Original Article

Simulation and Skill Training Facilities in Nursing Institutes at Uttarakhand: A Cross-Sectional Study

Abstract

Background: Simulation and skill development facilities are essential for the training and preparation of nursing students, which aids in their clinical readiness and professional development. The aim of the study was to assess simulation and skill training facilities, their utility in selected nursing institutes at Uttarakhand. **Materials and Methods:** This descriptive cross-sectional study was conducted in conveniently selected 16 nursing institutes at Uttarakhand (India). Data were collected from Nov. to Dec. 2019, through a face-to-face interview using a validated self-structured questionnaire. Descriptive and inferential statistics were used to analyze the data. **Results:** There were 16 institutes from four districts that participated in the study. Of these, five (31%) were government, and 11 (69%) were private. All nursing institutes (100%) had a nursing foundation lab, midwifery, and child health nursing lab, while only 44% of institutes had a medical surgical nursing skill lab. Among skill development facilities, the overall average number [mean (SD)] of mannequins was 3.90 (7.10); and high-fidelity simulators were 2.47 (7.1). In private institutes, the average period [mean (SD)] of laboratory usage was significantly higher than in government institutes [35.82 (6.57) vs 27.40 (5.22); $p = 0.025$]. The duration of lab usages was significantly associated with the age of the institute ($p = 0.04$). **Conclusions:** This study found inadequate simulation and skills training facilities and less utilization of those facilities. There is a great need to find out the key issues that lead to the unavailability and limited use of the required nursing skill development facilities.

Keywords: *Clinical skills, education, nursing, students, simulation training, skilled nursing facilities*

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Introduction

Simulation is widely used in all skill training programs for health care professionals.[1] Nurses are the largest professional healthcare workforces, who are maximizing their contribution to health coverage for all globally. The nursing profession today demands a high level of knowledge and skills.[2] Studies from the world reported that clinical learning is not at the expected level as a professional nurse.[3,4] In the past, traditional methods were used to develop clinical skills by using modeling techniques with demonstration and re-demonstration on simple dummies and direct exposure in clinical areas, but patient safety was always at risk.[5] However, traditional methods have limitations in students' learning due to limited availability of sufficient clinical learning material, time constraints, patient safety, and fear of iatrogenic complications.[6] Therefore, there

is a great necessity to have well-equipped clinical nursing simulation labs with good quality simulation facilities in nursing institutes where student nurses can get the opportunity to develop clinical nursing skills by simulation exercises without compromising the quality of care and safety of patients.[7-9]

Simulation is a lively pedagogy approach with various activities, including devices, trained teachers, real life-like virtual environments, standard patients, and dramatic play, not just handling mannequins.[10] This helps nursing students, to unite and value knowledge, develop technical and interactive skills, and develop disciplines and responses for thinking and reflection, thus contributing to the training of skilled professionals.[11] The nursing simulation laboratory is a controlled and safe environment for nursing students, where they can learn and refine their

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psychomotor skills.[5] Also, students can correlate and combine theory with practice for scientific understanding of each step of clinical procedure, which helps them to prepare to work in actual clinical settings.[12,13] Simulation-based training in the nursing skill laboratory positively impacts the students, teachers, which will result in quality training.[14] The integration of clinical experience with the nursing education curriculum prepares students to transition into the professional nurse's role.[15] Nursing education in India has geographically imbalanced, with significant problems including the most important are inadequate educational monitoring, poor physical and educational infrastructure for skill development, which results in deficit clinical skills competencies among student nurses during the training programme.[16,17]

Although there are studies[18] in India that have shown favorable results for the use of simulation-based training after the completion of the course to develop specific skills. A survey of 16 countries over six continents reported that many simulation centers had insufficient resources, including infrastructure, research, and technology, due to lack of sufficient financial support. This can hamper the training of medical, nursing, and allied health students in skill development training.[19] There is no literature available in India that can explain the available clinical skill development simulation facilities in nursing institutes for nursing students. Hence, this study was conducted to assess nursing simulation and skill development facilities and their utility in the selected nursing institution in Uttarakhand.

Materials and Methods

A cross-sectional descriptive study was conducted from November 01 to December 31, 2019, in Uttarakhand state, India. It is a state in the northern part of India with a total of 13 districts. As per Uttarakhand Nurses and Midwives Council record presently, Uttarakhand has 23 nursing institutions offering diploma, Undergraduate (UG), and postgraduate (PG) nursing programs.[20] The sample size was calculated using online Rao software,[21] with a total population of 23, a confidence level of 90%, the margin of error 10%, and keeping response distribution 50%. The obtained sample size was 16 nursing institutes from Uttarakhand state. A convenience sampling technique was used to select 16 institutes from four districts of Uttarakhand.

A self-structured basic profile datasheet and checklist were used to collect the data. The *basic profile data sheet* included questions such as type of institute, types of courses offered by the institute, different types of nursing skill laboratories available, clinical learning facilities, and student-teacher ratio.

The *checklist* consisted of items on nursing simulation and skills development facilities, which included numbers of beds, number of mannequins, types of simulators, basic nursing articles, duration of use of laboratories, etc., in the Foundation Nursing Skill laboratory (FNSL), Medical Surgical Nursing Skill Laboratory (MSNSL), Paediatric Skill Nursing Laboratory (PSNL), and Midwifery Skill Laboratory (MSL). The checklist was validated by seven nursing and other specialty experts. The checklist's face validity was calculated by measuring an impact score for each item. The experts rated the value of each item on a five-point scale ranging from 1 (not at all important) to 5 (extremely important). Each item's impact score of >1.5 was deemed acceptable. The content validity score of the checklist was calculated via Scale-level Content Validity Index based on the average method (S-CVI/Ave = 93%), Content Validity Ratio (CVR = 0.75), and its reliability was computed using an interrater test (r = 0.93). The data were collected by the researcher via a face-to-face interview with the principal of nursing institutes using the questionnaire, and the details were reviewed for appropriateness by examining laboratories and records of the respective laboratory in-charges.

The data were entered into a Microsoft Excel sheet and analyzed using International Business Machines Corporation (IBM) Statistical Package for Social Sciences (SPSS) software, version 23.0, Armonk, New York, USA. Data analysis was done using descriptive and inferential statistics. Descriptive statistics were used to summarize the basic profile of nursing institutes and nursing lab facilities presented with mean, standard deviation, median, frequency, and percentage. Inferential statistics were used to compare the nursing skill facilities in government and private nursing institutes and to observe the association between simulation and skill lab facilities and selected profiles of the institution. Independent *t*-test and Mann Whitney U and Kruskal Wallis test for non-parametric variables were used. A *p* value of less than 0.05 was considered statistically significant.

Ethical consideration

The project was approved by the institutional ethical committee (No. 31/IEC/M.Sc/2019). Written permission was taken from the head of the respective nursing institutes before conducting the study. Participation in the study was voluntary. Before data collection, information about the purpose and objectives of the study was provided and written informed consent was obtained from each participant, i.e. principal and lab in-charge of the institute.

Results

A total 16 (100%) nursing institutes from four districts: Haridwar 5 (31.25%(, Dehradun 7 (43.75%), Nainital 2 (12.50%), and Tehri 2 (12.50%), of Uttarakhand state, India, participated in this study. Among them, 5 (31%) were government, and 11 (69%) were private; and nearly half 9 (56%) of the institute's inception duration ranged from

6-10 years, while 5 (31%) were 1-5 years and only 2 (13%) were more than 10 years old. All nursing institutes had NFSL, MSL, and PSNL, while only 7 (44%) institutes had MSNSL. The majority 13 (81%) of the institutes had parent hospitals, and remaining were affiliated 3 (19%) and both 8 (50%) for the clinical experience facility. In the clinical experience facilities, the median number of hospital beds was 202.5 (range 100–960) and the student-patient ratio was 1:5 during clinical practice, and the student-teacher ratio was 15:1 in selected nursing institutes.

The student to mannequin ratio was highest (77:1) in PNSL and lowest (25:1) in MSL. The ratio between number of students with number of beds in labs was highest in MSNSL (75:1), and lowest in NFSL (37:1) [Table 1].

To estimate simulation facilities in the labs, all the mannequins, high fidelity, medium-fidelity, and low fidelity simulators were aggregated. The highest [Mean (SD)] overall simulation facilities were in the MSL [11.50 (20.20)], and the lowest was in the PNSL [3.69 (3.42)]. Among skill development facilities, the maximum [Mean (SD)] was numbers of mannequins [3.9 (7.10)], and lowest was numbers of low fidelity simulators [0.96 (2.89)] [Table 2].

There was no significant difference observed between the number of beds in government [Mean (SD) 16.8 (7.01)] and private [Mean (SD) 17.27 (6.27)] nursing

institutes ($p = 0.89$); whereas, the duration of laboratory usage in private nursing institutes was significantly higher than government nursing institutes [Mean (SD) 35.82 (6.57) vs 27.40 (5.22); $p = 0.025$]. On comparing simulation and skill development laboratory facilities with government and private nursing institutes, no statistically significant difference was found ($p > 0.05$) [Figure 1].

Results in Table 3 show that except duration of labs use with the duration of institute inception ($p = 0.04$), there was no significant association found between nursing
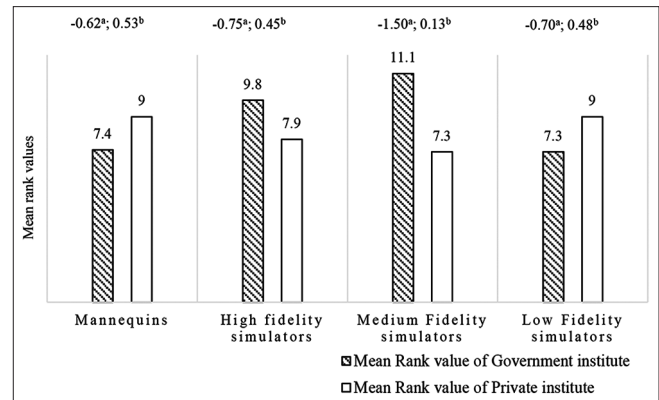

Figure 1: Comparison of simulation facilities in government and private nursing institutes. [a]Z-value; [b]*p*-value

Table 1: Student to mannequin and bed ratio in nursing skill development laboratories (*n*=16)

Parameters	NFSL* (*n*=16)	MSNSL** (*n*=7)	PNSL*** (*n*=16)	MSL**** (*n*=16)	Total (*n*=55)
Student-to-mannequin ratio	40:1	75:1	77:1	25:1	54:1
Student-to-bed ratio	37:1	75:1	63:1	73:1	62:1

*NFSL: Nursing Foundations Skill Lab; **MSNSL: Medical-Surgical Nursing Skill Lab; ***PNSL: Paediatric Nursing Skill Lab; ****MSL; Midwifery Skill Lab

Table 2: Simulation and skill development facilities and their utility in subject wise nursing laboratories

Skill development facilities	NFSL* (*n*=16) Mean (SD)[†]/*n* (%)[^]	MSNSL** (*n*=7) Mean (SD)[†]/*n* (%)[^]	PNSL*** (*n*=16) Mean (SD)[†]/*n* (%)[^]	MSL **** (*n*=16) Mean (SD)[†]/*n* (%)[^]	Total (*n*=55) Mean (SD)[†]/*n* (%)[^]
No. of Mannequins[a]	3.70 (2.90)[†] [0-10][‡]	1.80 (1.50)[†] [1-5][‡]	2.10 (2.0)[†] [0-6][‡]	6.80 (12.40)[†] [0-50][‡]	3.9 (7.10)[†] [0-50][‡]
High fidelity simulators[b]	0.70 (0.70)[†] [0-2][‡]	1 (0.80)[†] [0-2][‡]	0.50 (1.20)[†] [0-5][‡]	1 (2.40)[†] [0-10][‡]	2.47 (7.16)[†] [0-50][‡]
Medium fidelity simulators[c]	1.80 (1.90)[†] [0-5][‡]	0.40 (0.50)[†] [0-1][‡]	0.30 (0.60)[†] [0-2] [‡]	1.60 (4.90)[†] [0-20][‡]	0.98 (1.81)[†] [0-10][‡]
Low fidelity simulators[d]	0.70 (1.50)[†] [0-6][‡]	0.40 (0.50) [†] [0-1][‡]	0.60 (1.50)[†] [0-5][‡]	1.90 (3.80)[†] [0-15][‡]	0.96 (2.89)[†] [0-20][‡]
Overall simulation facilities [(a+b + c+d)]	7.06 (4.46)[†] [1-20][‡]	3.71 (2.36)[†] [1-8][‡]	3.69±3.42)[†] [0-11][‡]	11.50 (20.2)[†] [0-45][‡]	6.94 (11.58)[†] [0-80][‡]
Duration of lab use (weeks/year)	39 (11.5)[†] [8-50][‡]	37.10 (10.90)[†] [25-50][‡]	25.30 (9.70)[†] [6-40][‡]	30.80 (10.80)[†] [8-48][‡]	32.40 (11.70)[†] [6-50][‡]
Adequate basic care articles	14 (87)[^]	07 (100)[^]	14 (87.50)[^]	13 (81)[^]	48 (87.20)[^]
Adequate consumable supplies	14 (87)[^]	06 (85.70)[^]	14 (87.50)[^]	14 (88)[^]	48 (87.20)[^]

*NFSL: Nursing Foundations Skill Lab; **MSNSL: Medical-Surgical Nursing Skill Lab; ***PNSL: Paediatric Nursing Skill Lab; ****MSL; Midwifery Skill Lab; †Mean (SD); ^*n* (%); ‡Range [Minimum-Maximum]

Table 3: Association of simulation and skill development laboratory facilities with nursing courses and duration of institute inception in government and private nursing institutes (*n*=16)

Simulation & skill development facilities	Nursing Courses					Duration of Institute Inception				
	Courses	*n*	#Mean Rank	χ² value	*p*	Duration	*n*	#Mean Rank	χ² value	*p*
Number of mannequins	[1]Diploma	3	6.83	2.93	0.230	1-5 yrs.	5	9.60	1.71	0.424
	[2]B.Sc.	9	7.50			5-10 yrs.	9	7.22		
	[3]M.Sc.	4	12.00			>10 yrs.	2	11.50		
Number of high-fidelity simulators	[1]Diploma	3	6.17	1.02	0.598	1-5 yrs.	5	9.20	0.65	0.722
	[2]B.Sc.	9	8.78			5-10 yrs.	9	7.72		
	[3]M.Sc.	4	9.63			>10 yrs.	2	10.25		
Number of medium-fidelity simulators	[1]Diploma	3	8.17	3.84	0.146	1-5 yrs.	5	7.80	2.50	0.286
	[2]B.Sc.	9	6.89			5-10 yrs.	9	9.83		
	[3]M.Sc.	4	12.38			>10 yrs.	2	4.25		
Number of low-fidelity simulators	[1]Diploma	3	5.00	5.56	0.062	1-5 yrs.	5	9.30	1.15	0.561
	[2]B.Sc.	9	7.72			5-10 yrs.	9	7.50		
	[3]M.Sc.	4	12.88			>10 yrs.	2	11.00		
Number of beds	[1]Diploma	3	7.50	0.16	0.919	1-5 yrs.	5	10.10	0.89	0.641
	[2]B.Sc.	9	8.67			5-10 yrs.	9	7.94		
	[3]M.Sc.	4	8.88			>10 yrs.	2	7.00		
Duration of lab use	[1]Diploma	3	7.00	0.38	0.826	1-5 yrs.	5	11.80	6.24	0.044*
	[2]B.Sc.	9	8.94			5-10 yrs.	9	5.89		
	[3]M.Sc.	4	8.63			>10 yrs.	2	12.00		

#Kruakal Wallis test, *P consider significant at≤0.05, degree of freedom (df)=2, [1]Diploma in Nursing [2]B.Sc.- Bachelor of Science in Nursing, [3]M.Sc.- Master of Science in Nursing

courses, duration of institution inception with number of the mannequin, number of high, medium, and low fidelity simulators, number of beds in labs, and duration of lab use ($p > 0.05$).

Discussion

This study included nursing institutions from Uttarakhand, a state in northern India, and reported 31% of these institutes were government and 69% were private. Also, many of these institutes were having graduation and diploma courses, while very few were having postgraduation courses.

According to the 2016 FICCI report, nearly 90% of institutions in the country are private, and the standard of education varies in private and government institutions.[22] In terms of the usage of nursing skill laboratory services, our study found substantially greater use of skill development laboratories in private institutes than in government agencies.

In the present study, it has been shown that although almost all nursing institutes had the availability of skill laboratories as per Indian Nursing Council (INC) guidelines, all these labs were having seriously poor student to teacher and students to mannequin ratio and were very anaemic as per nursing skill development facilities were concerned. The skill learning activities should be conducted in a standard size of a group of students. It has been reported that a small group simulation lab and teaching activities are effective in teaching clinical skills.[23,24] In our study,

student to patient ratio was 1:5, and student to teacher ratio was 15:1 in selected nursing institutes. However, 1:3 should be the student to patient ratio during clinical posting, and 10:1 should be the student to teacher ratio for undergraduate nursing students, according to INC.[25,26] In addition, Jean Yan, Health Professions Networks, Nursing and Midwifery Unit at the World Health Organization, has stated that the teacher-student ratio in developing countries was estimated to be as high as 1:45, compared to a 1:12 ratio in developed countries.[27]

The overall student-to-mannequin ratio in this study was 54:1, which was extremely poor for teaching-learning activities. This poor ratio could be due to the inadequate teaching faculties and mannequins in selected nursing institutes Ideally, 1:3–4 should be the instructor-to-learner ratio but not feasible in the current medical curriculum, where each session consists of a large batch of students.[28] In order to facilitate effective clinical teaching and training, less student to teacher or mannequin ratio is favored where students would have more time to practice and learn basic clinical skills.[29] In the present study number of beds in the hospital was ranged from 100 to 960. This result is in line with INC (2013-2014), which stated that it is mandatory to have 100 bedded parent hospital to open school and college of Nursing.[25]

We found that most nursing laboratories had simulators of high-fidelity, and some of the laboratories were poorly equipped with medium to low-fidelity level simulators, which provided little scope to practice nursing skills, whereas some of the nursing institutes did not even have

simulators of any kind. There are some challenges that do not allow the simulation programs in some of these nursing institutions to be implemented. The need for more financial support and the need for a dedicated simulation technician has been recognized as the two major barriers to the growth of simulation programs around the world.[19]

A study found that clinical learning was significantly effective in the simulation group than the control group.[30] Congruently, studies reported that performing procedures in skill laboratories resulted in improved psychomotor skills as well as knowledge for a longer period.[31,32] A study also expressed that clinical laboratories work as a link between theory and practice and helps students to prepare for clinical practice according to their level.[33] It is suggested that at least 1-2 simulation centers should be set up to train nurses Students in nursing, both UG and PG, should be encouraged to use the available simulation facilities in the region in collaboration with regional medical colleges, which in turn integrate practice and educational cases.[34]

Some researchers reported that nursing skill laboratories were used in most nursing institutes for undergraduate (81.25%) and postgraduate students (62.50%) with no inter-professional activities while learning on simulators, which is an essential part of health care team training. In the patient care management, team training should be given higher priority during the skill development process.[35,36] There could be several reasons for no inter-professional training, including the absence of institutional culture for inter-professional training, logistic, schedule related to training together with professional courses, but these limitations can be resolved with proper strategic planning, which could be benefited to the patient for safety outcomes.[37]

In our study, all institutes have attached hospitals (parent, affiliated, or both). It has been suggested that for nursing graduates to conduct a clinical procedure, minimum necessary skills along with required competencies, should be established in these institutes. While in nursing colleges without attached hospitals, it is advisable to implement pre-clinical qualification, where the college needs to take students to hospital in the first year to be introduced to basic clinical practices and emphasis on simulation technologies in nursing education and training.[34]

One of the key factors influencing the quality of clinical education is the preparation and readiness of the students to enter the clinical environment. Given that an ideal clinical learning environment has a positive effect on professional development and a poor learning environment will adversely affect their professional development process.[38]

The strength of this study was the data compilation from the majority of nursing institutes of Uttarakhand. Besides, this is the first study that provides an overview of the available simulation and skill training facilities in Uttarakhand, India. However, few delimitations of this study also have to be mentioned, such as a self-structured questionnaire was used for data collection. The study was conducted in a single state with a small sample size due to time constraints. Also, we need to rely on the information provided by the custodian of the institute or laboratory.

Conclusion

The findings of the study indicate that nursing institutes have poor simulation and skills facilities. Central government-funded nursing institute had state-of-art nursing simulation facilities, but most of the state government and private institute labs were quite anemic. Well-equipped simulation and skill development facilities in nursing institutes are essential for patient safety and programed uniform anxiety-free clinical skill learning of nursing students. There is a great need to identify the key issues that lead to the unavailability and limited use of the required nursing skills.

Conflicts of interest

Nothing to declare.

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