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Simulation Training and Skill Assessment in Obstetrics and Gynecology

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Introduction

Simulation is a valuable teaching tool that increases skill and knowledge acquisition in obstetric and gynecologic clinical scenarios. There are increasing options for simulation from animal and human cadaver, low-fidelity (inanimate simulator), and virtual reality simulation. The role of obstetric and gynecologic simulation also plays a key role in both outcomes-based as well as competency-based medical education.

Simulators were initially created for flight training for pilots in the 1920s, and the ability to reproduce clinical situations has been utilized in obstetric and gynecologic education. Simulations used in medical training were used in the 1960s with standardized patients and mannequins. Simulation has continued to evolve with the development of simulation software for medical education in the 1980s.[1] Simulation is an effective way for residents and students to develop their skills in a safe learning environment. Simulation offers a realistic approach to practice such skills without the potential to cause harm to a living patient. Although the reduction in duty hours has shown to improve standardized examination scores for residents, residents may not encounter specific cases due to the decreased volume. [2] Simulation allows residents and students to encounter case scenarios and skills that in a reproducible environment.

Standardized patients provide simulated learning interactions with patients. It is advantageous to practice and model procedures and simulated scenarios in obstetrics and gynecology. Clinical simulation encounters offer learning skills for standard delivery, postpartum hemorrhage, instrument deliveries, shoulder dystocia, fetal malpresentation, massive blood transfusion protocol, disseminated intravascular coagulation, or amniotic fluid emboli. Laparoscopic and robotic operative simulations facilitate operative skills for hysterectomy, oophorectomy, salpingectomy, and access to the abdomen.

Function

The primary cause of adverse events is due to human error or deviation of accepted practice.[3] Simulation training may function to reduce errors. Simulation training provides residents and students skills and repetition prior to clinical practice. Skill assessment with simulation is a viable way for residents and students to learn. If this was developed and standardized, learning with patient safety and improved patient outcomes would be optimized, as participants would receive approval to perform procedures with live patients.[4]

Issues of Concern

Debriefing is necessary for the learning experience for students and residents. Despite different simulation techniques, successful debriefing tends to follow a similar set of rules that creates a safe learning environment with a clear set of rules that addresses critical learning objectives.[5] This set of rules has been shown to maximize learning and safety for residents and students, offering them the opportunity to review the simulation case and rationales of their clinical choices.[5] Debriefing also allows the facilitator to talk through clinical reasoning. Errors made during the simulation, provide the opportunity for the facilitator to correct and provide an explanation.

During a simulation, it is expected that participants will make mistakes, especially if this is their first encounter with this type of experience. Therefore, the facilitator must assist when needed so that errors do occur and can be explained later.[6][7] Errors identified during simulation have been shown to improve skill retention and translation in practice. [7] Facilitator training and experience can have an impact on simulation education for participants.

Debriefing is crucial to simulation experiences; the preparation of facilitators should be standardized.[8] Formal training through workshops, courses, fellowships, or degrees would be necessary for a standardized approach to facilitating simulation.[8] While most studies look at the effect of simulation on the knowledge and skills of the residents and students, there is a gap in the literature regarding cost analysis and effectiveness. There is also debate on the cost-effectiveness of simulated education.[9]

Curriculum Development

Simulated learning can have varying levels of difficulty. To create efficacy, simulations must address learning objectives for the case, contain a debrief, offer open-ended questions to facilitate learning, and must be in a safe, non-judgmental learning environment.[10] The facilitator can develop the curriculum to address any gaps in learning identified in the participants. The facilitator can also use it at the beginning of a rotation or residency to help residents and students learn baseline material that will be utilized throughout their training. Simulation in obstetrics and gynecology has had an increasing role in the education of residents and students. It allows an opportunity to increase confidence and knowledge.[11]

Simulation allows transition away from the classic master-apprentice model. They are implemented with various gynecologic and obstetric procedures such as pediatric-adolescent gynecologic exams, management of postpartum hemorrhage, laparoscopic hysterectomy, cesarean sections, and interdisciplinary obstetric emergencies.[12][13][14][15] [16] Additional examples of procedure-specific simulation in gynecology include- loop electrosurgical excision procedure, operative hysteroscopy, cystoscopy, vaginoscopy, laparoscopic tubal ligation, and salpingectomy, vaginal hysterectomy, vaginal repairs, total abdominal hysterectomy, laparoscopic hysterectomy, laparoscopic sacrocolpopexy, Burch colposuspension.[14]

These articles have demonstrated the experience contains similarities to the operative and patient encounters and that practicing utilizing simulation-based training has provided learners with more comfort and confidence with the patient and operative management. The repetition and simulation increase skill acquisition in a protected environment.

Assessment of Procedural Skills

There are several options for surgical simulation, namely animal and human cadaver simulation, low fidelity trainers, as well as virtual reality simulation. Animal and cadaver laboratories have high validity in terms of anatomy, haptics, and tissue quality; however, the changing ethics, regulations, and cost have decreased the popularity of this training simulation model.[14] Low-fidelity trains are usually inanimate simulators, also known as box trainers. Improved psychomotor skill and repetition and the ability to adjust the model for increasingly difficult operative scenarios aid in laparoscopic skills acquisition.[17] Finally, virtual reality simulation offers immediate feedback with evaluation for time-motion analysis but carries a significant cost.[18]

Simulation assessment can be performed in a variety of ways and can include participant self-assessment, participant assessment of others, facilitator assessment of student, standardized patient assessment, and sensors within the mannequin. Standardized patients are beneficial for learning communication skills than a conventional lecture. [19] While there was no difference between performance or stress levels between standardized patients and high-fidelity simulators in clinical deterioration simulations, participants thought it was valuable to see real patients prepare them for an actual patient deterioration scenario, showing that standardized patients still have a valuable place in the field of simulation while mannequins and virtual reality simulations allow for the practice of procedures.[20]

While simulation across the United States in the field of obstetrics and gynecology is widely available, there exists a disparity in the perception in the retention and benefit learned during simulations.[21] A standardized way of assessing the knowledge of residents and students after each simulation experience needs to be developed.

Simulation plays a role in competency-based medical education. Outcome-based education (OBE) ensures that trainees are competent at the end of their training, but defining what 'competent' truly means poses a challenge for this type of evaluation. This type of education relies on discrete and summative assessments, often at the end of a program. It is usually evaluated on a 5-point Likert-scale of normative ranking. On the other hand, competency-based medical education (CBME) - relies on small elements of learning that can be assembled into over-arching competency. Competency-based evaluation relies on longitudinal evaluations over a training program. There are criterion-based to each specific competency, and it often takes place in the clinical setting.[14]

Medical Decision Making and Leadership Development

Leadership training and communication skills can easily be incorporated during group and high-fidelity simulations by identifying a simulation team leader. The leader of the team needs to be clear with instructions, aware of what each team member is doing, and needs to be listening at all times. Communication is critical with multiple providers and requires the use of closed-loop communication to effectively and efficiently complete tasks required to help the patient. [22]

Simulation facilitators can actively monitor team dynamics and interaction and can address any issues in the debrief or during the simulation if necessary. Medical decision making can also be improved through the use of simulated team dynamics. Communication during the simulation allows for discussions between participants to improve the knowledge base.[22] Facilitators can contribute if he or she believes the participants are having a good discussion by pausing the simulation and allowing for more time to deliberate the options for their patient.

Continuing Education

The American College of Obstetricians and Gynecologists (ACOG) offers simulation training for continuing medical education (CME) credit for those who attend sessions related to obstetric emergencies, endoscopic surgical simulation, and advanced surgical simulation. ACOG additionally offers other simulations, such as vaginal hysterectomy, etonogestrel implant insertion, shoulder dystocia, to practice the skills necessary to perform these procedures.[13][14]

Simulation has been formally standardized and incorporated into a laparoscopic simulation program for general surgery in the Fundamentals of Laparoscopic Skills (FLS) training program.[23] Additional surgical specialties are now incorporating more formalized simulation curricula.

Clinical Significance

Simulation is important to clinical education. Simulation leads to increased student and resident knowledge and confidence and reduces risks to patient safety.[11][4] By improving technical skills, simulation can also reduce errors and potentially improve patient outcomes.[6][7]

The benefits of simulation are abundant, but the costs associated with simulation should not be overlooked. Mannequins and high-fidelity simulation may require costly maintenance and repairs. Hiring the appropriate staff to lead the simulations, as well as their continuing education to further improve their skills, can also be costly. These costs must be weighed against the budget of the program looking to add them to their curriculum.[24]

Pearls and Other Issues

1. Due to the sensitivity of obstetrics and gynecology, simulation can be an effective tool to practice difficult skills and procedures.
2. Standardized patients are often utilized in simulation for communication skill practice.
3. Mannequins and virtual reality simulations are useful for procedures that are not easily reproducible, contain high-fidelity scenarios, or require repetitive practice.

4. Simulations will help to improve the stress and comfort of participants and can be utilized to enhance team performance.
5. When considering adding a simulation program to the curriculum, programs must consider the initial and longitudinal costs of equipment maintenance.

Enhancing Healthcare Team Outcomes

Simulation training in obstetrics and gynecology has improved knowledge acquisition. Simulation has exposed students and residents to increased levels of interprofessional communication and care coordination, which have led to an increase in team performance overall.[22] [Level I] There have been improved outcomes and increased patient-centered care and safety through the use of simulation.[4] [Level 1]

Simulation is beneficial to improve the skill level of obstetricians and gynecologists.[13][14] [Level 2] Simulation training offers the opportunity for participants to acquire procedure knowledge and team-based skills in a safe environment.

Continuing Education / Review Questions

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