examples of nursing education in Tallinn Health Care College.

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Research Article

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### ABSTRACT

**Background:** Simulation-based learning is increasingly being used and this is now a significant part of learning process around the world with a purpose to prepare students for placement in working environment. Simulation environment enables to practice safely, to perform the procedures related to the profession and resolve cases/situations in the lifelike environment, after which an analysis and constructive, benevolent criticism will be followed.

**Objective:** To investigate the second-year nursing students` (academic year 2017/2018) experiences and achievement of learning outcomes in connection with the introduction of high-tech simulation-based learning in the Tallinn Health Care College.

**Methods:** This is a qualitative empirical research; semi-structured interviews were carried out to collect data. The sample consisted of seven second-year nursing students of the Tallinn Health Care College (academic year 2017/2018). The interviews were carried out individually during 11.12.–12.12.2018, shortly after the simulation-based learning in the subject Clinical Nursing Procedures by three second-year midwifery students. Participation in the interviews was voluntary, personal data was not used. The interviews were recorded and transcribed. Analysis of the inductive transcription was done in accordance with the research tasks. The results were compared with the literature on evidence-based learning by simulation.

## Conclusion

The research results were divided into two groups: 1. students` experiences (organization of simulation-based learning, mentors, environment, and feedback) and 2. Achievement of learning outcomes in connection with the introduction of simulation-based learning in education process. The interviewees mentioned that they had had fear of being watched while exercising, and there was not enough time for training. Methods of the mentors were different, an exchange lecturer was sometimes misunderstood due to a language barrier. Simulation environment made it possible to learn from one`s errors effortlessly. It was important to have constructive and benevolent criticism. Achievement of the learning outcome concerning the subject Patient Education was hampered because the communication with a simulator seemed “strange” requiring acting and a good imagination. The learning outcome concerning the performance of nursing procedures and manual skills was mostly achieved. In conclusion, simulation is an indispensable part of the learning process before the clinical placement. Comparing the results with the literature, significant differences between them were not found.

## Background

Simulation as a learning method for pilot training has already been used since the Second World War. Simulation-based learning for training nurses has also been used since ancient times but for giving intra-muscular and subcutaneous injections, for training heart massage, etc. at first. (1). Simulation-based learning has been improved and used more frequently for training nurses only over the last ten, twenty years (2,3,4).

Today, the health care system is constantly changing due to the rapid development of technology and also nursing pedagogy demanding of future health care workers more than acquiring medical theory and practical skills only. (5). It is because nursing curricula are becoming more student-centered and more new innovative solutions including simulation-based learning are introduced in order to support and encourage future nurses for continuous professional development, for being responsible for one`s work and self-improvement. (6).

In the simulation environment, students are prepared for clinical placement in working environment. (7, 8, 9).The purpose of the simulation-based learning is to practise in safety learning environment (9),to perform procedures and learn to resolve lifelike clinical situations(11),to analyse activities related to different cases and to give a constructive feedback

avoiding negative criticism. Resolving cases takes place in teams, in an active communication process. The main difference between the clinical placement and simulation-based learning is that in the simulation-based learning process, the activities are learned by using technical monitors (12), this enables to learn from errors, which can be prevented in a realistic situation. On the basis of errors, it is possible to discuss insufficiencies in the lessons learned in order to reduce errors in clinical placement and to provide students with the right attitude and skills needed in the real life. Simulation environment allows to learn skills without tensions (13) and to roleplay the situations slower, which is not possible in a realistic situation. (14, 15, 9).

The simulation process consists of a *briefing* or an introduction, simulation activities, and a *debriefing* or an analysis. At the *briefing* preceding the simulation activity, the case, environment, students' roles, the case history and other important information needed for the scenario-based simulation are introduced. If necessary, theoretical knowledge and the expected result of the case will be reviewed in order to move the participants in the right direction. In the simulation course, it is important for students to use theoretical knowledge, manual and communication skills at the same time, and to work in a team knowing that the decisions taken by them will influence the result of the case. After the scenario-based simulation the *debriefings* followed within which the participants can share their emotions and thoughts and the observers offer their observations and give constructive criticism. According to the literature, the analysis following the simulation is considered the most important part of the process within of which both the participants and observers have the possibility to reflect what they have seen and experienced, and learn from the errors. (16). Simulation-based learning is considered a low-risk learning method. (11). The level of reality in simulation can be high, medium or low and each of them has a different purpose. Thus, planning the simulation-based learning, its purpose and the most useful type of simulation for students should be taken into account. The simulation takes different forms, see Appendix 1, Figure 1. (17). For the simulation course in accordance with the requirements, the simulated clinical situation conforming to realities, a mentor/moderator, participants and the scenario are needed. Learning through simulation allows and requires support of a mentor and the subsequent discussion(11). A mentor's role is to guide the simulation process and where appropriate, to involve students in the process or to give additional information to the participants. A mentor also controls the equipment (e.g. remotely controlled computers, simulators) and makes a decision concerning the result of the simulation. However, when it is necessary, he/she should know how to involve students in the process, but at the same time he/she should let them to make errors and not to interfere if there is no need for. The participants play different roles in simulation. One student plays a role of a patient, another a support person and the third one has a role of a nurse or a midwife. Sometimes there are more roles, e.g. a doctor or a medical student. The most significant role of a mentor is to create the

environment as real as it possible and to encourage the students to stay within the limits of their roles and behave as if they were in the clinical environment. (16).

Norman (2012) and Au et al(2016)also state that it is a big challenge to teach nursing students through solving complicated problems providing them with the opportunity to learn through acquiring experiences. (18,4). It is important to put the theory into practice (19), which is becoming more complicated today due to lack of placements, increased self-consciousness of patients, short hospital stays and partly because of a shortage of mentors (18,20). Compliance with ethical rules and patient safety in hospital sets also limits to learning opportunities (21,3). Within the simulation-based learning, students can learn theory and practice integrating the decision`s adoption and solving different problems. (19). Based on the research by Shin et al, the use of simulation-based learning can improve learning outcomes comparing with using of classical learning methods (22). The research carried out with nurses also shows that comparing with classical lectures, the simulation-based learning improved commitment of them (23), their clinical thinking, clinical skills and knowledge acquisition. The students were more satisfied using simulators and being more involved, which in turn improved the learning process (24).

In clinical placement, students do not come across all cases and emergencies, which are covered in the classroom (18). Whereas, it is assumed that students should be prepared for coping with crises and emergencies in clinical placement but in case of complicated situations, experienced workers take the responsibility and the leading role in order to provide patient safety. Therefore, students do not acquire skills or gather experiences for coping with crises. The responsible person should have rapid response capability and coping skills including psychomotor, cognitive and affective skills(16, 20), as provided for by Bloom`s taxonomy created in 1956 with a purpose to motivate lecturers to teach students through these three domains changing the higher education more holistic (25).

Based on the Bloom`s taxonomy, cognition is responsible for the knowledge required, acquiring and applying of them, psychomotor area is responsible for skills required, using of them and experience, and affective area is responsible for stress responses, relationships between people and one`s emotions and feelings(16, 5, 25). Development of the affective area is essential in the nursing curriculum and also in training of other health care providers to make specialists, who wish and are able to provide the best possible care treating a patient as a whole, available to the labor market. Manual skills and acquiring theory have been priorities in the curricula of health sciences to pass exams and complete placements, but importance of critical thinking, teamwork and analyzing skills remained in the background (6).

Earlier studies confirm that errors made in clinical placement were mostly caused by lack of teamwork, poor communication and management skills of medical personnel rather than lack

of practical skills or theoretical knowledge (26). For example, in 2004, the Joint Commission on Accreditation of Healthcare Organizations carried out a research with a purpose to analyze medical errors occurred in the health care field. Based on the analysis, 72% of the cases were caused by poor communication and 55% of them by lack of teamwork. (16).

Simulation-based learning is being increasingly used despite the fact that it is often very expensive to be provided. (27, 28). Isaranuwachai et al investigated the cost-effectiveness of the simulation-based learning at different levels reporting that the use of a high-sensitive simulator was the most cost-effective. (27). On the basis of that, it is important to continue examining the effectiveness of this learning method, students' experiences and benefits of high-tech simulation but little has been done so far.(129).

In autumn 2014, in the Tallinn Health Care College (Estonia), a modern simulation centre was created and it is constantly being developed further. The high-tech simulators create new challenges for lecturers in planning learning process and in ways of building skills. In order to obtain an overview of the influence of simulation-based learning as complete as possible, it is important to examine students' existing experiences of learning through simulation. The research results will enable to assess existing resources, effectiveness of learning, students' motivation, and based on that, to adopt simulation-based learning. In that regard students' experiences and achievement of the outcomes through simulation-based learning were investigated within the frames of the applied research in the Tallinn Health Care College in the academic year 2017/2018 in order to develop and improve the curricula and provide a modern, comprehensive learning process.

### **Objective:-**

To investigate the second-year nursing students' experiences and achievement of the learning outcomes (in 2017/2018) in connection with introduction of high-tech simulation-based learning in the Tallinn Health Care College.

### **Methods**

This is a qualitative empirical research, conducted in the Tallinn Health Care College. The research was supervised by the lecturer of the Health Education Centre Urve Kaasik-Aaslav and carried out in cooperation with the three second-year students: Isabel Paul, Marge Koorep, and Sophie Dragunevitš. The research was started with searching corresponding literature. Semi-

structured interviews were used to collect data for the empirical part of the research. The plan of the interview including key questions was developed at first. The sample consisted of seven second-year nursing students (in 2017/2018), the sample size was appropriate and therefore it was possible to obtain adequate answers to the research questions although too much data was provided and many answers were quite similar. Participating in the interviews was voluntary, anonymity, protection of personal data and confidentiality were provided. The students were first asked for consent to be interviewed and three of them refused to participate in the interview. The interviewees were introduced the objective of the research, the process of the interview and its connection with the applied research on simulation-based learning, and also benefits of it to learning process. After that, the interviewees completed "The Informed Consent Form for the Research", see Appendix 2. The interviews were carried out individually in the period of 11.12.-12.12.2018 in a private box of the library in order to provide confidentiality of the interviewees. The interviews took place once the simulation-based learning in the subject Clinical Nursing Procedures was passed (the interviewees had already participated in simulation-based learning in other subjects) and carried out by the three second-year midwifery students. The interviews were recorded and transcribed. The analysis of transcription was inductive (encoding, categorization) and done by authors of the research in accordance with the research objective. The results were compared with the literature sources on evidence-based simulation-based learning and the References include all cited literature. During the interviews, no discrimination or subjective opinions occurred. The data collected during the interviews was processed in accordance with the Data Protection Law. After successful defending of the final paper by a nursing student, audio files were deleted and manuscripts on paper were destroyed using a paper shredder.

## **Results:-**

The research results were divided into two groups:

1. The second-year (year 2017/2018) nursing students` experiences of high-tech simulation-based learning, which were divided into four subgroups. Experiences of simulation-based learning with regard to:

- 1.1. organization,

- 1.2. mentors/moderators,

1.3. Environment,

1.4. Feedback (analysis, discussion, benefits for education).

2. The second-year (year 2017/2018) nursing student's achievement of the learning outcomes in the subject Clinical Nursing Procedures with regard to the use of high-tech simulation-based learning. There were two learning outcomes to be examined:

2.1. Achievement of the outcome "A student can choose patient-centered teaching methods to provide nursing care in accordance with the procedure to be performed" in the subject Clinical Nursing Procedures.

2.2. Achievement of the outcome "A student can perform clinical nursing procedures in the simulation environment relying on the evidence basis" in the subject Clinical Nursing Procedures.

## **1. The second-year nursing students' experiences of high-tech simulation-based learning in the Tallinn Health Care College**

### **1.1. Experiences with regard to organization of simulation-based learning**

According to the interviews, at the beginning of the simulation-based learning in the subject Clinical Nursing Procedures a situation/case was first introduced in the *briefing room*, the material to be used was reviewed and after that nursing procedures were performed in the simulation centre. The students' prior preparation for resolving the case was different; some students did not have any special preparation for training. The knowledge was acquired and improved by resolving the cases during the simulation-based learning process. Not all students had similar experiences; it depended on how many procedures they could perform and activity of them. Some students were more active and they could perform more procedures. A few students had a role of an observer to watch the activities and to complete the assessment table. Organization and resolving of the case, communication with the patient, interaction

between nurses, following aseptic and antisepsis techniques, ethical aspects and criteria to be improved were assessed. The observers had a chance to act and resolve the cases next time. It became evident that some students experienced fear when being watched by observers because they were scared of being criticized. There were different opinions on time planned for the simulation-based learning: some students stated that they had not enough time to resolve the cases, others wanted to finish earlier to have dinner. Most respondents found that the extent of the simulation-based learning should be increased in the curriculum in order to improve their skills.

**Examples of the transcribed interviews, codes of the interviewees are between brackets:**

*At the beginning we sit in this room, then we are given the lists where is a description of the situation, vital signs and then we discuss the case mostly." (i3)*

*"I do not try much to be prepared for." (i3).*

*"In previous simulations, there was also this that when we were busy with simulation then other students looked at us in a critical way – how`d it go?" (i3).*

*"I do not make any preparations....Learning on the ground through activities... In case of trauma simulation, I read the material not to seem fool. More time is needed..."*

*„... Who want to do more, they do not have time for." (I1).*

*"Everyone gets so different experience. One deals with one thing, another just sits around." (I2)*

*"There are a lot of procedures to perform and all of us have not gone through all of them." (I3)*

According to the evidence-based literature, learning through simulation makes it possible to perform the procedures related to the profession in a lifelike environment. (12, 4). It is important to have previous preparation for getting better results. At the beginning of each session, students are informed about the forthcoming simulation case, available means and technical equipment, the anamnesis, medicines needed for the case, and also the locations of



them in the medicine cupboard (30, 29). Students like to resolve cases in small teams (11). To resolve the cases, the roles are assigned to the students, and they who are not assigned to a role will be observers and play roles in the next course (30).

## 1.2 Experiences with regard to mentors/moderators of the simulation-based learning

Based on the previous simulations, the interviewees stated that lecturers guiding the simulation-based learning process used different methods and valued different details in this: some of them informed of the situation and the procedures to be performed very well, others attached importance to terminology, Latin. There were also differences at national level. An exchange lecturer used most time for explaining theory in English and by gestures, and due to that less manual tasks were performed. At the same time, she disregarded preparation of the students who listened to her calmly and in a modest manner, inherent to Estonians. Few students were disappointed because of a language barrier. It was difficult to understand the lecturer talking fast and having poor pronunciation but they were ashamed to tell about. Due to this the learning process became problematic at times. There were also students who helped others to understand the foreign language. The participants in the interviews highlighted the simulation guided by the lecturer in trauma of the Tallinn Health Care College who paid attention to performing nursing procedures rather than to theory. The importance was addressed to the mentor's role to take into account the type of simulation, encourage the students to participate in the process more actively and use time more effectively.

Examples of the transcribed interviews:

*„...The lecturer clearly explains.”(I5) “... during the simulation, explains step by step everything you need to know.”(I5)*

*“We see these cultural differences.”(I5) “...we are so calm and restrained...” (I3) “An exchange lecturer always wants us to use medical terminology in English.” (I7).*

*"Many of us wrinkle their noses at the lecturer speaking too much." (I2) "Everything seemed confusing to the exchange lecturer and she would not stop talking."(I2)*

*"...and sometimes there is such kind of national diversities, she has a lively personality and I do not want to say that she is mundane but..." (I3) "...we are calm and restarted..." (I3)*

*"It is easier to think in Estonian." (I4)*

*"If there is a small language barrier, then we just help each other."(I7)*

*"There are so many procedures that all of us have not performed them all." (I3)*

According to the literature, mentors have a big influence on conducting of effective and professional learning process and their role is also to encourage the students to act and think critically(31, 13). There are students who do not enjoy performing in front of the all group and they feel that pressure of mentors cause strain on them rather than success in learning (32, 11). Example of a mentor is a significant element in simulation-based learning. Satisfaction with mentors depends on mentors` activity and how well they can encourage students to think and participate in the simulation process in order to cope in the clinical placement in working environment (11). Students like to perform procedures in small teams because then a mentor, having also a role of observer, will have more time for discussing (11)-

### **Experiences with regard simulation-based learning environment**

Based on the interviews, the students were upset because the environment appeared to be artificial rather than "real". The students experienced difficulties when playing roles because the mannequin did not answer the questions and communicating with it seemed odd. The activities/procedures took place like in theatre and a good imagination was needed. Some lecturers had helped the students in communicating with simulators speaking for the patient. It was also brought out that the simulation environment allowed to train without tensions and provided the students with confidence needed for successful coping in the placement in working environment.

Examples of the transcribed interviews:

*„If we cannot play the roles of nurses and patients ourselves, we have to imagine that this all is real (15)“*

*“...it is strange that nobody answers... More acting is needed “(14)*

*“We have to imagine that this all is real”(13).*

*“In some situations, the lecturer has spoken instead of the mannequin because it was difficult to put myself in the situation... „ (13)*

According to the literature, simulations provide the students with safety environment where they can train real situations. They can use their knowledge, skills, critical thinking and communication skills (9), in order to learn without tensions (13). Using technologies, they can play more complicated realistic situations that may be encountered during the placement in working environment (33). The simulation environment enables to play situations slower, which is not possible in the clinical placement (14,15). The weakness of the simulation-based learning is that the mannequin has no emotions and does not answer the questions although it says a few phrases. There are also significant shortcomings in mechanical, artificial functioning of organs, e.g. unreal heartbeat sounds and the absence of the intestinal peristaltic (31, 34).

### 1.3 Experiences with regard to feedback (analysis, discussion, benefits for education)

The interviewees liked that they could learn through making errors, which should be prevented in the clinical placement in working environment. After the role-playing, feedback from the participants was received. First, the role-players described their emotions and opinions on coping with the activities. The role-players considered the possibility to follow their procedures recorded by video on the screen during the discussion important. This enabled to notice better the errors made by them, to analyze them, and also to see successes. Based on their previous experiences, the role-players stated that they had not made the errors made in simulation in the clinical placement in working environment. After the role-players, the observers who had

watched the procedures on the screen in the debriefing room and completed the feedback table had a word. They described their observations in accordance with the criteria required in the table, e.g. assessment with regard to communicating with the patient, patient education, communication between nurses, nursing procedures, following the principles of aseptic and antisepsis techniques, achieving the learning outcomes, ethical aspects, and the criteria that needed to be improved. The interviewees stated that being observers, they had learned even more because the errors made by others would better be remembered. The participants in the interviews did not have comments on the mentor`s closing speech, and detailed questions on this were not asked. All interviewees agreed that the resolving of practical cases through simulation provided them with experience, self-confidence, the courage to perform the procedures in working environment, and they emphasized the fact that the constructive, positive feedback rather than negativity took over.

Examples of the transcribed interviews:

*„...the lecturer wants us to be critical (17)”*

*“When watching others acting, you also think how this should be done, and errors made by others will be remembered (13)...*

*“Simulation is a basis; you have to know what should be done next... If you take up a placement you will think about the steps that were done on the mannequin... Confidence, experiences will be greater... “(13).*

Based on the literature, the task of the simulation-based learning is to reinforce the theory learned previously (11). A mentor of simulation-based learning conducts the debriefing and the discussion after the practical task should reflect not only positive but negative aspects as well providing the participants with the possibility and sufficient time in order to assess the decisions made by them, teamwork and coping in an unexpected situation(35). Debriefing is an essential part of the simulation-based learning helping the students to achieve the learning purposes and outcomes. Debriefing mostly consists of an oral reflection and audio-visual

record. The students should not feel attacked when feedback is given and they should refrain from criticism of other students. The reflection following the simulation has to be finished positively (30). As indicated also in the literature, higher quantities of simulation-based learning are needed to resolve cases occurring during the placement(15).Through mistakes it is possible to discuss gaps in lessons learned, this will reduce the error rate in the clinical placement in working environment, and provide the students with a right attitude and skills required in real life. At the same time, the students can demonstrate their knowledge, skills, critical thinking and communication skills (9).

## **2. The second-year (year 2017/2018) nursing student's achievement of the learning outcomes in the subject Clinical Nursing Procedures with regard to the use of high-tech simulation-based learning.**

### **2.1. Achievement of the outcome "A student can choose patient-centered teaching methods to provide nursing care in accordance with the procedure to be performed" in the subject Clinical Nursing Procedures.**

The interviewees were of the opinion that the patient education is important in professional work, but it is complicated to communicate with a mannequin who does not answer the questions. Good acting and imagination are needed for this. Thus, counseling within the patient education was not sufficient in the simulation process. Based on the theory, communication with a patient is one of the most important needs in health care, a patient should be explained the reasons for all procedures, and this causes difficulties in the simulation environment. Manual activities are a major focus. Thus, the learning outcome "A student can choose patient-centered teaching methods to provide nursing care in accordance with the procedure to be performed" was partly achieved.

### Examples of the transcribed interviews:

*„Wearer provided with sufficient information concerning the patient education, this is one of the most important part in nursing (I2)...we are taught this, feedback questions are asked ...(I1)*

*„In most cases we have focused on the mannequin (I7)... We have performed the procedures but we have not given advice how to cope with this disease ... There was not possibility for (I4).*

*„...communication skills are required in hospital... (I4). Communication skills are in the background (I5)... We have always had feedback that more speaking is needed (I3)*

*„ ...communication would give more confidence... Communication is in the background. We concentrate more on procedures....(I1)“*

*„... it is ridiculous to speak with a mannequin... From the beginning, we are told that it is important to communicate with a patient... You don` t pull back the covers immediately...(I1)*

According to the literature, the main deficiency in the simulation-based learning is poor communication. The students were satisfied with the mannequin being able to communicate at minimal level and demonstrate some emotions, but there was no possibility to have a thorough professional conversation, which could be trained only in the placement in working environment (31). Since the simulation-based learning provides the students with realistic imagination of professional competences, this should also, in addition to manual skills, enable professional communication (33).

### **2.2 Achievement of the outcome “A student can perform clinical nursing procedures in the simulation environment relying on the evidence basis” in the subject Clinical Nursing Procedures.**

Based on the interviews, it was highlighted that linking the theory to practice in nursing procedures is better achieved in the simulation environment. Theory provides the basis; practical activities provide the skills for performing the procedures in the order of priority and

using properly both hands. The procedures have to be previously acquired because the notes cannot be used in the simulation centre. Simulation provides a good opportunity to test oneself and one's hand movements. According to the interviews, there was a lack of practising and all procedures were not performed. The students reported that the principles of aseptic and antisepsis techniques had been followed and even small deviations in the placement in working environment will be prevented. The students think that more training is needed and the extent of learning through simulation should be increased. All the respondents agreed that the learning outcome "A student can perform clinical nursing procedures in the simulation environment relying on the evidence basis" was better achieved.

Examples of the transcribed interviews:

*„... Theory did not link to practice nicely (I7)... In these lessons everything was done (I4)... In lessons concerning procedures everyone has the notes open but now they are not open anymore (I3)... Now, all of us do things without needing them...(I3).*

*„ ... Theoretic knowledge, this is a basis. You know by heart what should be done but also hand movements are important in order to take the things you need, it is very important..(I1)*

*„ we have trained in lessons but we have not done everything enough through simulation (I4)...we have not had possibility to get tested. (I1)...*

*„... It is not right to take up a placement simply on the basis of theory...(I3).*

*„... of course, it would be great if there were volunteers to practice inserting a cannula on... There we learn... We manage at least. The second learning outcome was better achieved... (I1).*

*...“sometimes there is a time left over...(I5)....not all students have had possibility to go through. (I3)...but time use depends on lecturers, I guess....,....Lessons for simulation are needed once or twice a month to see gaps in real activities...“(I2)*

According to the literature, all professional procedures can be trained on a simulator, which is an essential part of the learning process in order to achieve necessary learning outcomes (31). Manual skills and ability to understand the coherence between the theory and practice will be improved. (32).

The results obtained in the research were similar to the arguments brought out in the evidence-based literature sources. Based on the research conducted in the Tallinn Health Care College, it is possible to bring out the aspects requiring to be improved and also positive points in relation with simulation-based learning.

## SUMMARY

### Aspects that should be improved:

1. Students have to be better prepared for the simulation, and train, be active during the simulation in order to meet the demands needed for achieving the objective of the simulation-based learning.
2. Communication in English should be improved, because all students will have some practice abroad during their study being exchange students,
3. Some students achieved the first learning outcome, including patient education, partially. It was supposed that communication with a simulator requires more imagination because the mannequin does not answer the questions. Patient education requires good communication skills. To improve this aspect, the roles should be assigned so that the role of a mannequin/patient will be played by a student with whom it is possible to communicate.
4. Communication skills were poor in simulation.
5. The research did not confirm that the students learned something new within resolving the case, and the aspects needing to be improved were not revealed.
6. No evidence relating to the type of simulation that should be chosen by a mentor according to the purpose needed to be obtained was not revealed.



7. A mentor guiding the simulation process did not manage time effectively. There is a need for involving students in the process and encouraging them to be active. A good performance should be approved by a mentor, the aspects requiring improving should be brought out using a constructive criticism.
8. The extent of simulation-based learning was not sufficient and there is a need for reviewing the curriculum and if it is necessary, to increase the extent.

**Positive aspects:**

1. The second learning outcome relating to the manual activities was better achieved because they had a greater value.
2. Learning through simulation enables students to learn from their errors made in the simulation process and avoid them in the clinical placement.
3. Simulation-based learning consolidated the theoretical knowledge, provided students with practical experiences, self-confidence and the courage to cope in the placement.
4. The results obtained in the applied research were used for updating of the nursing curriculum and the learning process.

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## Appendix 1

<b>Case Study</b>	<b>Role Play</b>	<b>Part-Task Trainer</b>	<b>Full-Scale Simulation</b>
Reviews background, events, and outcomes	Re-enacts interactions or events of interest	Simulates one segment of a complex task	Simulates a complex task in its entirety
No attempt to re-enact events.	May use simulated patients (actors) to portray defined conditions or patient populations	Most appropriate for developing psychomotor skills	Includes all environmental complexities attendant to the task
	Appropriate for cognitive learning and developing attitudes	Allows repeated practice so task performance becomes automatic and does not require conscious direction	Reproduces high workload in multiple domains of performance
			May reproduce elements of stress among participants
			Includes elements of teamwork and interactions between professionals of different disciplines

Figure 1. Typology of simulation fidelity derived from Beaubien and Baker.<sup>17</sup> (Figure by C. Byrne).

## Appendix 2

### Informed consent form

Name of the research: **Use of simulation in professional learning based on examples of nursing education in Tallinn Health Care College**

I..... have been informed about the research, the purpose of which is describe experiences of nursing and midwifery students gained from simulation-based learning, and achievement of the learning outcomes in the pre-clinical practice. The consent to conduct the research was given by the Committee of Applied Researches in the Tallinn Health Care College. I have been informed that semi-structured interviews will be used in the research and the interviews will be recorded. I have been informed that the data will be available only for the researchers who collect the data and analyze this. I have been informed that the data will be stored until successful defending of the final paper. After that the audio files will be deleted and the manuscripts on paper will be destroyed using a paper shredder. I have been informed that my confidentiality will be maintained. I am aware of my right to abstain from taking part in the research any time. I have been informed that my personal data will not be associated with my opinions at no stage of the research. I am aware of the possibility to send the results of the research by e-mail if desired.

I have got the answers to my questions and I have had a period of reflection. I confirm my consent to share my experiences in the research „Use of simulation in professional learning based on examples of nursing education in Tallinn Health Care College” and confirm it by my signature.

Respondents` signature

Date, month, year

Name of the person who provided the respondent with information

Signature of the person who provided the respondent with information

Date, month, year