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SIMULATION-BASED LEARNING FOR HEALTHCARE STUDENTS

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***Abstract:** The simulation-based learning is a great way to develop health professionals' knowledge, skills, and attitudes while protecting patients from unnecessary risks. The realistic scenarios and equipment allows the medical personnel to practice until they master the procedure or skill. Teamwork is also encouraged which results in enhanced performance and error reduction. The obvious benefits of the simulation-based learning have led to its use in an increasing number of health care institutions and medical schools.*

***Key words:** simulation-based learning, education, teamwork, healthcare student*

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INTRODUCTION

Simulation is a technique used to safely recreate the real world (with or without complex technology) with the purpose of educating, training, evaluating effectiveness or conducting a research. Most people are familiar with the use of simulation in aviation. Before entering the cockpit of a real airplane the pilot has spent numerous hours in a mock cockpit. Simulation has been used in health care for hundreds of years. Many nurses have used oranges to learn how to give intramuscular injections. The use of cadavers for teaching anatomy is also considered a type of simulation. Simulation mannequins, the size of a real person, have been used in anesthesia since the end of the 1960s. This model is known as "Sim One" and has been used for training endotracheal intubation and anesthesia [2]. Today's simulation mannequins are computer models that mimic the physiology of the human body.

SIMULATION-BASED LEARNING

Simulation changes the ways of teaching medicine and developing relevant skills. Via using the simulation techniques, the medical staff has the opportunity to develop and improve their skills with repeated attempts without putting patients at risk. Simulation training centers, with their new techniques and equipment, offer unique opportunities to practice dynamic, complex and unexpected medical situations.

When simulation-based learning was first introduced it was quite expensive and just a few institutions realized that this is an extremely worthwhile long term investment [2]. With time simulation proved to be a very flexible and durable form of medical education and training. The equipment, controlled by computer and information technology, has led to advances in medical training and has ensured that students learn the treatment procedures and protocols before carrying them out on real patients. The simulation allows learning and repeating the procedure as often as needed in order to correct errors, improve skills and optimize clinical outcomes. Simulation also makes it possible to study scenarios of rare or unusual cases. This ensures that students gain clinical experience without depending on accidental encounters of certain cases. Many people believe that simulation-based training improves the efficiency of the learning process in a controlled and safe environment.

The skills that can be improved by using simulation are as follows:

- Technical and functional expertise training
- Problem-solving and decision-making skills
- Interpersonal and communication skills or team-based competencies

Acquiring skills requires more active listening and cooperation. Every training session should be followed by feedback and analysis [3]. Feedback should be linked to learning outcomes and should include analyses of training protocols. Studies show that simulation improves learning. Simulation is effective in developing skills in procedures that require coordination of eyes and hands and maneuvers with both hands, bronchoscopy and other endoscopic procedures. Simulation training helps students prepare to handle unexpected medical events and thus increases their self-esteem.

Multidisciplinary teams today offer numerous health care services, but many universities are still focused on individual technical responsibilities and thus leaving students inadequately prepared to enter a complex team-based environment. If professors from different disciplines teach separately, students might have hard time integrating their skills. Effective multidisciplinary teams should always have good communication and leadership skills in order to ensure the safety of the patient.

Teamwork is an example of a non-technical, but essential part of the health care professionals' training. Simulation has the potential to create lasting and sustainable behavior and cultural change that will make healthcare profession more efficient and safe [1]. It has the ability to fundamentally change the way of doing things and working with colleagues. Transformational change can only occur when the student realizes the problems and tries to address them.

The essence of the team is the common goal and commitment. This is a powerful unit of collective performance that can be done individually or in teams. The overall objective must be translated into concrete goals. The discipline of the team is vital for achieving excellent results.

Simulation training and practice is essential for creating an effective medical team with a sense of group identity, efficiency and trust among members. There must be a genuine commitment and understanding among the team members in order for them to work well together. Examples of this can be seen in the incredible teamwork during intensive care and operation. Health care professionals who are trained and knowledgeable can be flexible enough to adapt to any new situation. Each member of the group can perform the work of another member thus indicating their interdependence. Members of the teams have defined roles and responsibilities, have flexibility and realize common goals. Conflict resolution is another aspect of teamwork that can be practiced during simulations.

INTERDISCIPLINARY GROUPS AND SKILLS

The healthcare professional team includes doctors of various specialties, nurses, physiotherapists, radiologists, pharmacists, medical students, and other support staff. The composition varies depending on the purpose of the teams. The training of each team member is determined by his/her own discipline. These people need to come together in an integrated way so they can deal with patients with complex medical problems. None of the specialties is more important than others. Everyone has a role. During simulation every person has a synergistic role. Teamwork skills and interpersonal communication techniques are vital components in this kind of training.

Professors must be able to objectively see the team dynamics and interaction within the team. They train and provide valuable feedback. Professors assess the performance of the team in real time and maintain lists of activities, actions and relevant human factors. Videotaping is useful because it can be played repeatedly and thus indicate students' negative and positive practices and behavior.

Problems that occur during team work include [1]:

- The lack of understanding the role and responsibilities of other team members, especially those from other specialties.
- The lack of clearly defined roles can persist until a change in members takes place and reveals the confusion of roles.
- Most healthcare systems have no, or minimal alternative solutions in case of errors.

- There is an implicit expectation by members that everyone will perform his/ her task with 100% efficiency and effectiveness. There is no method to measure this.

ESTABLISHING A SIMULATION TRAINING CENTER

The simulation training center is a long-term investment in healthcare professional training. Students can use it to study anatomy, physiology and to get familiar with medical examination techniques. For starters this center must be in a convenient location, usually in the university itself. The architectural plan and infrastructure should be discussed among all professors who will use the center. There should be enough space available for training small groups of students, rooms with mirrors as well as enough space for equipment. The presence of video equipment is also desirable.

Simulation training technology located in the center includes:

1. Mannequins: In the center there is usually a full size mannequin which blinks, breathes, has a pulse and makes breathing sounds. This model can be technologically developed. For example, it can "communicate" with students through computer-guided teaching program. Attached monitors can display vital signs and thus provide a virtual simulation of nearly every major body function. This simulator can be used for regular physical examination as well as interdisciplinary trauma management. Some simulators can even recognize injected drugs with the help of laser bar code reader and then react with appropriate changes in vital signs [3].

2. Simulated clinical environment: Professors can prepare an intensive care unit or operating room with all necessary equipment. The most realistic model should be established. Students should familiarize themselves with the environment.

3. Virtual procedural stations: Professors can create different stations depending on what the main focus is. These stations should have all the necessary equipment for procedures, for example, bronchoscopy and colonoscopy intubation. The simulators can provide a variety of scenarios and pathology and the student can practice until perfection.

4. Electronic Medical Records: This can be perfect for training as more and more medical facilities adopt electronic medical records. The system used can contain fictitious patients with their histories, notes and lab results. There may also be system integration to connect to the lab and X-ray studies (digitalized radiographs).

For institutions that cannot afford the creation of a comprehensive simulation lab, a cheaper option would be to invest only in simulation mannequins [3]. A various number of those mannequins can be purchased and used for training.

SAFETY AND SIMULATION

An important concept in medical safety is the paradigm of how one learns. Traditionally, medicine is based on the model of apprenticeship. Students begin to take care of patients from the first day they enter a hospital and under the direct supervision of an experienced staff member who ensures errors will be avoided. Before taking responsibility for the first patient, each healthcare professional must be familiar with high-risk procedures for resuscitation and possess critical skills for making decisions in real time on real patients. Simulation complements the traditional teaching methods in the field of medicine. These planned simulation situations can ensure students are prepared to handle emergency situations. It is undisputed that experience reduces complications. The simulators help in gaining experience before implementing procedures on real patients.

The simulation characteristics which facilitate training include:

- Ability to provide feedback
- Practice through repetition
- Integration in the curriculum
- Ability to change the levels of difficulty

The educational benefits of simulation training include:

- Practice with feedback

- Exposure to unusual events
- Possible repetition of actions
- Ability to assess students
- Lack of risks for patients

CONCLUSION

Simulation-based training opens new educational application in medicine. Students are able to get trained with the help of protocols and algorithms that can then be tested through simulation scenarios. The key to the simulation training success is integrating it into traditional educational programs. Universities should be involved in developing such programs. Professors will see the potential of the virtual reality and will invest time and energy to create curricula. They can also help by engaging the wider medical community. Teamwork during simulation can be beneficial to the traditional didactic teaching as it helps improving skills and reducing errors.

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