

EFFECT OF SKILL-STATION TRAINING ON URINARY CATHETERIZATION SKILLS AMONG NURSING STUDENTS: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT

Introduction: Urinary catheterization is an important clinical nursing procedure that requires adequate theoretical knowledge, psychomotor skills, and strict adherence to aseptic principles. Nursing students may have limited opportunities for repeated supervised practice in clinical settings, which can affect their confidence and competence. Skill-station teaching provides a structured simulation-based learning environment in which students can observe demonstrations, perform the procedure, receive immediate feedback, and repeat the skill under supervision. This study evaluated the effectiveness of a skill-station teaching programme on knowledge and practice regarding urinary catheterization among nursing students. **Materials and Methods:** A quantitative evaluative approach using a quasi-experimental one-group pre-test–post-test design was adopted. One hundred second-year B.Sc. Nursing students were selected by simple random sampling from selected nursing colleges in the Sangli, Miraj, and Kupwad Corporation area. Data were collected using a demographic proforma, a structured knowledge questionnaire, and an observational practice checklist. A structured 45-minute skill-station teaching session on urinary catheterization was conducted following the pre-test. The post-test assessment was conducted on the eighth day. Data were analyzed using frequency, percentage, mean, standard deviation, and paired *t*-test. **Results:** The mean knowledge score increased from 8.94 in the pre-test to 11.86 in the post-test. The observed improvement was statistically significant (paired *t* = 28.31, *df* = 99, *p* < 0.00001). Similarly, the mean practice score increased from 16.27 to 19.36, showing a statistically significant improvement following the intervention (paired *t* = 21.52, *df* = 99, *p* < 0.00001). **Conclusion:** The findings indicate a significant improvement in both knowledge and practice regarding urinary catheterization following the skill-station teaching programme. Structured, supervised, and practice-oriented skill-station teaching may be a useful approach for strengthening clinical competencies among nursing students. Incorporating such simulation-based learning activities into nursing education may help bridge the gap between theoretical learning and clinical practice.

KEYWORDS: Skill station; urinary catheterization; knowledge; practice; nursing students; clinical skills training; nursing education.

INTRODUCTION

Nursing education aims to prepare students with theoretical knowledge, psychomotor skills, clinical reasoning abilities, and professional attitudes required to provide safe and effective patient care. The transition from classroom learning to clinical practice is an important component of undergraduate nursing education. Nursing students are expected not only to understand the theoretical principles underlying clinical procedures but also to perform these procedures accurately, safely, and confidently in clinical settings. Therefore, appropriate teaching and learning strategies are essential for developing clinical competence and reducing the gap between theoretical knowledge and practical performance.

Urinary catheterization is an important invasive nursing procedure performed for urinary drainage, monitoring of urine output, management of urinary retention, and selected diagnostic and therapeutic purposes. Although it is a commonly performed clinical procedure, urinary catheterization requires careful preparation, appropriate selection of equipment, maintenance of aseptic technique, correct procedural performance, and appropriate post-procedure care. Inadequate technique may result in patient discomfort, urethral trauma, bleeding, urinary tract infection, and other complications. Therefore, nursing students should develop adequate knowledge and procedural competence before performing urinary catheterization in clinical practice.

Traditional nursing education commonly relies on classroom teaching, demonstration, and supervised clinical practice. These methods provide an essential foundation for learning, but opportunities for repeated practice of invasive procedures may be limited by patient availability, clinical workload, institutional policies, and the

availability of suitable clinical cases. A single demonstration may also not provide sufficient opportunity for students to practise each step, identify their errors, receive immediate correction, and develop confidence in performing the procedure. These limitations highlight the importance of providing structured learning opportunities in which students can practise clinical skills in a controlled environment before performing them on patients.

Simulation-based learning has become an important component of contemporary nursing education because it provides students with opportunities to learn and practise clinical procedures in a safe and controlled environment. Simulation enables learners to observe a procedure, practise the required steps, receive immediate feedback, correct errors, and repeat the procedure until an appropriate level of performance is achieved. Skill-station teaching is one such structured approach in which learning is focused on a specific clinical skill. It can combine explanation, demonstration, hands-on practice, return demonstration, supervision, and immediate feedback within a defined learning session. Such an approach allows students to actively participate in the learning process rather than relying only on observation.

Previous studies have reported positive effects of simulation-based and structured skills training on various learning outcomes among nursing students, including knowledge, psychomotor performance, confidence, satisfaction, clinical preparedness, and retention of clinical skills. Research involving simulation, scenario-based teaching, virtual reality, high-fidelity simulation, and structured clinical skills training has demonstrated the potential of experiential learning approaches to strengthen nursing students' clinical competence. Studies reported by Levett-Jones et al., Cant and Cooper, Shin et al., Waters et al., and subsequent researchers have contributed to the growing evidence regarding simulation-based learning in nursing education. Research specifically related to urinary-catheterization simulation has also explored improvements in students' knowledge, procedural performance, confidence, and preparedness for clinical practice. However, there remains a need to evaluate focused and structured skill-station teaching approaches for urinary catheterization among undergraduate nursing students, particularly within the Indian nursing education context.

Urinary catheterization requires the integration of theoretical knowledge and a sequence of psychomotor actions that must be performed correctly while maintaining infection-prevention and patient-safety principles. Providing students with a structured opportunity to observe, practise, and receive feedback may help them translate theoretical knowledge into appropriate clinical performance. Therefore, the present study was conducted to assess the effectiveness of a structured skill-station teaching programme on knowledge and practice regarding urinary catheterization among second-year B.Sc. Nursing students. The study specifically assessed students' knowledge and practice before and after the skill-station programme and compared their pre-test and post-test scores.

MATERIALS AND METHODS

A quantitative evaluative research approach was adopted for the study, using a quasi-experimental one-group pre-test-post-test design. The design was represented as $O_1 \rightarrow X \rightarrow O_2$, where O_1 represented the pre-test assessment, X represented the structured skill-station teaching programme, and O_2 represented the post-test assessment. The study was conducted among second-year B.Sc. Nursing students from selected nursing colleges located in the Sangli, Miraj, and Kupwad Corporation area of Maharashtra, India. The study population comprised undergraduate nursing students, and the sample consisted of 100 second-year B.Sc. Nursing students who fulfilled the predefined eligibility criteria.

Students were eligible to participate if they were enrolled as second-year B.Sc. Nursing students in the selected nursing colleges, were available during the period of data collection, and were willing to participate in the study and provide written informed consent. Students who were unwilling to provide written informed consent were excluded from the study. Simple random sampling was used for the selection of the participants, as specified in the study methodology. The independent variable was the structured skill-station teaching programme on urinary catheterization, while the dependent variables were knowledge and practice regarding urinary catheterization. Relevant demographic characteristics of the participants were also collected to describe the study sample.

Data were collected using a demographic proforma, a structured knowledge questionnaire, and an observational practice checklist. The demographic proforma was used to obtain relevant background information about the participants. The structured knowledge questionnaire consisted of 15 items designed to assess students' knowledge regarding urinary catheterization. The questionnaire covered important areas related to the procedure, including basic concepts, indications, preparation, infection-prevention principles, procedural steps, precautions, and post-procedure care. The total possible knowledge score was 15. Based on the predetermined scoring system, scores of 12–15 were interpreted as excellent, 8–11 as good, 4–7 as average, and 1–3 as poor.

An observational practice checklist consisting of 31 items was used to assess students' performance of urinary catheterization. The checklist covered important procedural steps, including preparation, maintenance of aseptic technique, appropriate procedural performance, patient safety, and completion of the procedure. The maximum possible practice score was 31. According to the predetermined scoring system, scores of 25–31 were interpreted as excellent, 16–25 as good, 8–15 as average, and 1–7 as poor. The practice assessment was conducted through direct observation using the standardized checklist. The scoring categories should be verified against the original validated instrument before final submission because the ranges 16–25 and 25–31 overlap at a score of 25. The content validity of the study instruments was established through expert review. The instruments were reviewed by 22 experts from the fields of nursing, medical-surgical nursing, and research. The experts assessed the

relevance, clarity, appropriateness, and adequacy of the items in relation to the objectives of the study and the assessment of urinary-catheterization knowledge and practice. Suggestions provided by the experts were considered, and necessary modifications were made to improve the clarity and appropriateness of the instruments before their use in the main study. The reliability of the study instruments was assessed using the Karl Pearson correlation coefficient, as reported in the source study. The reported reliability coefficient was $r = 0.80$, indicating acceptable reliability of the instrument for the intended assessment. If separate reliability coefficients are available for the knowledge questionnaire and practice checklist, these should preferably be reported separately in the final manuscript to provide greater methodological clarity.

A pilot study was conducted among 10 students, representing approximately 10% of the intended sample size, to assess the feasibility of the study procedures. The pilot study was undertaken to evaluate the clarity of the instruments, the time required for data collection, the feasibility of conducting the skill-station programme, and the practicality of the assessment procedures. The pilot study also helped the researcher identify any difficulties associated with the data collection process. The pilot participants were not included in the final study sample, provided this was the procedure followed in the original study protocol. Following completion of the pre-test assessment, a structured 45-minute skill-station teaching programme on urinary catheterization was provided to the participants. The intervention was designed to provide a systematic learning experience that progressed from explanation and demonstration to supervised practice. The session included an introduction to urinary catheterization, indications and precautions, preparation of the patient and required equipment, principles of aseptic technique and infection prevention, demonstration of the procedure, explanation of the sequence of procedural steps, supervised hands-on practice, correction of procedural errors, and reinforcement of important patient-safety and post-procedure measures. The skill station provided students with an opportunity to practise the procedure in a controlled learning environment under supervision before their performance was reassessed.

Data collection was conducted after obtaining the necessary institutional and administrative permissions from the concerned authorities. Eligible students were informed about the purpose of the study and the procedures involved. Written informed consent was obtained from all participants before their enrolment in the study. The baseline assessment was conducted using the demographic proforma, structured knowledge questionnaire, and observational practice checklist and constituted the pre-test. Following the pre-test, the students participated in the structured 45-minute skill-station teaching programme. The post-test assessment was conducted on the eighth day following the intervention. Knowledge was reassessed using the structured knowledge questionnaire, while practice was assessed through direct observation using the standardized practice checklist. The same assessment framework was used for both pre-test and post-test measurements to facilitate comparison of students' performance before and after the intervention.

Ethical principles were maintained throughout the study. Institutional ethical and administrative permissions were obtained before commencement of data collection. Participants were informed about the purpose and procedures of the study, their voluntary participation, and their right to withdraw from the study without penalty. Written informed consent was obtained from all participants. Confidentiality and privacy were maintained during data collection, data management, and reporting. Individual identities were not disclosed in the research report, and the information obtained from participants was used only for research purposes. The teaching and assessment procedures were conducted in a manner intended to minimize physical, psychological, and emotional discomfort to the participants.

After data collection, the completed data were checked for completeness, coded, organized, and entered for statistical analysis. Descriptive and inferential statistical methods were used according to the nature of the variables. Frequency and percentage were used to summarize demographic and categorical data. Mean and standard deviation were calculated for knowledge and practice scores. The paired *t*-test was used to compare the pre-test and post-test knowledge scores and the pre-test and post-test practice scores of the participants. The level of statistical significance was set at $p < 0.05$. The statistical analysis was undertaken to determine whether the changes observed in knowledge and practice following the skill-station teaching programme were statistically significant.

RESULTS

A total of 100 second-year B.Sc. Nursing students participated in the study. The findings are presented according to the objectives of the study.

Section -I

Assessment of demographic variable of nursing students

Table 1. Distribution of participants according to demographic and academic characteristics

n = 100				
Sr. No.	Demographic variable	Category	Frequency (f)	Percentage (%)
1	Age	18–20 years	32	32.0%
		21–23 years	48	48.0%
		24 years and above	20	20.0%
2	Gender	Male	44	44%
		Female	56	56%

Table shows that among 100 participants, 48% were in the age group of 21–23 years, followed by 32% in the age group of 18–20 years and 20% who were 24 years and above. Regarding gender, 56% of the participants were female and 44% were male. Thus, the majority of participants were aged 21–23 years and were female.

Section -II

Assessment of pretest knowledge regarding urinary catheterization

Table 2. Pre-test Level of Knowledge Regarding Urinary Catheterization
n = 100

Score / Level	Frequency	Percentage
12–15 (Excellent)	2	2%
8–11 (Good)	75	75%
4–7 (Average)	23	23%
1–3 (Poor)	0	0%
Total	100	100%

In the pre-test, 75% of students had good knowledge, 23% had average knowledge, and 2% had excellent knowledge. None of the students had poor knowledge regarding urinary catheterization.

Section -III

Assessment of pretest practice regarding urinary catheterization

Table 3. Pre-test Level of Practice Regarding Urinary Catheterization
n = 100

Score / Level	Frequency	Percentage
25–31 (Excellent)	0	0%
16–24 (Good)	53	53%
8–15 (Average)	47	47%
1–7 (Poor)	0	0%
Total	100	100%

In the pre-test, 53% of students demonstrated good practice, whereas 47% demonstrated average practice. None of the students demonstrated excellent or poor practice. Thus, although more than half of the students demonstrated good procedural performance, nearly half had only average practice scores before the skill-station programme.

Section-IV

Assessment of Post-test Level of Knowledge and practice After Skill Station Programme

Table 4. Post-test Level of Knowledge After Skill Station Programme
n = 100

Score / Level	Frequency	Percentage
12–15 (Excellent)	62	62%
8–11 (Good)	38	38%
4–7 (Average)	0	0%
1–3 (Poor)	0	0%
Total	100	100%

Interpretation: After the intervention, 62% of students had excellent knowledge and 38% had good knowledge; no student remained in the average or poor categories

Table 5. Post-test Level of Practice After Skill Station Programme
n = 100

Score / Level	Frequency	Percentage
25–31 (Excellent)	1	1%
16–24 (Good)	90	90%
8–15 (Average)	9	9%
1–7 (Poor)	0	0%
Total	100	100%

Following the skill-station programme, 90% of students demonstrated good practice, 1% demonstrated excellent practice, and 9% demonstrated average practice. No student demonstrated poor practice. Compared with the pre-test, the proportion of students with good practice increased from 53% to 90%, while the proportion with average practice decreased from 47% to 9%.

Section-V

Comparison of pretest and posttest knowledge score

Table 6. Statistical Comparison of Pre-test and Post-test Knowledge Scores
n = 100

Assessment	Mean	SD	df	t-value	p-value
Pre-test	8.94	2.92	99	28.305	<0.00001
Post-test	11.86				

The mean knowledge score increased from 8.94 in the pre-test to 11.86 in the post-test, representing a mean increase of 2.92 points. The paired *t*-test showed a statistically significant difference between the pre-test and post-test knowledge scores ($t = 28.305$, $df = 99$, $p < 0.00001$). This indicates significant improvement in knowledge following the skill-station programme.

Section-VI

Comparison of pretest and posttest knowledge score

Table 7. Statistical Comparison of Pre-test and Post-test Practice Scores
n = 100

Assessment	Mean	SD	df	t-value	p-value
Pre-test	16.27	3.09	99	21.5159	<0.00001
Post-test	19.36				

The mean practice score increased from 16.27 in the pre-test to 19.36 in the post-test, representing a mean increase of 3.09 points. The paired *t*-test demonstrated a statistically significant difference between the pre-test and post-test practice scores ($t = 21.516$, $df = 99$, $p < 0.00001$). This indicates significant improvement in observed practice performance following the skill-station programme.

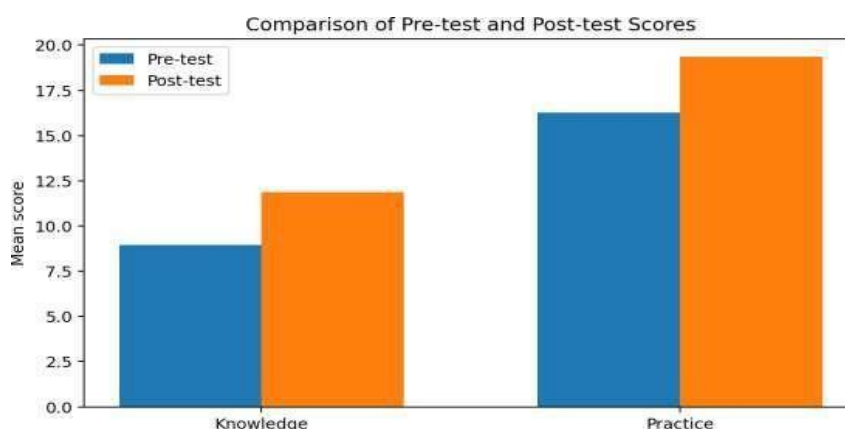


Figure 1. Comparison of Pre-test and Post-test Mean Knowledge and Practice Scores

DISCUSSION

The present study evaluated changes in knowledge and practice regarding urinary catheterization among 100 second-year B.Sc. Nursing students following a structured skill-station teaching programme. A quasi-experimental one-group pre-test-post-test design was used. The findings demonstrated statistically significant improvement in both knowledge and observed practice following the skill-station programme.

Before the intervention, most students had good knowledge regarding urinary catheterization. Seventy-five percent of students were classified as having good knowledge, while 23% had average knowledge and only 2% had excellent knowledge. Although these findings suggest that most students had a basic theoretical understanding of the procedure, a proportion of students still demonstrated average knowledge. This indicates the importance of providing structured learning opportunities to strengthen understanding of the procedure and its essential safety principles.

The baseline practice findings showed that 53% of students had good practice and 47% had average practice. No student was classified as having excellent practice at baseline. The difference between the knowledge and practice findings is relevant because theoretical understanding does not always translate directly into correct procedural performance. Urinary catheterization involves a sequence of psychomotor steps, and students require opportunities for supervised practice and correction of errors to develop procedural competence. Following the skill-station programme, a marked improvement was observed in the distribution of knowledge levels. The proportion of students with excellent knowledge increased from 2% in the pre-test to 62% in the post-test, while 38% were classified as having good knowledge. No students remained in the average or poor categories. The mean knowledge score increased from 8.94 to 11.86, with a mean difference of 2.92 points. The paired *t*-test demonstrated a statistically significant pre-test to post-test difference ($t = 28.305$, $df = 99$, $p < 0.00001$). Improvement was also observed in procedural practice. Before the intervention, 47% of students had average practice scores and 53% had good practice scores. Following the skill-station programme, 90% of students demonstrated good practice, 1% demonstrated excellent practice, and only 9% remained in the average category. The mean practice score increased from 16.27 to 19.36, representing a mean improvement of 3.09 points. The paired *t*-test showed a statistically significant difference between pre-test and post-test practice scores ($t = 21.516$, $df = 99$, $p < 0.00001$).

The improvement in practice is important in the context of urinary catheterization because the procedure requires students to integrate theoretical knowledge with psychomotor performance. Correct preparation, appropriate handling of equipment, maintenance of aseptic technique, correct procedural sequencing, and attention to patient safety are essential components of competent catheterization. A skill-station environment allows students to observe the procedure, practise the required steps, receive supervision, and correct errors during the learning process. The improvement observed in the present study is therefore consistent with the educational rationale for structured clinical skills training. The findings are broadly consistent with the literature cited in the present manuscript. Previous research involving simulation-based learning and structured clinical skills training has reported improvements in learning outcomes such as knowledge, psychomotor performance, confidence, satisfaction, and clinical preparedness among nursing students. Research specifically addressing urinary-catheterization training has also examined different simulation approaches, including scenario-based simulation, virtual reality, high-fidelity simulation, and other structured skills-training methods. These studies provide a relevant educational context for the improvement observed in the present study. The present findings also have implications for undergraduate nursing education. Skill stations can provide a focused opportunity for students to practise an invasive clinical procedure in a controlled learning environment before performing the procedure on patients. They can complement classroom teaching and routine clinical instruction by providing repeated, supervised practice and immediate feedback. This approach may be particularly useful when clinical opportunities for practising a specific procedure are limited.

However, the findings should be interpreted with consideration of the study design. The study used a one-group pre-test-post-test design without a control group. Therefore, the observed improvement cannot be attributed exclusively to the skill-station programme because other factors, such as independent study, repeated exposure to the assessment tools, or other learning experiences during the eight-day interval, may have contributed to the change. The findings therefore demonstrate a significant pre-test to post-test improvement but should not be interpreted as definitive evidence of causal effectiveness. The study was also conducted among second-year B.Sc. Nursing students from selected nursing colleges in the Sangli, Miraj, and Kupwad Corporation area, which may limit the generalizability of the findings to students from other institutions or educational settings.

Future studies could use randomized controlled designs with comparison groups, larger samples, and participants from different nursing institutions. Longer follow-up assessments would also be useful to determine whether improvements in urinary-catheterization knowledge and practice are retained over time. Comparative studies evaluating different simulation approaches could further identify effective strategies for developing and maintaining clinical procedural competence.

CONCLUSION

The present study demonstrated significant improvement in knowledge and practice regarding urinary catheterization among second-year B.Sc. Nursing students following a structured skill-station teaching

programme. The mean knowledge score increased from 8.94 before the intervention to 11.86 after the intervention, while the mean practice score increased from 16.27 to 19.36. The differences between pre-test and post-test scores were statistically significant for both knowledge and practice, with $p < 0.00001$.

The categorical findings further demonstrated a shift towards higher performance levels following the skill-station programme. The proportion of students with excellent knowledge increased from 2% to 62%, while the proportion with good practice increased from 53% to 90%. These findings suggest that a structured skill-station approach may provide a useful learning opportunity for strengthening both theoretical understanding and procedural performance in urinary catheterization.

The study supports the inclusion of structured, supervised skills training as a complementary strategy within undergraduate nursing education. However, because the study used a one-group pre-test-post-test design without a control group, the findings should be interpreted as evidence of significant improvement following the intervention rather than definitive proof of causal effectiveness. Further controlled studies with larger samples and longer follow-up are recommended to evaluate the comparative effectiveness and retention of urinary-catheterization skills.

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