

# RECOMMENDATIONS FOR THE USE OF SIMULATION METHODS IN A SELECTED AREA OF HEALTH SCIENCES BASED ON AN EXAMPLE SIMULATION SCENARIO

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## ABSTRACT

Over the past two decades, there has been rapid and enthusiastic acceptance of the simulation in medical education on the international stage. Poland compared to other countries has become unique due to the possibility of developing simulation and education by training teachers who teach medical professions, and building simulation centres.

One of the most important milestones in the development of the curriculum in medical and health sciences is the introduction of a simulation-based teaching method. Active teaching methods, including medical simulation, create conditions for independent learning, so they should be permanently included in the canon of education methods in the field of health sciences.

**KEY WORDS:** medical simulation; education; teaching; nursing

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## INTRODUCTION

Over the past two decades, there has been rapid and enthusiastic acceptance of simulation in medical education on the international stage [1]. Poland compared to other countries has become unique due to the possibility of developing simulation and education by training teachers teaching medical professions and building simulation centres on a national scale. The first medical simulation centres have been developing in Poland since 2010, mainly for medical, nursing and obstetric departments. Currently, there are over 10 mono-profile medical simulation centres in Poland, providing multidisciplinary education and 30 other

mono-profile medical simulation centres are being opened. One of the most important milestones in the development of the curriculum in medical and health sciences is the introduction of a simulation-based teaching and learning method [2]. Medicine has benefited a lot from the aviation and aerospace industry, which has been using simulation for many years as a successful tool for educating future adepts of flying. Increased demand for training hours, limited opportunities of work with patients and a focus on patient safety have led to a new model of education in healthcare that increasingly includes technology and innovative ways to provide a unified curriculum [1, 3].

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## Medical simulation as a teaching method in nursing

A medical simulation is an indispensable tool used for the education of medical staff to reproduce real situations (events) in artificial conditions which are safe for trainees. Simulations consist of imitating selected situations or processes using a correspondingly analogous situation and technical devices (trainers and simulators). Active teaching methods, including medical simulation, create conditions for independent learning. Conducting classes based on scenarios, especially scenarios of high fidelity simulation, allows students to make autonomous decisions, encourages creative thinking and, most importantly, it provokes self-reflection. The learner supplement the planned scenario of classes regarding a real or potential event [4].

Simulation methods have been present in training of nurses for years, their foundations are still based on the "student-master" theory (practised, among others, by Socrates and Plato), according to the teaching model: see one, do one and teach one. From around 1905 teaching nurses was mainly based on clinical practice in medical facilities (at the patient's bedside) and vocational training process did not include practical preparation in simulation conditions, ensuring, among others, greater patient safety. The changes in the vocational training of nurses evolved and the year 1921 turned out to be the breakthrough in the introduction of simulation to the teaching method. Then The Polish Red Cross Nursing School in Poznan started to operate. Its curriculum included both theoretical and practical parts and in the available sources some information about "demonstration rooms" is found. The training was conducted by a teacher — a nurse (thus by a practitioner!) and one of the requirements for proceeding to the stage of clinical practice was to master the technique of individual procedures in simulated conditions [5]. The functioning of the Warsaw School of Nursing was another trace of the use of simulation methods in the education of nurses. After the year 1929 the school was moved to a new building equipped with both lecture halls and exercise rooms, which proved the use of simulation methods. At the same time (around the year 1925), the education of nurses using medical simulation took place in Krakow — University School of Nurses and Health Caregivers (later called: Hygienists). The training program included the implementation of knowledge at three stages: theoretical classes, classes in a demonstration room and practical classes in medical centres [6, 7]. Later in other medical schools

this method of knowledge implementation has been retained and it has been continued until now.

Practical education in the field of health sciences is related to health promotion and care for the sick, suffering and dying. This education is an integral part of the teaching process, which aims to shape and improve the skills necessary to obtain professional qualifications. Simulation is one of the most actively developing educational methods used in medicine. Universities emphasize the importance of the creation of medical simulation centres and try to standardize education according to a global pattern. Training in medical and health sciences is based on standards of education. These standards highlight three areas of education focused on knowledge, skills and social competencies. The knowledge refers to a good understanding of basic concepts and assumptions in a given field or discipline, the skills are the proper performance of standard activities based on widespread medical procedures, while the social competencies relate to the attitude of the students and their abilities to cooperate with the interdisciplinary team [8, 9].

Education in medicine and health sciences is now considered an industry, in which more and more emphasis is placed on responsibility, transparency, quality assurance and, to a great extent, patient safety. These factors require monitoring the type and quality of health services provided by all healthcare professionals. Therefore, it is recommended to use more recent teaching methods to fill the space between traditional teaching in the field of medicine or health sciences and a new approach. Traditional teaching is based on commonly used methods (lectures, practical classes, laboratory work, consultation at the patient's bedside), while more recent methods are based on problems and ways of creative solving of encountered clinical difficulties. The use of medical simulation techniques confirms the idea of Confucius: "Tell me and I will forget, show me and I may remember, involve me and I will understand", which reflects the essence of medical simulation. The most effective way to acquire and consolidate knowledge is to actively participate in an event or process as opposed to listening or passive participation [10]. The learner is the most important active participant in the process of teaching, while the educator is the guide responsible for creating appropriate conditions for effective learning [8]. The basic element of medical practice is above all the principle of "primum non nocere" — above all do no harm. Acquiring specialist knowledge in the area of medical and health sciences requires the student to engage in a practice focused on

achieving the intended learning outcomes. Student education aims to achieve the intended educational goals called learning outcomes. There are knowledge, skills and social competences among the effects. Despite the simulated conditions, simulation learning allows the student to achieve three components in one session and to be actively engaged in both work and study. This method involves the repetitive practice of intended cognitive or psychomotor skills in a given field, combined with a rigorous skill assessment that provides the learners with feedback, resulting in better skill performance under controlled conditions. Concerns about patient safety, restriction of patient access, reorganization of work in hospitals and many other factors have led to the introduction of simulation, the development of medical simulation centres in education and the transfer of some clinical classes to simulation rooms [2].

Several mono-profile medical simulation centres have been created over the last two years. Some of them are poly professional due to the presence of obstetrics in the structures of the university. Low and indirect fidelity techniques have been used in the teaching process until now and when it comes to education in high fidelity conditions, it has not been conducted in the field of nursing. These more advanced techniques and equipment were used in the process of educating doctors and paramedics, although it is difficult to implement these class schedules in the educations of nurses in a 1:1 ratio.

It is related to the style of work of these professions. The two previously mentioned are trained for teamwork with a function of a team leader. In this scheme, it is easier to design classes for a group of students (everyone has a function and an assigned task). In the case of nurses, professional work is more individual and the equivalent of a team leader does not function on shift duty. So while constructing the scenario for nursing course, some modifications should be made so that during the course each student could be activated and after the course all the assumed learning outcomes could be achieved.

While designing the scenario for simulation classes, you need to consider, among others:

- size of the group — usually 6–8 students;
- the nature and level of advancement of a group of students;
- duration of classes — real duration of the simulation (clinical situation) should be estimated; usually 10–15 minutes;
- purpose of the class — planning the learning outcomes of the class;
- description of the main task for the group;
- description of the task for the lecturer and simulation technician, if their participation is planned;
- room description and equipment guidelines — the use of models (simulator/trainer — Fig. 1.) or simulate/standardized patient (actor — Fig. 2.);



**FIGURE 1.** Patient examination — using a simulator  
Source: own study (by Karolina Radke)



**FIGURE 2.** Breast examination using a model and a simulated patient (SP). Source: own study (by Karolina Radke)

- description of the scenario for the teacher (it is not always the same person);
- taking into account possible difficulties or simplifications [8, 10–12].

Additional variants introduced to the scenario mean that students do not inform each other about its course and despite the common effect to achieve, they have different arrangements of the same problem. What is more, the effect of boredom, doing the same things by everyone

can be avoided. After each scenario variant (for each pair of the students), it is recommended to conduct debriefing in order to obtain the feedback from the students and to make a specific summary of the exercise. It is recommended to modify the main task in 3 additional variants for other students (the same purpose but different arrangement, e.g. a different patient, different circumstances, a different outfit of the mannequin/ /SP outfit etc.) [14].

**Table 1. An example simulation scenario for the nursing course**

The title of the scenario/ duration	A breast cancer survivor	20 minutes
The main problem	The patient comes to the healthcare centre for a breast examination. The student is to carry out a breast examination in accordance with the current scheme and provide the right test conditions	
The aims to discuss during debriefing	Conducting a physical examination which enables early detection of breast lesions and shows the patient how to carry out a self-breast exam (C.U53) The student respects patients' rights (C.K5)	
The case description	You are in the exam room in the health care centre, the patient comes to the room for the scheduled appointment	
The team composition	The scenario is implemented by 2 nursing students — they work in the healthcare centre The other students observe the situation in the next room In subsequent versions of the scenario, the student pairs change but what is important, the components of the scenario also change	
Information for the participants:	N/A	N/A
Room	The exam room — standard equipment: a table, a blood pressure monitor, a thermometer, a settee, a screen, etc.	
Preparation of the mannequin or the stimulated patient and the room	A simulated patient (female) equipped with a strainer for a breast examination, possible to attach on the torso of the simulated patient. In addition, version 2: elements of a religious outfit — a nun * Trainer: – version 1: right breast lesion, lower outer quadrant – version 2: breasts without pathological changes – version 3: lesion in the left breast, upper outer quadrant – version 4: left breast lesion, tumour in the outer lower quadrant and upper inner quadrant * Medical record — the patient's record to enter the result of the breast examination	
Initial parameters	Alternative parameters: 1) <b>virtual patient (monitoring of the patient which aims to create simulated parameters):</b> BP 135/85 mmHg, HR 85/min. (heart tones correct) SAT 96% breath 12/min. (breathable, without breathlessness and work of additional breathing muscles, <b>vesicular breath sounds</b> ) even pupils reacting properly to light ECG: correct 2) <b>The Simulated Patient, factual situation</b> Breast examination trainer: – version 1: rightbreastlesion, lower outer quadrant – version 2: breasts without pathological changes – version 3: lesion in the left breast, upper outer quadrant – version 4: left breast lesion, tumour in the outer lower quadrant and upper inner quadrant	

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Table 1. cont. An example simulation scenario for the nursing course

Interview	<p><b>Sample information about the patient (interview based on the SAMPLE scheme)</b></p> <p>S1 — The patient does not carry out a breast self-examination at home. She lives with a partner who has felt for a lump in her breast during an intimate relationship. The patient comes to the health care centre for a professional examination because this fact disturbs her and causes stress and raises doubts</p> <p>S2 — The patient does not carry out a breast self-examination, there are no pathological changes in the mammary gland, she comes for a preventive breast examination referred by a primary care physician</p> <p>S3 — The patient comes for a preventive examination, she carries out a self-examination but she does not do it properly, unaware that she has a tumour in her left breast, upper external quadrant</p> <p>S4 — the patient comes to exam room crying and upset, she has felt for changes in her right breast: a tumour in the lower outer quadrant and upper inner quadrant</p> <p>A — birch pollen, aluminium deodorant rash</p> <p>M — the patient does not take any medicines, only periodically commonly available pain killers</p> <p>P — generally healthy, appendectomy surgery in childhood</p> <p>L — breakfast in the morning</p> <p>E — oral contraception for 10 years in the past, childless, smoking, her menstruation stopped 2–3 years ago</p>	
The course of the scenario, evolution in the mannequin's vital parameters	<p>The students</p> <ul style="list-style-type: none"> <li>– greeting the patient, introducing themselves</li> <li>– explaining the reason for the patient's visit</li> <li>– preparation for the breast examination: explaining the examination, providing comfortable (intimate) conditions</li> <li>– conducting the examination in accordance with the scheme</li> <li>– documenting the examination in the patient's record</li> <li>– informing about further proceedings — order to contact a primary care physician and request for a Rapid Oncological Diagnosis card in case of the scenario version 1, 3, 4</li> <li>– informing about further proceedings — teaching and instructing how to carry out a breast self-examination at home: a version of scenario 2</li> </ul> <p>The course of the examination:</p> <ol style="list-style-type: none"> <li>1) <b>The interview:</b> an examination on the 2–3 days after menstruation in case the patient has no menstrual period — always on the same day of the month</li> <li>2) <b>Viewing and assessment:</b> the shape and symmetry of the breast and axillary pits, the appearance of the skin of the breast, the appearance of the areola and the breast nipple  <b>Sitting (or standing) position and leaning position</b> — with hands on the hips, with hands raised up, arms down along the torso</li> <li>3) <b>Palpation:</b> an examination by the flat surface of the three middle fingers  Sitting (or standing) position, lying on the side and lying on the back <ul style="list-style-type: none"> <li>– palpation of 4 breast quadrants and axillary region</li> <li>– evaluation of each breast quadrant and axillary region in 3 positions</li> <li>– nipple assessment</li> </ul> </li> <li>4) <b>Assessment of axillary and supraclavicular lymph nodes</b></li> </ol>	
	<p><b>Expected action:</b></p> <p>The students follow all the rules for the proper breast examination:</p> <ul style="list-style-type: none"> <li>– provide comfort and intimacy</li> <li>– provide the correct technique of a breast examination</li> <li>– keep examination records</li> <li>– inform the patient about recommended further action</li> <li>– provide mental support</li> </ul>	<p><b>Negative action:</b></p> <p>The students do not respect the patients right to intimacy (they do not use a screen):</p> <ul style="list-style-type: none"> <li>– the students do not know the examination scheme and they do conduct it incorrectly</li> <li>– the students do not keep examination records</li> <li>– the students do not inform the patient about recommended further action</li> <li>– the students ignore the patient's condition and do not provide her mental support</li> <li>– the students have a problem with being serious during the interview and the examination</li> </ul>

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Table 1. cont. An example simulation scenario for the nursing course	
Diagnosis	N/A — The patient has not been undiagnosed additionally yet
Physical examination	N/A — The Simulated Patient
A supportive question	If the students do not set the screen in front of the door, the Simulated Patient (SP) asks if someone will not come in during the examination because undressing is embarrassing for her
Distractions and difficulties	<ul style="list-style-type: none"> <li>– <b>version 2:</b> the patient feels very uncomfortable, she is a nun (without a habit) and she does not want to undress — interview and communication. Scenario for a female and a male student.</li> <li>– <b>version 3:</b> the patient ignores the disease, after diagnosing a change in the breast, she does not want to see a primary care physician, she says: <b>“What for? Probably it’s nothing serious. My neighbour has had the same and she is still alive”</b>. (communication and argumentation in difficult situations)</li> </ul>
Alternative courses of the scenario	<ol style="list-style-type: none"> <li>1. The first two students implement the baseline scenario</li> <li>2. The second two students implement the baseline scenario with the changes: the patient has no changes in the mammary gland, she comes to a breast preventive examination referred by a primary care physician</li> <li>3. The third two students implement the baseline scenario with changes: the patient comes to a preventive examination, unaware of the fact that she has a tumour in her left breast, the upper external quadrant</li> <li>4. The fourth two students implement the baseline scenario with the changes: the patient comes to the exam room crying and upset because she has felt for changes in her right breast: a tumour in the outer lower quadrant and the upper inner quadrant</li> </ol>

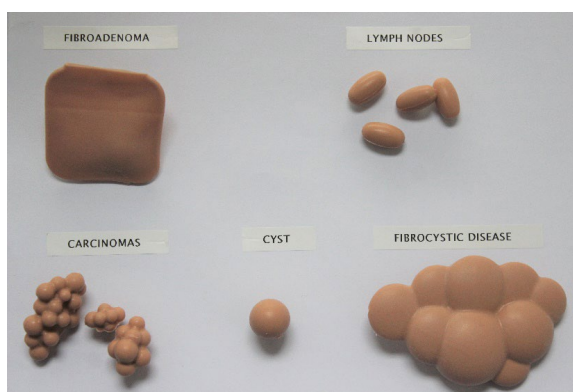


**FIGURE 3.** Examples of breast examination models. Source: own study (by Karolina Radke)



**FIGURE 4.** Silicone breast model used in the simulator. Source: own study (by Karolina Radke)

It should be remembered that medical simulation consists not only of trainers and simulators (Fig. 3–5). An additional and very important advantage of medical simulation is the possibility of getting communication skills. Interpersonal communication is an extremely important skill that should be acquired by all the graduates of medical universities, including nursing departments. In safe simulation conditions, with the support of a simulated patient, it is possible to shape appropriate situations in which appropriate reactions and behaviours occur (e.g. behaviour in difficult situations, such as cultural/religious differences, death, conflict or aggression) [11–13].



**FIGURE 5.** Examples of pathological changes used in breast examination models. Source: own study (by Karolina Radke)

## Summary

Simulation teaching methods are recommended by the actively developing medical education scene. It is known that modifying the teaching process is difficult but it can be implemented gradually in small steps. The use of information and simulation technologies is strongly recommended for several reasons:

- improving the quality of education;
- increasing the qualifications of the teaching staff — progress in the development of medical simulation should encourage the use of innovative or improved solutions and modifications;
- increasing the attractiveness of classes and thus increasing the effectiveness of teaching as a result of greater student involvement;
- increasing the attractiveness of classes previously considered uninteresting by students;
- standardization of the didactic process — everyone has the same learning/credit conditions;
- implementing the knowledge on several levels, which has a positive effect on the remembering process;
- techniques of introduction and summary with the feedback of the classes interesting for the student (pre-briefing and debriefing), which require certain skills from the teacher but bring excellent results [8, 12–14].

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