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REVIEW ARTICLE **OPEN ACCESS**

All about Simulation in Nursing: The Indian Scenario

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ABSTRACT
A shift to competency-based approach has demanded integration of simulation- based education in curriculum. Simulation in nursing is a technique that enables nursing students and novice nurses to utilize all their senses and develop technical and non-technical skills in artificial environment by practicing multiple times without any harm to the patient and becoming confident before entering into the real field of clinical practice. It facilitates learning through immersion, reflection, feedback and practice during various phases i.e. Pre-brief, Simulation scenario and Debrief. The facilitator should ensure that the pre-requisite of conducting a simulation session is fulfilled before actually running the session. Simulation has various forms ranging from face to face (traditional) simulation to virtual/augmented reality. Though the realism of High-Fidelity Simulation (HFS) is more as compared to Low Fidelity Simulation (LFS), the necessity of using expensive simulators in HFS makes LFS as a popular and commonly accepted type. Simulation should be conducted by a person who is well-verse with the technique and understand the principle behind each action and all the phases. Simulation Labs provides an environment that is conducive to learning and appropriate to run even a high-fidelity session but a simulation with standardized patient can be performed on roadside, classroom or in the traditional skill labs as well. Various academic bodies like National Reference Simulation Center India, Laerdal India, PediStars India, Society of Simulation in Healthcare (SSH) operates with an objective of training health care professionals about simulation-based education.
Keywords: *Simulation, Nursing, Pre-brief, Debrief, Fidelity*

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INTRODUCTION

The shift of nursing education from traditional to modular in the recent decades has demanded the nursing curriculum to focus on competency-based approach. [1] Evidence-based nursing practice for caring patients in clinical has added to this demand.[2] A comprehensive review done by Saud H and Chen R found that competency-based education has the potential to be a more effective framework than conventional educational strategies in terms of achieving outcomes linked to clinical knowledge, technical competence, and/or clinical judgement among medical and nursing students. [3] Some factors which have emphasized the need of mastering competencies by nursing students who will be the future nurses are:

1. Increasing medical errors[4]
2. Emerging technological innovation in healthcare environment[5]
3. Growing awareness of patients and efforts to enhance patient's satisfaction[6]
4. Gain high level of student's satisfaction[7]
5. Better clinical performance of nursing students leading to improvement in patient outcome.[5]

This is achieved by applying acquired knowledge, skill trainings, integrating critical thinking and decision-making skills in managing a case and through simulation-based education.[8] Simulation enables nursing students and novice nurses to develop competencies in artificial environment by practicing multiple times and becoming confident before entering into the real field of clinical practice.[9] A longitudinal, randomized, controlled national simulation study done by National Council of State Boards of Nursing revealed no negative effects on learning outcomes when up to 50% of the clinical hours in a pre-licensure nursing education were replaced with simulated experiences. [10] Viewing the benefits of simulation in nursing, the Indian Nursing Council has included simulation in B.Sc. Nursing curriculum from this year onwards in the revised syllabus.[11]

What is Simulation?

Simulations were first used in aviation industry and for cosmonaut training. Over the past two decades, it is frequently being used in medical and allied healthcare field (e.g., cadaver).[5,8,12] Nursing is both an art and science of caring the people in need. It is a skill focused program in which nursing students deals directly with live patients. When we deal with human lives, errors are not affordable.[9] Simulation in nursing is a technique for nursing students to utilize all their senses and practice case management skills again and again in an environment that recreate actual or potential life-like situations without any harm to the patient.[5,12]

Gaba D M defined simulation as a technique, not a technology, to replace or amplify real experiences with guided ones, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion.[13]

Types of simulation

There are mainly three types of simulation - Low fidelity, medium fidelity and high-fidelity simulation. Fidelity means degree of realism in a particular simulation. There is a long history of using simulations in nursing, for example, using a standardized patient to help students learn history taking and develop communication skills, learn first aid and bandaging on their peers and basic life support on the CPR mannequin.

Low fidelity simulations (LFS) use static, anatomical part of the body, also called part task trainers (e.g. IV arm) to learn a particular skill. It can be co-related to the use of oranges to learn Intramuscular injection in the olden days.

Picture-1 shows a part-task trainer: IV arm which can be used to teach procedural skills and in hybrid simulation

Medium fidelity simulation (MFS) feels more real as compared to low fidelity simulation as it involves advance full body manikins that speaks, blinks, give different sounds like heart sound, breath sound and bowel sound and a variety of procedure can be performed over these simulators ranging from simple physical examination or subcutaneous injection to advance procedures like ET insertion, suctioning and CPR (e.g.- Nursing Anne).

Picture-2 shows the medium fidelity human patient simulator- Nursing Anne

High-fidelity simulation (HFS) uses totally automated, full body, adult simulators which are computer-assisted, electricity operated, can be pre-programmed or customized and provide heightened realism

through various add-on features of medium fidelity simulators like full range of motion, sitting unassisted, simulating blood loss, wounds, seizures, chest rise and fall; mimicking tongue edema, laryngospasm, secretions like sweating, tears, CSF; projecting instructor controlled vital parameters, ECG, SpO2 waveforms, ABP, CVP, etc.; depiction of physical signs such as cyanosis, CO2 exhalation, peripheral pulses and pupillary reaction (e.g.- SimMan 3G plus). A variety of advance procedures like Chest Tube insertion, Stomach decompression, volume infusion, etc. can be done on these high-fidelity simulators to providelearners with immersive learning experience. [8,14,15]

Picture-3 shows the high-fidelity human patient simulator- Sim Man 3G Plus (Picture Courtesy: Laerdal India)

A meta-analysis done by Kim J, Park JH, Shin S established simulation-based nursing education was effective in generating educational outcome, with a high impact on the psychomotor domain. Also, High-Fidelity simulation (HFS), Medium fidelity simulation (MFS) and Standardized patients (SP) were reported more beneficial as compared to Low- fidelity Simulation (LFS) and Hybrid simulation (HS)[16] Though the realism of HFS is more as compared to LFS, the necessity of using expensive simulators in HFS makes LFS as a popular and commonly accepted type of simulation. Simulation is a blanket term that includes various forms like face to face (traditional) simulation, computer assisted simulation, hybrid simulation (Standardized patient along with task trainer), virtual simulation, online simulation, virtual/augmented reality or computer games. These different forms of simulation help in igniting the curiosity, interest and involve learners actively in teaching- learning process as compared to traditional teaching methods. It provides an educational setting for the learners that is immersive, experiential and reflective in nature without threatening patient safety.[17,18]

When to perform simulation in nursing?

There are certain pre-requisites to perform simulation in nursing [19,20]:

Pre-requisite for Facilitator	**Pre-requisite for Students**
Clear with learning objectives	Clear with learning objectives
Well-designed simulation scenario	Well verse with the knowledge content related to the topic on which simulation is planned.
Standardized checklist to guide through the simulation process is essential	Competent in the psychomotor skills required for the planned simulation.
Pre-preparation of required articles, standardized patient or simulator andenvironment on the part of the facilitator is vital.	Practice their critical-thinking and decision-making skills through methods like case studies and virtual simulation

How to run a simulation- "Structure of simulation"

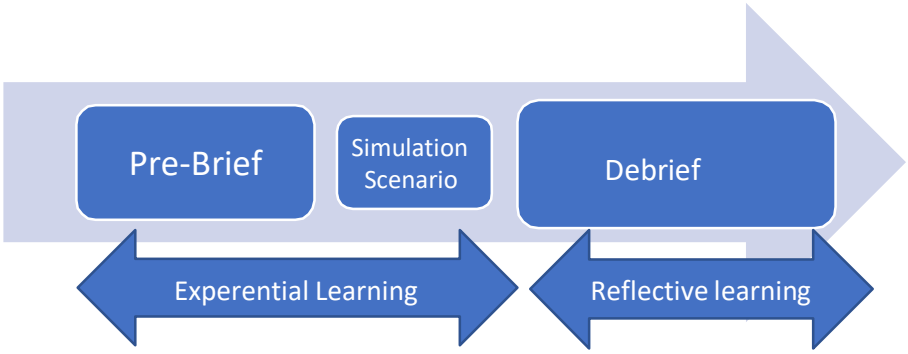

Figure -1 shows the phases of simulation

1. ***Pre-brief-*** It is an introductory phase, generally first 10-12 minutes which specify "why" and "how" of the whole simulation process. It starts with setting a safe environment for learners that is conducive for learning. This can be achieved by welcoming students and taking introductions. Anxiety can be relieved by informing ground rules of simulation and learning objectives to the students. Orientation to the simulators/ standardized patient, hand- holding of articles, equipment, and environmentshould be done by the facilitator. This should be followed by the explaining the case and assigning roles to the learners.
2. ***Simulation scenario-*** This is the action phase where students play the roles taken by them in pre-brief. They get immersed to experience the "real" situation and utilize all their cognitive, psychomotor and decision -making skills to manage the specified case. Facilitator should not interfere when students are performing but can use "actors", "lifesavers" or "cues" in case there is some deviation or problem in the scenario. This phasecan last for 5-10 minutes depending upon the learning objectives to be achieved. [20,21]

Debrief- This is the last but the most valuable phase of simulation. Students learn through reflective learning and 80 percent of learning takes place in this phase. It should be minimum three times of the scenario time and go maximum till 45 minutesdepending upon the objectives of the simulation, learners' background and experienceof debriefer. Debriefing includes learner-centric discussion in the presence of facilitatorwhere students reflect back and try to find out gaps in their performances. It offers analysis of learners' reactions, actions and their frame of mind behind them irrespectiveof whether they were good or bad and helps in changing actions of the learners in the subsequent practice by changing their frame of mind.[22]

If provision is there, a video-recording of the scenario can be used during the debriefingto help students in reflective learning.[8]

Figure -2 depicts the phases of debriefing

Reaction phase:

The facilitator after setting the table for the learners, allows them to ventilate their feelings by asking open ended questions like "How did it feel to be in that situation?" or "How were you feeling?". This is done so that the learners are coming out of the rolethey played and there is no cloudiness in their thoughts while they get involved indiscussion during the next phase. Also, it relieves the anxiety of the students and theyfeel more at-ease to discuss in the non-judgmental and non-threatening environment. Potential follow up questions like "why you were feeling like that" or reactions fromothers can be also asked. Learners are also asked to narrate the sequence of events that happened during the "real" situation so that everyone sitting on the table is on the samepage about what happened in the simulation

scenario.

Analysis phase:

This is most critical phase of debriefing. Facilitator utilize double loop learning method to find out "why" behind the actions performed by the learners.[23] Open ended questions are asked to make the learners brainstorm about "what and why the things happened the way they happened", "what it could lead to" and "what can be done next time". Facilitator should not pin-point the mistakes in the performances of students but guidethe discussion in a non-judgmental way, keeping his/her observations on the table that encourages students to themselves come up with their performance gaps. Debriefing is not only about finding performance gaps but also appreciating what students managedwell, finding "why" behind those actions also and "how" these correct actions can be helpful in their future practice. Various discussion strategies like educator guided, learner guided or educator guided with learner insight can be used to sail through the analysis phase.

Summary phase:

After analyzing all the actions based on the objectives of simulation, the debriefing is summed up by the facilitator or by the learners. Here, the point to be noted is that the summary is done for the learnings happened during the analysis phase of the debriefing rather than the whole simulation process or the simulation scenario. This is followed bytake home message from each student which they can apply in their future clinical practice.[24]

Why to choose Simulation- "Advantages of simulation"

Simulation helps in bridging the gap between knowledge and practice by allowing students to learn inter-professional team dynamics, leadership, communication skills, problem solving, clinical reasoning skills, critical thinking and decision-making skills beside case managementskills especially of the cases that students rarely come across in clinical setting and the emergency situations.[8,9] Students feels less anxious, are allowed to learn at their own pace and even commit mistakes. [25] It also helps to improve confidence in students [26] Simulation can be helpful in assessing competency of students during both formative or summative evaluation.[27]

A study done by **Garner *et al*** ascertained that simulation is effective in improving self-efficacy in nursing competency among undergraduate nursing students in India. [28]

As it is a known fact that student-directed learning is promoted by andragogy in order to boost understanding and engagement. Hence, modern days educational techniques are based on adultlearning principles.[17] Realistic scenarios, the chance to practice in a secure environment, and ongoing feedback are simulation aspects that improve adult learning.[8]

Simulation facilitates learning through immersion, practice, reflection and feedback.

Immersion- When students perform the simulation, they get immerse into the roles theyplay in the re-created environment. Assumptions has no room in simulations. Higher the fidelity, more the students can learn through immersion. Learning is better retained when it occurs in a realistic environment. Learning by doing and learning by committing mistakes is the basis for experiential learning which vital part of simulation is.

Reflection and Feedback-It is very important to understand the frame of mind behind the actions learners perform during the simulation scenario. Debriefing help students to reflect back on their simulation experiences and improve the gaps found in knowledge, skills or team performance. Constructive feedbacks by the peers and facilitator can reinforce the learning happening during debrief.

Practice- Students are encouraged to repeatedly practice all the skills so that they can become confident and competent when they come across similar situation in the real life. Task trainers and manikins can be used to acquire these psychomotor skills. Oncereflection and feedback are done during debriefing, a re-simulation can be done followed by a quick debrief to help students incorporate the learning attained duringthe previous simulation.[9]

Who should conduct simulation?

Whenever an institute decides to integrate simulation in curriculum, it should come up with a team rather than an individual. One or more trainers, subject matter experts, and simulation technicians make up the perfect simulation team. [17]

As said earlier that simulation is a methodology, hence simulation should be conducted by a person who is well-verse with the technique and understand the principle behind each action in all phases of simulation[20] (e.g.- During pre-brief, the trainer should understand the rationaleand importance of giving orientation to the equipment and environment before disclosure of individual roles of the learners). S/he

should be the one with good experience with real patients.It is important that the same trainer is present or observed all the phases of simulation startingfrom preparation of simulation to debrief.
The trainers should understand the difference between being an instructor Vs a facilitator and should be able to choose the role according to the phase of simulation and the level of the learners.

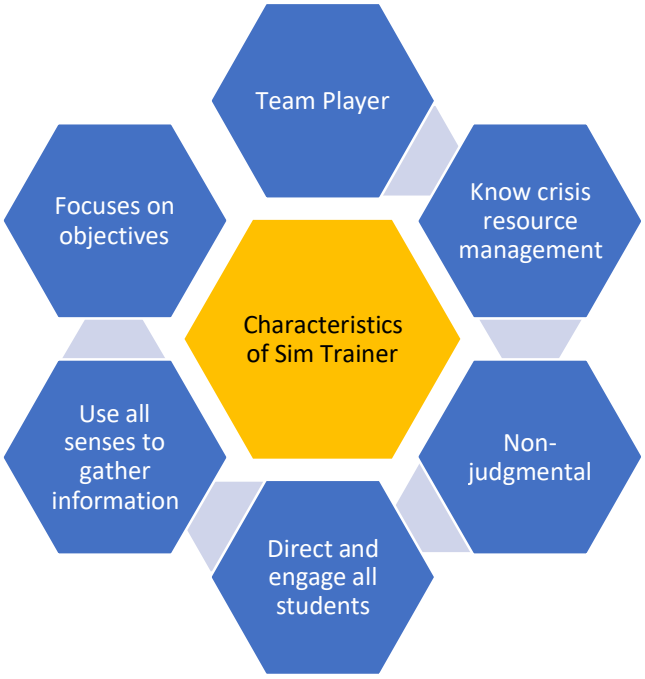

Figure-3 shows the characteristics of a simulation trainer

The characteristics of a trainer and simulation methodology in detail can be better understood by attending certain certified training programs run by various institutions. One of such programs is the training of trainer program (ToT) on Simulation based Education offered by National Reference Simulation Centre (NRSC), SGT University, Gurugram, Haryana, India in collaboration with Indian Nursing Council for nursing faculty all across India. The vision of NRSC is to implement inter-professional education in a state-of-art simulation center through simulation-based training. The intention is to train all health care professionals with increasing complexities of individual skills, decision making and case management through simulation- based education.[29] Another program is SimBegin offered by Laerdal as an advanced course for the trainers in simulation.[30]

Where simulation should be conducted?

With simulation-based education emerging in India, simulation labs are now the talk of the town. It is correct to say that the majority of simulation-based experiences (SBEs) take place in a simulation laboratory setting, where learners spend predetermined amount of time and participate in activities that are especially created to meet a certain set of learning objectives.[5]
Simulation Labs provide an environment that is conducive to learning and appropriate to run even a high-fidelity simulation. But it is not true to conclude that one requires an advance laboratory setting. Simulation is all about the methodology, not the technology.

FUTURE OF SIMULATION IN INDIA

Simulation in nursing is in its pre-adolescence stage and offers a lot of room for development and opportunities in India. Mostly, simulation is considered as an educational tool to enhance competencies of students, but it is an equally acceptable method for continuing nursing education for the clinical nurses.[17] Interprofessional team training can be given a boost through simulation-based education in India.[31] Though multiple studies point to the benefits of using simulation as a teaching method and recommend to replace traditional methods of learning with simulation[10], still more research is required to weight the advantages with the challengesin implementing simulation in curriculum.[32, 33]
A cross-sectional study done by Goswami G, Sharma SK, Sharma R, Rani R revealed that there is a scarcity of simulation and skills training facilities and under-utilization of labs in a North-Indian state.[34]
India is now aware of the value of simulation in nursing education. Institutions are increasingly creating centralized simulation training facilities, while certain departments already have such.[33] With National

Reference Simulation Centre established in India, institutes and stakeholders take keen interest in referring and establishing similar centers across India. There are certain other academic bodies that operates in India with an objective of training health careprofessionals about simulation-based education like:

Laerdal India- https://laerdal.com/services-and-programs/educational-services/
PediStars India- https://www.pedistarsindia.com/about-pedistar.php
Society of Simulation in Healthcare (SSH)- https://www.ssih.org/
Sim Center Asia (Accredited by SSH)- https://www.ssih.org/Home/SIM-Center-Directory/Area/ASIA
Vyedhi Advanced Simulation Academy (VASA)- http://vasa.ac.in/
Vidyanta Skills Institute- https://vidyanta.com/
SRM/STRATUS Centre for Medical Simulation- https://www.srmist.edu.in/medical-college- hospital-research-centre/departments/medical-simulation

CONCLUSION

In a paradigm of learning that is student-directed, simulation might be a key component. Simulation in nursing is a technique which require group of students to apply their knowledge,practice their skills and make use of their critical thinking and decision-making skills to manage a patient in a simulated environment. It can be categorized as low-fidelity, medium-fidelity andhigh- fidelity simulation. Though high-fidelity simulation requires simulation labs but it is nota "must" have feature to run any simulation. Simulation helps to improve the technical and non-technical skills of individual as well as team performance through experiential and reflective learning. It should be performed by an expert trainer who understands the pre- requisites and is present during all the phases of simulation i.e. Pre-brief, simulation scenario and Debrief. The expertise to conduct simulation can be gained through courses run by variouscenters and academic bodies across India.

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