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Effectiveness of demonstration versus video assisted teaching on IV cannulation skills among nursing students at selected nursing colleges, Bangalore

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Abstract

Introduction: IV cannulation involves inserting a cannula into a vein to directly administer medications or fluids into the bloodstream, requiring precise proficiency from healthcare providers for rapid and reliable circulatory access in medical care and monitoring.

Objectives: This study aims to investigates the effectiveness of demonstration versus video-assisted teaching methods on intravenous (IV) cannulation skills among nursing students.

Methodology: Quasi experimental study design was adopted and 80 nursing students were recruited by convenient sampling technique, data was collected by using socio demographic variables and observational check list on IV cannulation skills. The data were analyzed by descriptive and inferential statistics.

Results: The study revealed significant enhancements in IV cannulation skills among nursing students using both demonstration and video-assisted teaching methods ($P<0.05$). Initially, 80% of the demonstration group and 90% of the video-assisted teaching group exhibited poor skills. Following the interventions, mean IV cannulation scores improved from 11.52 ± 2.54 to 19.02 ± 1.83 in the demonstration group and 9.98 ± 1.91 to 17.22 ± 2.09 in the video-assisted teaching group. Moreover, 92.5% of the demonstration group and 70% of the video-assisted teaching group achieved proficient IV cannulation skills.

Interpretation and conclusion: This study underscores the importance of innovative teaching methodologies in nursing education to optimize IV cannulation procedural skill acquisition and student learning outcomes. Future research may explore further enhancements and adaptations of demonstration and video- assisted teaching in diverse nursing education contexts.

Keywords: Demonstration, Video Assisted Teaching, IV Cannulation Skills, Nursing Students.

Introduction

Nurses are the frontline guardians of patient well-being, entrusted with a diverse spectrum of responsibilities ranging from basic caregiving tasks to complex clinical

interventions. From administering medications and conducting assessments to providing emotional support and coordinating interdisciplinary care, nurses play a multifaceted role in the healthcare ecosystem. As such, the acquisition and mastery of nursing skills are fundamental prerequisites for delivering safe, competent, and holistic care. In Hospital setting one of nurse's most important duties is to administer medication, so it is imperative that they are knowledgeable about how to prepare and establish intravenous cannula without experiencing any complications. In hospitalized patients, intravenous cannulation is the second most invasive procedure which is performed by a nurse. Globally, around 25 million people receive intravenous treatment yearly. In United States it is reported that 30% of bacteremia in hospitals was associated with IV catheters. Improper use of this vascular access device can lead to many complications such as extravasation infiltration, inflammation, and tenderness over the cannula, obstruction, phlebitis, infection, sepsis, needle stick injury and thrombophlebitis. The prevalence of phlebitis, hematoma, infiltration and extravasation were 21%, 12%, 7%, and 3.5% respectively. [Sinha. P 2022]. Global burden of catheter related infection increases mortality related to IV catheter among patients affected by health care associated sepsis was 24.4% to 52.3% among patients were admitted and treated in intensive care unit. [WHO 2023]

In India, around 80% of hospitalized patients receive intravenous therapy during their hospitalization. [Tolpadi et, al.2021]. The incidence rate of IV catheter placement for a patient who was admitted to hospital is about 50%. It is observed that certain risk factors like age, gender, types of drugs and fluids, mechanical factors, catheter material, size and duration of cannulation and health professional practices affects IV cannulation procedures. [Mandal. A & Ragu,K]. The Incidence rate of phlebitis estimated to be around 25- 59%. The incidence and occurrence of PIVC induced complications are surveyed around 842 PIVC sites, 39.3% of the PIVC showed one or more complications and among that phlebitis found to be higher [Dsilva.BS 2021]. In another study it was found that the out of 1821 subjects, 83.63% had phlebitis. Which leads to complications such as pulmonary embolism, deep vein thrombosis, septicemia, formation of nodule and cellulitis occurs due to poor practice (Tolpadi A.2021). The occurrence of hospital infection rate is 2.5% and complications are 50-75%. Another study, out of 118 patients, around 80 patients had 67.79% of complication on IV cannulation. The incidence of PIVC induced complications among 842 PIVC sites, 39.3% of the PIVC showed one or more complications, out of which phlebitis found to be higher (choukikar. J & Dsilva BS .2021). It requires an insertion of new cannula. It has greater effect on the health and quality of life of a patient and it increases financial burden with longer stay in hospital and treatment (Tolpadi A et al., 2021).

The lack of knowledge and skills on IV cannulation is associated with certain factors such as patient evaluation, selection of site for cannulation, duration of cannula, complication and duration of treatment. In one study it revealed that the limited clinical application, shortened hospital stays of patients, medical errors, patients' safety, legal regulations have affected the practical training of students. The students spend less time in clinical setting which affects the clinical performance of students on IV cannulation. [Akman O et al., 2021]. It is also reported that more than half of the nursing students [55.8%] had adequate knowledge while [44.2%] students had inadequate knowledge which indicates that the knowledge and confidence is required to practice and

training in these areas need to be improved (Sinha P et al., 2022). In another study it was found that 38.2% BSc nursing students have good practice and 61.8% students have average practice. Studies observed that estimated infection rate is around 2.5% in developed countries. It is even higher in developing counties like India. Therefore, it is important for nurses to know the techniques of insertion, monitoring and maintaining the IV access. [Chowkikar 2021].

Educator can implement the various educational and training strategies to train the students to acquire the skill in IV cannulation in lab and clinical setting. Recognizing the need for innovative educational strategies, educators and healthcare institutions have turned to technology-driven approaches to enhance learning outcomes. Raj A. SP (2023) from, India reported that demonstration was effective in improving the knowledge and practice skill among the staff nurse. There was a significant difference in practice skill score of pre- and post- test after demonstration. ($p<0.05$). Previous research findings from India and other countries proves that video assisted teaching, structured teaching program, demonstration, simulation-based training and Virtual simulation was effective in improving the psychomotor skills and knowledge of nursing students on IV cannulation. Adequate skill in IV cannulation reduces the failure rate of insertion and prevent complication associated with faulty insertion. Thus, nursing care would improve the patient satisfaction and clinical outcome.

Objectives of The Study

- To Assess the IV cannulation skills among nursing students.
- To find out the effectiveness of demonstration versus video assisted teaching among nursing students.
- To determine the association between socio-demographical variables and IV cannulation skill among nursing students

Materials and Method

Research Design: A quasi-experimental research Study

Variables

Study variables

Independent variable: Demonstration and Video assisted teachin

Dependent variable: IV cannulation skill

Attribute variables: Age, gender, availability of skill lab facility, parent hospital, Number of hours spent in skill lab and previous training on IV cannulation, and have you inserted IV cannula to the patient

Study Setting: The study was conducted in M.S Ramaiah institute nursing education and research and Bangalore Baptist hospital college of nursing, Bangalore.

Sample Size: Total of 80 [Demonstration 40] and [Video assisted teaching 40]

Sampling Technique: Non-probability convenient sampling technique.

Criteria For Sample Selection

The samples were selected with the following pre-determined criteria

Inclusion Criteria: 2nd year B.Sc. nursing students

Exclusion Criteria: Students who are not available at the time of data collection

Tool Development

After an extensive review of the literature, discussion with the experts, and the investigator's personal and professional experience the tool was developed and divided into two parts;

Section- A: The tool's first part comprises socio-demographic variables; age, gender, availability of skill lab facility, parent hospital, Number of hours spent in

skill lab and previous training on IV cannulation, and have you inserted IV cannula to the patient

Section- B:

Observational check list: Structured observational check list on IV cannulation skills was developed by an extensive review of literature, discussion with experts and professional experience.

Validity: The content validity of the tool was obtained from 8 experts, comprising of 2 Heads of the Department of Medical- Surgical Nursing, 3 Associate professor of Medical-Surgical Nursing, 2 Assistant professors of Medical-Surgical Nursing, 1 from Ramaiah medical college statistician.

Reliability: The reliability score obtained for the English tool was r=0.769 and the it was found reliable to conduct study.

Ethical Clearance: Ethical approval for the current study was obtained from the institutional ethical committee Ramaiah Medical College Ethics Committee on July 2023. The reference number EC- 23/28-PG-RINER.

Pilot Study: The pilot study was conducted at Rebekkah Ann Naylor school of nursing. 10 nursing Students were selected for the study. On completion of the pilot study, it was found that the study was feasible and practicable to conduct the main study.

Data Collection Procedure

The data collection was carried out from 27.2.24 to 22.2.24. Formal permission was obtained from the college authority. Total of 80 subjects were selected by using non probability convenient sampling technique and 40 subjects were allotted to demonstration group; 40 were allotted to video assisted teaching group. Self-introduction was given by student researcher to the subjects. Purpose of the study was explained to the subjects. Obtained informed consent from the subjects. Administered socio demographic tool to group A [Demonstration] on 27.2.24 and group B [Video assisted teaching group].15.3.24. Pretest was conducted for both the group on IV cannulation skills by using observational checklist in the nursing foundation lab.

Group A: Demonstration of IV cannulation was done by the student researcher. The procedure was explained step by step with normal pace. followed the sequence of procedure clearly and directly. Explained each skill part of IV cannulation slowly. Clarified the doubts encountered by the subjects. Obtained feedback from the subjects by asking questions. The duration of the procedure was 30 minutes for group A followed by return demonstration done by each subject. On 8th day post-test of IV cannulation skills was conducted by using structured observational checklist in demonstration group.

Group B: video assisted teaching. Recorded video which was developed by the student researcher on IV cannulation skills was played in the classroom for 15 minutes and debriefing of IV cannulation skills was done by the student researcher for 15 minutes in the classroom. On 8th day post- test on IV cannulation skills was conducted by using structured observational check list in video assisted teaching group. Collected data was analyzed by using descriptive and inferential statistics.

Result

Statistical method: Statistical analysis for the study was done using IBM SPSS version 20. The results obtained are discussed in the following area.

SECTION A: Frequency and percentage distribution of socio-demographic variables.

SECTION B: Frequency and percentage distribution of IV cannulation skills.

SECTION C: Comparison of IV cannulation skills in demonstration versus video assisted teaching.

SECTION D: Effectiveness of IV cannulation skills in demonstration versus video assisted teaching.

SECTION E: Association between IV cannulation skills with selected socio demographic variables in demonstration versus video assisted teaching.

Section-A

Table 1: Frequency and percentage distributions of subjects regarding socio-demographics variables: n= 40+40

Sn.	Socio Demographic Variables	Demonstration		Video Assisted teaching	
		Frequency	Percentage	Frequency	Percentage
1.	Age in completed years				
	Range	Mean	Standard deviation	Mean	Standard deviation
	19-25years	19.75±1.127		19.55±1.239	
2.	Gender				
	Male	10	25%	-	-
	Female	30	75%	40	100%
3.	Do you have nursing skill lab facility in the nursing institution where you study?				
	Yes	40	100%	40	100%
	No	-	-	-	-
4.	If yes, number of hours you spend in skill laboratory to practice nursing procedures in a week.				
	Two hours	-	-	-	-
	Three hours	40	100%	-	-
	Four hours	-	-	40	100%
	More than four hours	-	-	-	-

The mean score for age in demonstration group was 19.75±1.127 and the mean score for age in video assisted teaching group was 19.55±1. 239. With regards to gender, 10[25%] of subjects belonging to male, whereas 30[75%] of subjects belongs to female in demonstration group. Whereas in video assisted teaching all subjects40 [100%] were female. The majority of subjects 40[100%] had skill lab facilities in the institution where they study nursing, in demonstration and video assisted teaching. The majority 40[100] % of subjects spend 3 hours of training in the skill laboratory per week in demonstration group. Whereas 40[100] % of subjects spend 4 hours of training in skill laboratory per week in video assisted teaching.

Table 1.2 Frequency and percentage distribution of sociodemographic variables with regards to availability of parent hospital, previous training, have you inserted IV cannula. in demonstration versus video assisted teaching. n= 40+40

Sn.	Socio Demographic Variables	Demonstration		Video Assisted Teaching	
		Frequency	%	Frequency	%
5	Availability of parent hospital to practice nursing				

	Yes	40	100%	40	100%
	No	-	-	-	-
6	Had previous training on IV cannulation				
	Yes	-	-	10	25%
	No	40	100%	30	75%
7	Have you inserted cannula to the patient				
	Yes	-	-	-	-
	No	40	100%	40	100%

Majority of subjects 40[100%] had availability of parent hospital in demonstration and video-assisted teaching Majority 40[100%] of subjects do not have previous training on IV Cannulation in the demonstration group. Whereas 10[30%] of subjects had previous training and 30 [75%] do not have previous training on IV cannulation procedure in video assisted teaching group. Majority 40[100%] of subjects have not insert IV cannula to the patient in demonstration and video assisted teaching group.

Section B

Table 2:1 Frequency and percentage distribution of subjects regarding IV cannulation skills in demonstration: N=40

Level of Scores	Levels of Performance	Demonstration			
		Pretest		Post Test	
		Frequency	%	Frequency	%
Median below15	Poor performance	32	80%	3	7.50%
More than 15	Good Performance	8	20%	37	92.50%

Table 2. 2: Frequency and percentage distribution of subjects regarding IV cannulation skills in video assisted teaching: n=40

RangeOf Scores	Levels of Performance	Video Assisted Teaching			
		Pretest		Post Test	
		Frequency	%	Frequency	%
Median below 15	Poor performance	36	90%	12	30%
More than >15	Good Performance	4	10%	28	70%

The above table depicts that frequency and percentage distribution of IV cannulation skills. In pretest the majority of subjects in demonstration group 32 [80%] had poor performance and 8 [20%] had good performance where as in post-test the majority of subjects 37 [92.5%] had good performance 3 [7.5%] had poor performance.

Section C

Comparison of IV Cannulation Skills In Demonstration Versus Video Assisted Teaching.

Table 3.1: Comparison of Mean and standard deviation pre-test and post test scores of IV cannulation skills in demonstration versus video assisted teaching. n= 40+40

Sn.	Groups	Pretest	Post Test	T Value	P Value
		Mean and SD	Mean and SD		
1.	Demonstration	11.58±2.541	19.02±1.83	14.532 df39	<0.000*
2.	Video assisted teaching	9.98±1.915	17.22±2.02	16.83 df39	<0.001*

S - significant

The above table depicts that the pretest and post test scores of IV cannulation skills in demonstration versus video assisted teaching. In demonstration the pretest mean score of IV cannulation skills was 11.52 ±2.54 and post-test was 19.0± 1.83 and the difference was statistically significant [p<0.000]. Similarly, in video assisted teaching group the pretest means score was 9.98 ±1.91 and in post-test was 17.22± 2.09 and the difference was statistically significant [p<0.001]. Hence research hypothesis accepted (H1) and null hypothesis rejected (H0).

Section D

Effectiveness of IV Cannulation Skills in Demonstration Versus Video Assisted Teaching.

Table 3.2: Comparison of post test scores of IV cannulation skills in demonstration versus video assisted teaching N=40+40

Variables	Post test			
	Mean	SD	t value	P value
Demonstration	19.02	1.83	4.091	0.000*
Video assisted teaching	17.23	2.09		

S=significant

The above table depicts that the mean post test scores of IV cannulation skills in demonstration was 19.02±1.83 in video assisted teaching the mean posttest mean score 17.23±2.09[p<0.001] less than 0.05 level of significance. Hence the research hypothesis was accepted and there is a significant difference between IV cannulation skills in demonstration and video assisted teaching. Hence the research hypothesis H1 was accepted. It indicated that there is an effectiveness in demonstration method than video assisted teaching.

Section E

Association between IV Cannulation Skills and Selected Socio Demographic Variables in Demonstration

Table 4:1 Association between IV cannulation skills and age and gender in demonstration group. n=40

Socio Demographic Variables		Levels Of Performance		Chi Square	P Value
		Poor	Good		
Age	<19years	6[15%]	16[40%]	0.135 df=1	0.714 NS
	>19years	4[10%]	14[35%]		
Gender	Male	4[10%]	6[15%]	1.6 df=1	0.206 NS
	Female	6[15%]	24[60%]		

NS= not significant

The above table depicts that association between IV cannulation skills and selected socio demographic variables in demonstration. The calculated chi square value for age 0.135 less than table value 3.84. It indicates that there is no significant association between age and level of performance.

The calculated chi-square value for gender 1.6 less than table value 3.84 indicates that there is no significant association between gender and level of performance.

Table 4:2. Association between IV cannulation skills and selected demographic variables in video assisted teaching age and previous training. n=40

Socio Demographic Variables		Levels Of Performance		Chi Square	P Value
		Poor	Good		
Age	≤19	11[27.5%]	16[40%]	0.609	0.435
	<19	7[17.5%]	615%]	df 1	NS
Previous training	Yes	13[32.5%]	17[42.5%]	0.135	0.731
	No	5[12.5%]	5[12.5%]	df 1	NS

NS= not significant

The above table depicts that the association between IV cannulation skills and selected socio demographic variables in video assisted teaching group. The calculated chi square value for age 0.609. There is no significant association between age level of performance. The calculated chi square value is for previous training 0.135. There is no significant association between previous training and level of performance. Hence the null hypothesis H03. was accepted and there was no significant association between IV cannulation skills and selected socio demographic variables.

Discussion

Objective 1: To Assess the IV cannulation skills among nursing students

In pretest majority of subjects 32 (80%) in demonstration had poor performance and 8 [20%] of subjects had good performance. In post-test majority of subjects 37 [92.5%] had good performance and 3 [7.5%] had poor performance. In pre- test majority of subjects 36 [90%] in video assisted teaching had poor performance and 4 [10%] had good performance where as in post-test majority of subjects 28 [70%] and 12 [30%] had poor performance.

The results of the present study supported by Sinha et al, [2020], results showed that 44.2% had inadequate skills. Vedavathi H reported add year that only 31% of students were confident to perform PIVC. The results were contradicted by Faris Go et al, half of the students' nurses had average skills 43.6% good 29.7% poor 26.7% in IV cannulation.

Similar study conducted by Veda Murthy R [2020] the findings indicated that 75% of nursing students received average results, 25% received below-average scores, and none of the students received higher than average knowledge scores on the pre-test. Following the intervention, the post-test results showed that 60% of nursing students scored averagely, 37.5% scored above average, and just 2.5% of students scored below average in terms of their understanding of IV cannulation. Comparably, when it came to IV cannulation prior to protocol- based teaching, 65% of nursing students had above-average proficiency, 35% had average skill, and none had below- average aptitude. Following the

intervention, 2.5% of nursing students had average skills, 97.5% of students had above- average skills, and none of the students had below-average skills.

Al-ashour et al [2022]. The study contradicted to the present study finding showed that the intravenous cannulation skills for nursing students proved to be substandard or inadequate. It was discovered that the nursing staffs in the two hospitals were, deficient in 82% and 94% of cases respectively. Liji Mariam Abraham [2018] study contradicted to present study findings it showed that 25% nurses had average knowledge and 5% had poor knowledge. All the nurses had inadequate practice regrading intravenous cannulation

Objective 2: To find out the effectiveness of demonstration versus video assisted teaching among nursing students

In demonstration the pretest mean score of IV cannulation skills was 11.52 ± 2.54 and post-test was 19.02± 1.83. In video assisted teaching group the pretest means score was 9.98 ± 1.91 and in post-test was 17.22± 2.09. The calculated p value (0.000, 0.001 respectively) was < 0.05 level of significance in demonstration versus video assisted teaching.

Findings of the study supported by Anurag Singh C and Paul P, the mean difference between pre-test and post-test was 9.73 and there was statistically significant difference in pre and post-test of skills scores ($p<0.05$) after demonstration on IV cannulation skills. D Silva BS, from Goa India [2021], reported that there was significant difference in pre-test mean score was 6.97 with SD of 3.36 and post-test mean score was 16.7 with SD of 2.15 calculated 't' value higher (15.35) than table value indicate significant at ($p<0.05$) after video assisted teaching on IV cannulation skills. The study contrary to the present study conducted by Morgaonkar et.al [2017]. The mean and (SD) knowledge score after training (7.52 +1.58) was higher than the pretraining score (5.32+1.57) The total practice scores showed a similar pattern (9.22 (0.66) vs 7.91 (1.11), $P<0.001$). there was a significant improvement in knowledge and skill in intravenous cannulation following the training compared to the pretraining evaluation. ($p<0.05$). Findings were contracted by a study Samuel L Pillai. S [2014]. The results showed that mean of class room demonstration was 32.93, t value 0.1 was not significant at 0.05 at df=58. The total mean score of class room demonstration 44.27 and mean score of video demonstration was 43.63 t -value (0.33) and it was not significant.

Study contrary to present study conducted by Hermon et al, [2021] reported that half of the nursing students had deficient knowledge and skills during pretest in IV cannulation skills. The mean score for knowledge was 7.2 out of 15.0, with a standard deviation (SD) of 2.4, and the mean score for attitude was 10.20 out of 18.00, with an SD of 4.79. 16.20 out of 28.00 was the mean performance score (SD = 2.98).

Objective 3: Determine the association between IV cannulation skills and selected socio demographic variables

There was no significant association between IV cannulation skills and selected socio-demographic variables in demonstration versus video assisted teaching group. The calculated chi square value for age 0.135 and gender 1.6 lesser than t value it was not significant at p level <0.05 in demonstration group, where as in video assisted teaching the calculated chi square value for age 0.609 and previous training0.135 lesser than t value 3.84 and it was not significant at p level <0.05.

Findings supported by Ahlin et al, (2019), that there was no significant association between selected socio demographic variables and IV cannulation skills among

nursing students whereas the findings of the present study contradicted by NowaiL. Keelakai et, al.

Study conducted by Kanishka G., [2013] supported to present study the pre-test level of knowledge and practices of staff nurses on the prevention of problems from intravenous cannula and the specified personal variables are not found to be statistically significant based on chi-square values.

Present Study contrary to the study conducted by D silva BS., [2021] that age had significant association on impact on knowledge and practice. Variable related to demographics There was a strong correlation between age in years and the pretest knowledge score. The knowledge score was not substantially correlated with other characteristics such as years of work experience, educational attainment, or current field of work.

Study contrary to the present study conducted by Ramesh A and Reddy P., [2021] Demographic characteristics did not significantly correlate with their pretest knowledge, there was a strong correlation between the year of experience, a selected demographic variable, and their knowledge. Post-test knowledge and post-test practice scores had a positive link, as indicated by the correlation coefficient of "r" 0.21.

Limitation

- Smaller sample size.
- Sampling method was volunteer's basis or non-randomized sampling method.
- Generalization of study finding was limited.
- Only female subjects were in one selected college.

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Conclusion

This study underscores the importance of innovative teaching methodologies in nursing education to optimize IV cannulation procedural skill acquisition and student learning outcomes. Future research may explore further enhancements and adaptations of demonstration and video-assisted teaching in diverse nursing education contexts.

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