

Effectiveness of a Structured Skill Competency Programme on Medication Management Knowledge and Clinical Skills Among Nursing Interns: A Quasi-Experimental Study with Effect Size Analysis

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ABSTRACT

Medication errors are still a big problem in clinical practice, and nursing interns are typically blamed for them since they don't have enough training. This research assessed the efficacy of a structured Skill Competency Programme (SCP) in enhancing medication management knowledge and practical abilities. A quasi-experimental pre-test–post-test control group design was implemented with 400 nursing interns. Before and after the intervention, we used validated instruments to measure knowledge and skill scores. The experimental group exhibited markedly significant enhancements in both knowledge and competence ratings relative to the control group ($p < 0.001$). The improvement was very big, with effect sizes of $d = 3.24$ for knowledge and $d = 4.37$ for skills, which shows that the intervention had very big benefits. The examination of percentage improvement indicated an augmentation of roughly 67–68% from baseline levels. There were significant links between baseline competency and some socio-demographic characteristics. However, these links were not very strong, and the differences that were seen after the intervention were not very big. The results show that structured competency-based training makes people much more prepared to handle their medications. The study advocates for the incorporation of standardized skill training into internship curriculum and suggests longitudinal, multicentre research to evaluate sustainability and its effects on patient safety outcomes.

Keywords: Skill Competency Programme, Nursing Interns, Medication Management, NABH Nursing Excellence, Knowledge, Skill, Nursing Education, Patient Safety.

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1. INTRODUCTION

One of the most crucial things nurses perform is to give out drugs. This has a direct impact on the safety of patients, the effectiveness of therapy, and the overall quality of healthcare. The World Health Organization (2022) says that more than one in twenty persons in the world become hurt when medication makers make mistakes. More than half of these mistakes are made by nurses. People often make mistakes when delivering medicine because they don't know enough about drugs, they don't keep track of their own skills, or they don't check their own skills. Nurses are the final individuals who can give out medications. They need to be very

smart, have good hand-eye coordination, and be responsible as professionals.

A lot of nursing interns study a lot of theory, but they often have trouble putting what they learn into practice safely. Previous research has demonstrated that there is always a gap between knowing the theory and being able to provide medications in real life, which could hurt patients and degrade the quality of care (Kumar & Reddy, 2019; Williams et al., 2022). This discrepancy between theory and practice is particularly alarming during internships, as students shift from supervised learners to independent practitioners.

The National Accreditation Board for Hospitals and Healthcare Providers (NABH) in India says that the quality of nursing is one of the most critical elements that affects the quality of healthcare. One of the most essential rules is how to control drugs. Structured competency-based education, strict skill validation, obeying medication safety rules, and always keeping an eye on practice standards are all critical facets of the NABH Nursing Excellence criterion. But not all nursing schools have official competency programs that are directly based on NABH criteria. This suggests that not all graduates are ready to work in a clinical context (Kumari et al., 2020; Agarwal et al., 2021). This difference shows that there is a big disparity between what schools do and what regulators want them to do.

Patient safety programs have made drug safety a top priority all around the world. The World Health Organization (WHO, 2021) supports training methods that focus on competency and simulation to lower the number of pharmaceutical mistakes that could be avoided. Empirical studies validate that structured and simulation-enhanced training enhances medication accuracy and clinical confidence (Peterson et al., 2021; Huang et al., 2023). Structured skill competency training programs have shown effective in enhancing knowledge and specific skill sets among nursing interns in India (Thomas & Prabha, 2020). However, there is a lack of research investigating comprehensive competency programs that combine cognitive knowledge assessment with organized observational skill evaluation, especially with NABH Nursing Excellence standards.

Clinical observations reveal discrepancies among nursing interns in dosage calculation, administration techniques, documentation accuracy, and error reporting procedures. There is a strong need for structured, standardized, and accreditation-aligned competency programs that include both theoretical and psychomotor areas. This is because mistakes with medications are a common source of bad outcomes in hospitals that could have been avoided (WHO, 2021). We need to use a planned approach based on the ideas of experiential learning to make up for this lack in education.

The current study is grounded in Patricia Benner's "Novice to Expert" hypothesis (1982), which delineates nursing competence as a developmental trajectory attained through experiential learning, guided mentorship, and reflective practice. Following this theoretical framework, a systematic Skill Competency Programme (SCP) was created to help nursing interns move from a basic grasp of medication management to being able to do it well in a clinical setting.

This study sought to assess the efficacy of a NABH-aligned Skill Competency Programme in improving medication management knowledge and practical abilities

among nursing interns. The study aimed to evaluate initial knowledge and skill levels in both experimental and control groups, assess the intervention's impact on post-test outcomes, compare group differences following the intervention, and investigate the correlation between specific demographic variables and baseline competency levels. The hypotheses posited were: (H₁) nursing interns participating in the Skill Competency Programme would exhibit a statistically significant enhancement in knowledge and skill scores from pre-test to post-test; (H₂) post-test knowledge and skill scores would be markedly elevated in the experimental group relative to the control group; and (H₃) specific demographic variables would demonstrate significant association with initial knowledge and skill levels. The study assumed that all groups were equal at the start and that the intervention would be carried out the same way in all controlled academic settings.

2. METHODOLOGY

2.1. Study Design

The present study employed a quasi-experimental, non-equivalent two-group pre-test–post-test design to evaluate the effectiveness of a structured Skill Competency Programme (SCP) in enhancing medication management knowledge and clinical skills among nursing interns, in alignment with NABH Nursing Excellence standards. Random allocation was unfeasible due to the academic structure of internship placements; nonetheless, methodological rigor was augmented by baseline homogeneity evaluation, standardized intervention execution, and statistical group comparison. The experimental group received the structured SCP intervention, while the control group continued with conventional internship training without additional structured competency reinforcement.

2.2. Research Setting

The study was conducted in three nursing colleges located in Azamgarh District, Uttar Pradesh: Vedanta School of Nursing & Paramedical Sciences, Maa Kaushilya School of Nursing and Paramedical Sciences, Maa Shahzadi Devi Memorial Nursing College and Life Line Educational Institute. These schools provide structured internship training in medical-surgical wards, intensive care units, pediatric units, and obstetric departments, all of which adhere to NABH-aligned clinical practice guidelines. The chosen settings gave participants a chance to see how real-time medicine delivery works in a variety of clinical contexts.

2.3. Population and Sample

The target population comprised final-year nursing interns undergoing mandatory internship training during the study period. A total sample of 400 nursing interns was included in the study, with 200 participants assigned

to the experimental group and 200 to the control group. The sample size was calculated using the Equation:

$$n = \frac{2(Z_{\alpha/2} + Z_{\beta})^2 \sigma^2}{\Delta^2}$$

Where for comparing two independent means, considering a 95% confidence level ($Z_{\alpha/2} = 1.96$), 80% power ($Z_{\beta} = 0.84$), a standard deviation of 4.5 obtained from a pilot study, and an expected mean difference of 2. The calculated minimum sample size was approximately 190 per group, which was rounded to 200 participants in each group to enhance statistical precision and compensate for possible attrition. Non-probability purposive sampling was adopted based on eligibility and willingness to participate. To minimize selection bias, participants were matched across groups on selected demographic variables such as age, gender, and clinical posting area, and baseline equivalence was statistically verified prior to intervention implementation.

2.4. Inclusion and Exclusion Criteria

The study involved nursing interns undertaking their final-year internship training at selected institutions, who consented in writing and were available for the intervention and assessment phases. To avoid bias from prior exposure, interns who had already taken formal NABH-related medication management courses or who were on academic or medical leave during the study period were not included.

2.5. Description of the Intervention

The Skill Competency Programme (SCP) was made to be a systematic, competency-based strategy to teach that meets the NABH Nursing Excellence Medication Management (MOM) standards. The experimental group got 15 hours of instruction over five days in a succession. The SCP included both theoretical lessons on the rules of drug safety, checking prescriptions, and figuring out doses, as well as demonstrations and return demonstrations on how to give pharmaceuticals by orally, intramuscularly, and intravenously. We incorporated simulation-based Objective Structured Clinical Examination (OSCE) exercises to help with psychomotor development. After that, we practiced under supervision, learnt how to write down what we did, how to report medication mistakes, and had group conversations where we thought about what we had learned. The same investigator led the intervention period, and the lesson plans, teaching materials, and other resources were all the same. This made sure that everyone got the same information. We kept track of everyone that was present to make sure they were all involved. During the study period, the control group continued their regular clinical training without any systematic competency reinforcement.

2.6. Data Collection Instruments

The data was gathered using three tools that had been tested and found to work. We used a demographic data sheet to learn about the person's age, gender, course of study, clinical posting region, previous NABH exposure, and previous instruction in how to handle medications. A structured multiple-choice questionnaire with 25 questions was used to test knowledge in crucial areas such the ten rights of medication administration, how to calculate doses, how to store drugs, how to keep records, and how to keep patients safe. To see how good a person's clinical skills were, a structured observational checklist with 40 items was used. It looked at how well they prepared, gave the drug, followed aseptic precautions, verified the patient's identity, monitored the patient, documented the medication, and reported mistakes during real-time medication rounds. A group of ten experts in medical-surgical nursing, pharmacology, nursing education, and NABH accreditation determined that the content was valid. Reliability tests showed that the knowledge questionnaire was very consistent within itself (KR-20 = 0.82; Cronbach's $\alpha = 0.86$) and that the skill checklist was very consistent between raters ($r = 0.88$; Cronbach's $\alpha = 0.90$). This suggests that the measurements were consistent and unbiased.

2.7. Data Collection Procedure

The study was conducted over a period of six months following the acquisition of ethical and institutional authorization. The baseline (pre-test) evaluation was administered to both the experimental and control groups in cohorts of 25 to 30 interns under observation. We gave knowledge assessments in the classroom under controlled conditions and competence tests on routine medicine rounds using the structured observational checklist. The experimental group underwent the SCP intervention subsequent to the baseline evaluation. Seven days after the intervention finished, both groups took the same post-test evaluations to see if their skills and knowledge had improved. Standardized scoring rubrics were used to reduce bias among observers, and assessors were kept in the dark about which group they were in wherever possible. To keep things clean, intervention sessions were held at different times, and people from different groups were not allowed to talk to each other about the training.

2.8. Ethical Considerations

The Institutional Ethics Committee of Swami Vivekanand Subharti University in Meerut gave the study the go-ahead (SMC/UECM/2022/464/235). The nursing colleges that took part in the study gave their official permission before data was collected. Everyone who took part in the study signed a form agreeing to it, and their privacy and identities were carefully secured during the whole process. The study follows the ethical guidelines laid out by the Declaration of Helsinki (2013) and the Indian Council of Medical Research (ICMR) (2017). This meant

that the study protected people's privacy, let them choose whether or not to take part, and kept their data secret.

2.9. Data Analysis

We utilized version 26.0 of the Statistical Package for the Social Sciences (SPSS) to analyze and code the data. We set the level of statistical significance at $p < 0.05$ (two-tailed). We utilized the Shapiro–Wilk test to make sure that the data distribution was normal and that parametric testing was adequate before undertaking inferential analysis. We used descriptive statistics such as frequency,

percentage, mean, standard deviation, and range to put together the demographic components and baseline scores. We used paired t-tests to compare the results of the test before and after it, and independent t-tests to compare the outcomes of the test after it between the experimental and control groups. We used chi-square tests to look at how several demographic traits were related to initial skill levels. We also figured out the effect size (Cohen's *d*) and 95% confidence intervals to see how big and meaningful the intervention effect was in real life. This made the results clearer and stronger.

3. RESULTS:

3.1. Baseline Characteristics of Participants

Table 1 presents the frequency and percentage distribution of demographic variables among nursing interns in the experimental (n=200) and control (n=200) groups.

Table 1. Baseline Demographic Characteristics of Nursing Interns (N = 400)

Variable	Category	Experimental n (%)	Control n (%)	Total n (%)
Age (years)	20–21	78 (39.0)	82 (41.0)	160 (40.0)
	22–23	96 (48.0)	90 (45.0)	186 (46.5)
	≥24	26 (13.0)	28 (14.0)	54 (13.5)
Gender	Male	38 (19.0)	42 (21.0)	80 (20.0)
	Female	162 (81.0)	158 (79.0)	320 (80.0)
Course	GNM	82 (41.0)	88 (44.0)	170 (42.5)
	B.Sc. Nursing	118 (59.0)	112 (56.0)	230 (57.5)
Clinical Posting	Medical-Surgical	108 (54.0)	96 (48.0)	204 (51.0)
	ICU/Critical Care	46 (23.0)	50 (25.0)	96 (24.0)
	OBG/Pediatric	46 (23.0)	54 (27.0)	100 (25.0)
Previous Medication Training	Yes	68 (34.0)	60 (30.0)	128 (32.0)
	No	132 (66.0)	140 (70.0)	272 (68.0)
Residential Background	Urban	116 (58.0)	110 (55.0)	226 (56.5)
	Rural	84 (42.0)	90 (45.0)	174 (43.5)

The majority of participants (46.5%) were aged 22–23 years, and 80% were female, reflecting the gender distribution typical in nursing education. More than half (57.5%) were B.Sc. Nursing interns. Clinical exposure was predominantly in medical-surgical wards (51%). Only 32% had prior medication management training, indicating limited structured competency exposure before

the intervention. Baseline characteristics were comparable between groups.

3.2. Distribution of Knowledge Levels

Table 2 and Figure 1 shown the distribution of knowledge levels in experimental and control groups before and after the intervention.

Table 2. Distribution of Knowledge Levels (N = 400)

Knowledge Level	Experimental Pre n (%)	Experimental Post n (%)	Control Pre n (%)	Control Post n (%)
Good	22 (11.0)	160 (80.0)	20 (10.0)	72 (36.0)

Average	132 (66.0)	36 (18.0)	128 (64.0)	108 (54.0)
Poor	46 (23.0)	4 (2.0)	52 (26.0)	20 (10.0)

Following the Skill Competency Programme (SCP), the proportion of interns with good knowledge in the experimental group increased markedly from 11% to 80%, while poor knowledge declined from 23% to 2%, as

shown in Figure 1. In contrast, the control group showed only moderate improvement (good knowledge increased from 10% to 36%). These findings indicate substantial knowledge enhancement attributable to the intervention.

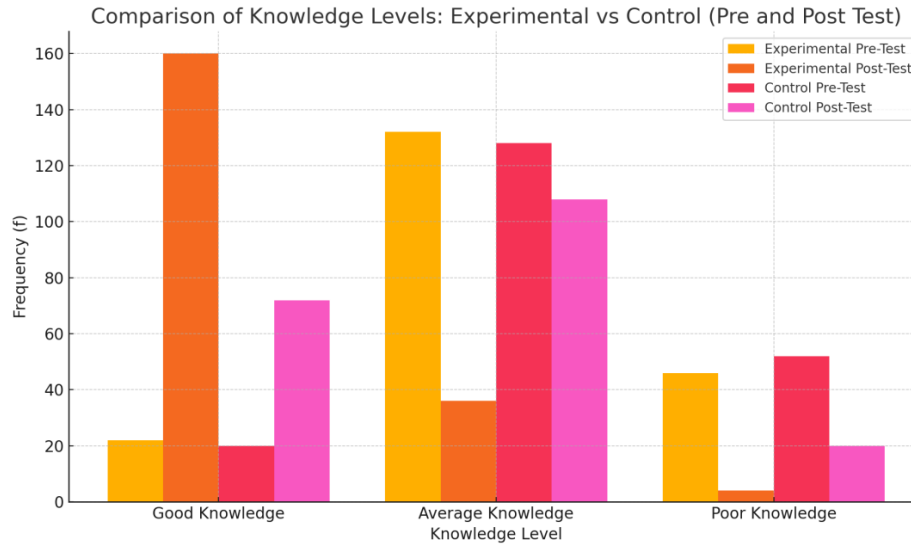


Figure 1: Comparison of knowledge levels: Experimental vs control (pre and post-test)

3.3. Distribution of Skill Levels

Table 3 and Figure 2 illustrated the changes in skill competency levels across groups.

Table 3. Distribution of Skill Levels (N = 400)

Skill Level	Experimental Pre n (%)	Experimental Post n (%)	Control Pre n (%)	Control Post n (%)
Good	18 (9.0)	170 (85.0)	22 (11.0)	80 (40.0)
Average	130 (65.0)	26 (13.0)	126 (63.0)	106 (53.0)
Poor	52 (26.0)	4 (2.0)	52 (26.0)	14 (7.0)

Good skill competency in the experimental group increased from 9% at baseline to 85% post-intervention, while poor skills reduced dramatically from 26% to 2%, as show in Figure 2.. Improvements in the control group

were comparatively modest. These results demonstrate that the SCP had a pronounced impact on psychomotor competency.

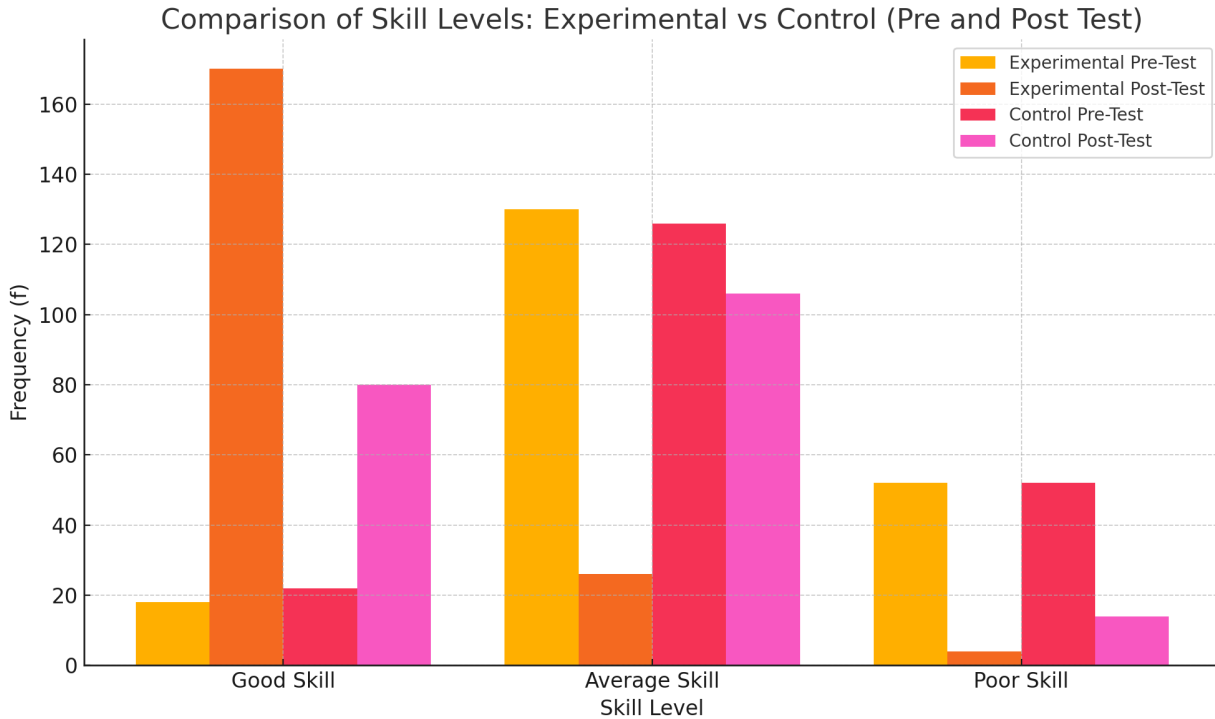


Figure 2: Comparison of skill levels: experimental vs control (pre and post test)

3.4. Within-Group Comparison of Knowledge Scores

Table 4 and Figure 3 presented paired t-test results comparing pre- and post-test knowledge scores.

Table 4. Within-Group Comparison of Knowledge Scores

Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	Mean Difference	t-value	p-value
Experimental	14.32 ± 3.01	23.98 ± 2.95	9.66	23.46	<0.001
Control	14.05 ± 3.12	16.21 ± 3.04	2.16	4.22	<0.05

A highly significant improvement was observed in the experimental group ($t=23.46, p<0.001$), with a large mean gain of 9.66 points, as show in Figure 3. Although the control group also demonstrated statistical improvement,

the magnitude was considerably smaller (mean gain 2.16), suggesting that structured competency training produced greater educational impact.

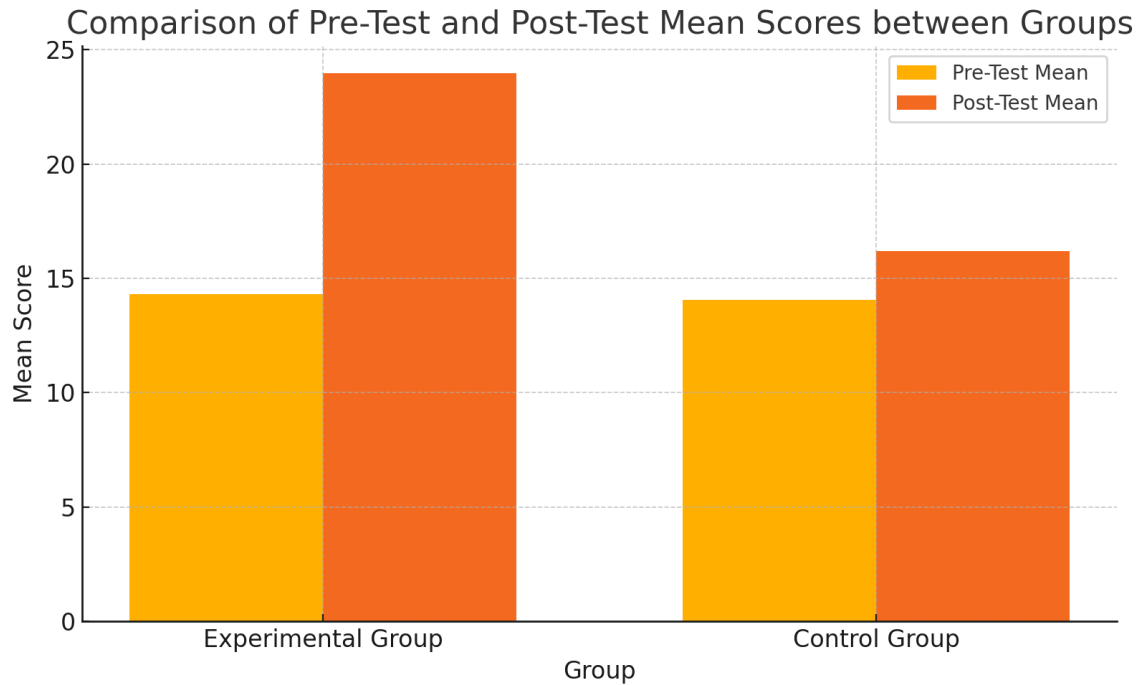


Figure 3: Comparison of Pre-Test and Post-Test mean Knowledge Scores between groups

3.5. Within-Group Comparison of Skill Scores

Table 5. Within-Group Comparison of Skill Scores

Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	Mean Difference	t-value	p-value
Experimental	13.12 ± 2.14	22.08 ± 1.96	8.96	28.14	<0.001
Control	13.05 ± 2.02	15.18 ± 2.01	2.13	3.94	<0.05

Table 5 and Figure 4 shown the experimental group demonstrated a substantial improvement in skill scores (mean gain = 8.96; $p < 0.001$), whereas the control group

showed minimal change, as shown in Figure 4. The large t-value indicates strong intervention effectiveness in enhancing clinical performance.

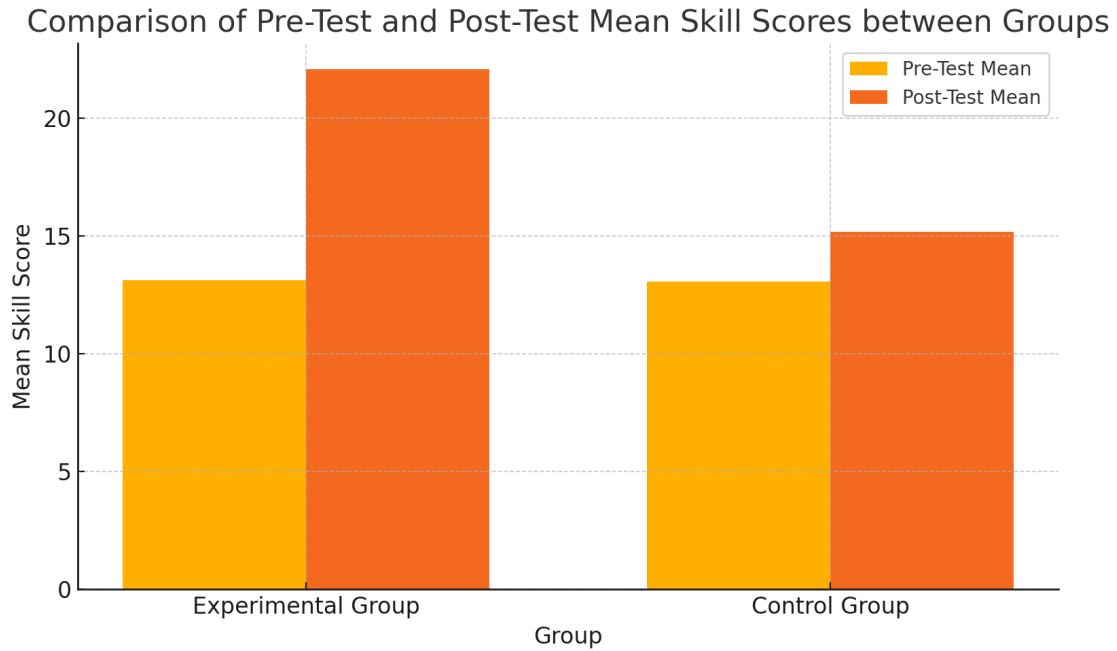


Figure 4: Comparison of Pre-Test and Post-Test mean skill scores within groups

3.6. Between-Group Comparison of Post-Test Scores

Independent t-test analysis revealed statistically significant higher post-test knowledge and skill scores in the experimental group compared to the control group

($p < 0.001$), as shown in the Table 6 and Figure 5. The large mean differences indicate strong intervention efficacy.

Table 6. Between-Group Comparison of Post-Test Scores

Variable	Group	Mean \pm SD	Mean Difference	t-value	p-value
Knowledge	Experimental	23.98 \pm 2.95	7.77	22.84	<0.001
	Control	16.21 \pm 3.04			
Skill	Experimental	22.08 \pm 1.96	6.90	24.12	<0.001
	Control	15.18 \pm 2.01			

Comparison of Experimental and Control Groups on Knowledge and Skill Scores

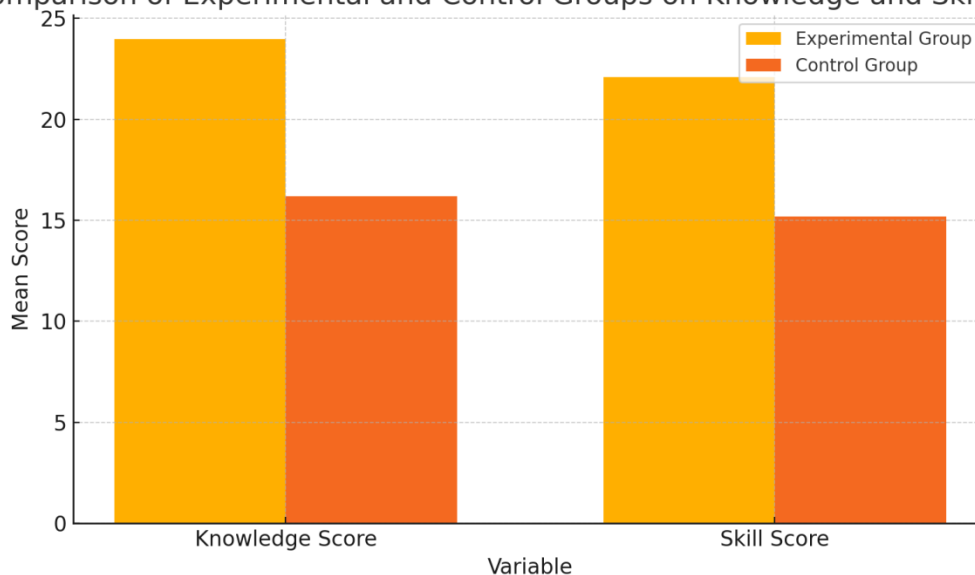


Figure 5: Comparison of experimental and control groups on knowledge and skill scores

3.7. Association Between Baseline Knowledge Levels and Selected Demographic Variables

Table 7 shows the chi-square analysis that looks at the link between pre-test knowledge levels and certain socio-demographic factors among nursing interns in the experimental group (n = 200). The analysis indicated statistically significant correlations between age ($\chi^2 = 8.42$, $p = 0.015$), course of study ($\chi^2 = 4.26$, $p = 0.04$), region of clinical posting ($\chi^2 = 6.58$, $p = 0.03$), and prior medication management training ($\chi^2 = 3.88$, $p = 0.05$) and baseline knowledge levels.

Interns aged 22–23 years exhibited comparatively greater levels of theoretical knowledge than their younger and older peers, indicating that maturity and academic advancement may affect theoretical proficiency. In the same way, B.Sc. Nursing interns had a greater distribution of knowledge than GNM interns, which could mean that

the curriculum is deeper and the pharmacological exposure is different. The clinical posting area also had a big effect. Interns who worked in medical-surgical wards had superior baseline knowledge, which could be because they had to give out medications more often in those settings. Additionally, trainees who had previously received training in medication management were more likely to have higher baseline knowledge scores, which underscores the significance of organized educational exposure.

Conversely, no statistically significant correlation was seen between gender ($\chi^2 = 1.94$, $p = 0.16$) or residential background ($\chi^2 = 1.68$, $p = 0.19$) and pre-test knowledge levels ($p > 0.05$). This suggests that initial theoretical proficiency was more significantly affected by academic and clinical exposure than by socio-demographic factors.

Table 7. Chi-Square Analysis of Baseline Knowledge Level

Variable	Category	Good n	Average n	Poor n	χ^2	df	p-value	Significance
Age (years)	20–21	10	50	18	8.42	2	0.015	Significant
	22–23	28	54	14				
	≥24	12	10	4				
Gender	Male	8	22	8	1.94	1	0.16	Not Significant
	Female	42	92	28				
Course of Study	GNM	16	52	14	4.26	1	0.04	Significant
	B.Sc. Nursing	34	62	22				
	Medical-							

Clinical Posting	Surgical Ward	30	62	16	6.58	2	0.03	Significant
	ICU / Critical Care	10	26	10				
	OBG / Pediatric	10	26	10				
Previous Medication Training	Yes	22	36	10	3.88	1	0.05	Significant
	No	28	78	26				
Residential Background	Urban	26	66	24	1.68	1	0.19	Not Significant
	Rural	24	48	12				

3.8. Association Between Baseline Skill Levels and Selected Demographic Variables (Table 8)

Table 8 shows the relationship between pre-test skill competency levels and some socio-demographic characteristics among the 200 nursing interns in the experimental group. The chi-square analysis revealed statistically significant correlations between age ($\chi^2 = 9.12$, $p = 0.01$), course of study ($\chi^2 = 4.04$, $p = 0.045$), area of clinical posting ($\chi^2 = 7.22$, $p = 0.027$), prior NABH exposure ($\chi^2 = 5.02$, $p = 0.026$), and previous medication management training ($\chi^2 = 4.86$, $p = 0.03$) with baseline skill levels. Older interns (22–23 years) exhibited relatively superior skill levels, potentially indicative of cumulative clinical exposure. B.Sc. Nursing students once again exhibited greater skills than GNM interns. This may be because their curriculum includes more hands-on training modules. Interns in medical-surgical and critical care units showed better psychomotor performance, probably because they had a lot of practice giving medications by hand.

It is important to note that having already learned about NABH standards and having already been trained in

medication management were both strongly linked to better baseline skill proficiency. This conclusion underscores the significance of organized accreditation-focused education and competency assessment in enhancing practical performance. Interns that are exposed to NABH standards are likely to learn about how to keep records accurate, how to keep medications safe, and how to avoid making mistakes. This makes them more confident and accurate when following procedures.

There was no statistically significant correlation between gender ($\chi^2 = 1.72$, $p = 0.18$) or residential background ($\chi^2 = 2.10$, $p = 0.15$) and baseline skill levels ($p > 0.05$), indicating that practical competency is predominantly determined by training and clinical exposure rather than socio-demographic factors.

The results from Tables 7 and 8 show that the differences in baseline knowledge and skills among nursing interns are mostly due to their academic preparation, clinical experience, and previous organized training. These results further support the establishment of standardized competency-based programs like the Skill Competency Programme (SCP) to ensure consistent preparation among various trainee populations.

Table 8. Chi-Square Analysis of Baseline Skill Levels

Variable	Category	Good n	Average n	Poor n	χ^2	df	p-value	Significance
Age (years)	20–21	12	54	12	9.12	2	0.01	Significant
	22–23	26	56	14				
	≥24	10	12	4				
Gender	Male	10	24	4	1.72	1	0.18	Not Significant
	Female	38	98	12				
Course of Study	GNM	18	54	10	4.04	1	0.045	Significant
	B.Sc. Nursing	30	68	20				
Clinical Posting	Medical-Surgical Ward	28	68	12				
	ICU / Critical Care	10	28	8				

	OBG / Pediatric	10	26	10	7.22	2	0.027	Significant
Previous Medication Training	Yes	24	38	6	4.86	1	0.03	Significant
	No	24	84	24				
Residential Background	Urban	28	70	18	2.10	1	0.15	Not Significant
	Rural	20	52	12				

3.9. Magnitude and Strength of Intervention Effect

In addition to inferential statistical testing (Table 9), magnitude-based analyses were conducted to evaluate the practical impact of the Skill Competency Programme (SCP). While t-tests confirmed statistical significance ($p < 0.001$), effect size estimation provides a more comprehensive understanding of the strength of the intervention (Sullivan & Feinn, 2012; Lakens, 2013).

Cohen's d was calculated (Cohen, 1988) using the pooled standard deviation method:

$$SD_{pooled} = \sqrt{\frac{SD_1^2 + SD_2^2}{2}}$$

$$d = \frac{M_2 - M_1}{SD_{pooled}}$$

Where, SD_1 is the standard deviation of the first group i.e pre-test mean scores, SD_2 is the standard deviation of the second group i.e post-test mean scores. The SD_1^2 and SD_2^2 is the variance of each group (square of standard deviation), SD_{pooled} is the combined estimate of variability across both groups. M_1 is the mean score of the first measurement (pre-test mean) and M_2 is the mean score of the second measurement (post-test mean) and $M_2 - M_1$ is the Mean difference (magnitude of change due to intervention), respectively

Knowledge scores in the experimental group, the mean difference between pre-test and post-test was 9.66 with a pooled standard deviation of 2.98, yielding (d) was 3.24 (Cohen, 1988).

This represents an **extremely large effect size**, indicating substantial cognitive improvement attributable to the intervention. Similarly, for skill scores, the mean difference was 8.96 with a pooled standard deviation of 2.05, resulting in d was 4.37.

This value reflects an **exceptionally large practical effect**, demonstrating profound enhancement in psychomotor competency following structured training.

To assess clinical relevance, percentage improvement was determined using:

$$\% \text{ Improvement} = \frac{\text{Mean difference}}{\text{Pre - test Mean}} \times 100$$

Here, the mean difference is the difference between post-test and pre-test means. Knowledge scores showed a 67.4% improvement, while skill scores demonstrated a 68.3% improvement, indicating marked educational and clinical gains.

Between-group post-test comparisons further strengthened these findings. For knowledge, with a mean difference of 7.77 and pooled standard deviation of 2.99, and d was 2.60, respectively.

For skill, with a mean difference of 6.90 and pooled standard deviation of 1.98, and d was 3.48, respectively.

Both values indicate very large to extremely large intervention effects, confirming the superiority of the structured competency programme over routine instruction.

To determine the strength of association for chi-square findings, Cramer's V was calculated (Cramer, 1946; McHugh, 2013) using:

$$V = \sqrt{\frac{\chi^2}{c(k-1)}}$$

Where, χ^2 (**Chi-square value**) is the test statistic measuring association between categorical variables, n is the total sample size, k is number of categories in the variable with fewer groups and V is the strength of association measure. For age versus knowledge ($\chi^2 = 8.42$; $n = 200$; $k = 3$), the effect size V was 0.145, respectively (McHugh, 2013).

This indicates a small-to-moderate association, suggesting that demographic influences were comparatively minimal relative to the intervention effect.

Overall, the integration of effect size, percentage improvement, and association strength analysis demonstrates that the Skill Competency Programme produced not only statistically significant but also practically transformative improvements in medication management competency.

Table 9. Effect Size, Percentage Improvement, and Strength of Association Analysis

Variable	Comparison	Mean Difference	Pooled SD	Cohen's d	% Improvement	Interpretation
Knowledge	Experimental (Pre-Post)	9.66	2.98	3.24	67.4%	Extremely Large Effect
Skill	Experimental (Pre-Post)	8.96	2.05	4.37	68.3%	Extremely Large Effect
Knowledge	Post-Test (Exp vs Ctrl)	7.77	2.99	2.60	—	Very Large Effect
Skill	Post-Test (Exp vs Ctrl)	6.90	1.98	3.48	—	Extremely Large Effect
Age vs Knowledge	$\chi^2 = 8.42$	—	—	Cramer's V = 0.145	—	Small-Moderate Association

4. DISCUSSION OF FINDINGS:

The current study offers robust evidence that the structured Skill Competency Programme (SCP) significantly enhanced both knowledge and practical skills pertaining to medication management among nursing interns. Statistical analysis revealed significant changes between pre-test and post-test scores in the experimental group ($p < 0.001$). More significantly, magnitude-based analysis showed that these improvements were not only statistically significant but also practically useful. The effect size estimates for knowledge ($d = 3.24$) and skills ($d = 4.37$) show that the intervention had very large effects, far bigger than what is usually seen in education. Moreover, the percentage improvement analysis indicated increases of about 67–68% from baseline levels, signifying a significant upgrade in competency subsequent to the intervention.

The change in performance categories adds even more weight to these conclusions. A significant percentage of participants transitioned from subpar and average competency levels to proficient levels within the experimental group following the intervention. Conversely, the control group exhibited only marginal improvement, highlighting that mere normal clinical exposure is inadequate for attaining effective drug management preparation. These results indicate that structured competency-based training offers a more organized and efficient method for enhancing both theoretical comprehension and psychomotor performance.

The substantial improvements can be elucidated using the pedagogical framework of the SCP. The program included supervised return demonstrations, active learning tactics, demonstration-based education, and reinforcement sessions. These kinds of tactics help people think more deeply, make it easier to fix mistakes, and improve the way memories are stored. To give medicine, you need to know about drugs, be able to accurately calculate the dose, follow safety rules, and keep accurate

records. Guided practice with supervision that is done over and over again makes performance more consistent and boosts confidence, which speeds up the process of learning new skills. The remarkably elevated effect size values identified in this study indicate that intentional practice coupled with organized feedback fosters a potent learning environment conducive to swift competency enhancement.

The results are in line with other studies that have shown that organized training programs improve cognitive understanding, procedural accuracy, and learner confidence (Ismail & Alshammari, 2025; Wahid & Arsat, 2025). Kamble & Deshpande (2025) and Nair et al. (2023) documented substantial enhancements in drug safety practices subsequent to organized clinical training programs. The extent of improvement noted in this study corresponds with global evidence. Williams et al. (2022) found that nursing students in the UK were 68% more likely to get the right dosage after targeted medication safety interventions. Huang et al. (2023) showed that simulation-based medication administration training in Taiwan made students much more confident in their clinical practice and helped them understand the concepts better. These results are consistent across a wide range of educational settings, which supports the external validity and generalizability of competency-based training programs.

The study also found strong links between baseline knowledge and skills and certain socio-demographic factors, like age, course of study, clinical posting, and previous training. However, the intensity of these relationships was relatively small to moderate, suggesting that demographic factors affected readiness levels but did not predominate learning outcomes. Significantly, post-intervention enhancements diminished baseline discrepancies, indicating that organized competency programs may serve as equalizing mechanisms among diverse trainee groups. This outcome underscores the

efficacy of uniform training frameworks in reducing variability in clinical readiness.

The theoretical basis of these findings is underpinned by Patricia Benner's "Novice to Expert" model (1984), which posits that clinical competence develops through sequential experiential stages. The SCP seems to put this paradigm into action by helping people go from rule-based beginner performance to context-driven competence through guided exposure and supervised practice. The significant enhancement seen in this study demonstrates that structured experiential learning expedites this developmental trajectory.

Even though it has some good points, there are some bad points that need to be noted. The quasi-experimental approach without randomization constrains the establishment of unambiguous causal links, while baseline comparability among groups mitigates this issue. The study was executed in a singular institutional environment, perhaps constraining its applicability to alternative scenarios. Also, the study didn't look at how well people remembered what they learned and how well they used their abilities over time. It also didn't measure how many prescription errors were made directly. As a result, it was evident that competency improvement happened, but more research is needed to find out how it directly affects patient safety results.

Future studies should use randomized multicenter designs with long-term follow-up to see if competency gains are long-lasting. Using objective clinical markers like the number of medication errors, near-miss reports, and compliance audits would give stronger proof that educational initiatives lead to better patient safety outcomes. Further investigation into simulation technologies, digital competency tracking systems, and adaptive learning platforms may improve the scalability and efficacy of organized training programs.

5. CONCLUSION

The current study offers robust empirical evidence that the organized Skill Competency Programme markedly improves medication management knowledge and practical abilities among nursing interns. Statistical analysis validated substantial enhancements in the experimental group, whereas magnitude-based evaluation indicated remarkably large impact sizes for both knowledge ($d = 3.24$) and abilities ($d = 4.37$). These numbers show that the intervention led to big changes in schooling, not just small ones. In addition, the program had a significant effect on people in real life, as shown by the percentage increase of about 67–68% from the baseline.

The intervention's organized approach, which included demonstration, supervised return demonstration, reinforcement sessions, and active involvement, seems to

have helped with deeper cognitive processing and better integration of psychomotor skills. The results indicate that regular clinical exposure alone may not be adequate for attaining optimal medication safety competency, but organized competency-based models facilitate systematic skill consolidation and confidence enhancement.

While several socio-demographic factors were linked to baseline competency levels, the intervention successfully diminished these differences, underscoring its promise as a standardizing educational tool. This encourages the use of competency-based frameworks in internship training programs that follow accreditation criteria and patient safety goals.

Even though the study design had certain problems and there was no long-term follow-up, the strength and size of the results show that structured training interventions can greatly increase clinical readiness. Future studies should use randomized multicenter designs, long-term assessments of patient retention, and objective measures of patient safety, like the number of prescription errors. The Skill Competency Programme is a scalable, evidence-based way to improve drug management skills and make clinical practice safer.

Declarations:

Conflict of Interest:

The authors declare that there is **no conflict of interest** regarding the conduct, analysis, authorship, or publication of this research study. No financial, professional, or personal relationships influenced the outcomes or interpretations presented herein. This study was carried out purely for academic and research purposes, following the ethical standards of the institution.

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Ethical Approval:

Ethical clearance for conducting this study was obtained from the Institutional Ethics Committee (IEC) of Swami Vivekanand Subharti University, Meerut, UP. All participants were informed about the objectives of the study, and informed consent was obtained prior to data collection. Confidentiality and anonymity were maintained throughout the research process, in accordance with the Declaration of Helsinki (2013) ethical principles for research involving human subjects.

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Author Contribution:

1. **Hepsi Natha:** Conceptualization, methodology design, data collection, statistical analysis, and manuscript preparation.
2. **Geeta Parwanda:** Provided academic supervision, critical feedback, and editorial revisions throughout the research process.

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