The Journal *of* Medicine, Law *&* Public Health

ISSN (P): 2788-9815
ISSN (E): 2788-791X

JM L&P HEALTH

Vol. 5 No. 1 (2025):Jan-Mar

Effect of Video vs. Lecture/Demonstration in Improving Nursing Interns' Knowledge and Skills Regarding External Ventricular Drain (EVD): A Quasi-Experimental Study

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Submitted:14/08/2024
Accepted:13/09/2024
Published:06/12/2024

Article Link: https://www.jmlph.net/index.php/jmlph/article/view/139

DOI:https://doi.org/10.52609/jmlph.v4i4.139

Citation: Shehadeh, F., Lalithabai, D., AlGhamdi , K., Rababah, A. (2025). Effect of Video vs. Lecture/Demonstration in Improving Nursing Interns' Knowledge and Skills Regarding External Ventricular Drain (EVD): A Quasi-Experimental Study. The Journal of Medicine, Law & Public Health, 5(1), 527-537.

Conflict of Interest: Authors declared no Conflict of Interest.

Acknowledgement: The authors wish to express their sincere gratitude to the nurse interns who volunteered to participate. They also wish to thank the research centre in the study setting for the services provided to facilitate the success of the study.

Effect of Video vs. Lecture/Demonstration in Improving Nursing Interns' Knowledge and Skills Regarding External Ventricular Drain (EVD): A Quasi-Experimental Study

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Abstract—Background: **Healthcare settings ought to consider creative strategies with regard to training nurses in clinical competencies, including trainee nurses and new nurses with limited resources. The aim of this study was to develop a high-quality educational video in order to gauge the effect of video instruction versus lecture demonstration in improving the skills and knowledge of nurse interns on the subject of external ventricular drain.**

Method: **The study used a quasi-experimental post-test design and took place from June 2019 until May 2020. The 80 participants, all nurse interns, were randomly assigned to one of two teaching methods (video instruction or lecture demonstration). The data were gathered using a questionnaire prepared by the researchers.**

Results: **The mean score of the lecture group was 68.2 +/-21.1, and in the video group, 78.5 +/-21.6. This means that the video group outperformed the lecture group in terms of skill (p=0.034). The findings showed no statistically significant difference in the groups' overall knowledge and competence ratings.**

Conclusion: **Video is a sound educational strategy, and the clinical education system can support the use of videos as a complementary method to teach clinical skills**.

Index Terms— **Clinical Education; Clinical Skill; Educational Video; External Ventricular Drain; Nurse Interns; Teaching.**

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DOI: 10.52609/jmlph.v4i4.139

I. INTRODUCTION

Nursing is essential to a safe, effective, and compassionate healthcare system. As such, there are inherent requirements with regard to nurses' technical proficiency, as well as skills in other areas, and a corresponding expectation of nurse educators and clinical nursing leaders to provide adequate professional development [1]. In an era of rapidly developing technology and societal changes, conventional instructional approaches have become inadequate [2]. A variety of teaching methods involving digital devices are being developed in response to these changes, and to increase learner participation [3]. According to meta-analyses, technology has improved learning [4], and much research backs up the efficacy of educational videos [5-7]. When used strategically, videos can be a useful and valuable component of a teaching toolkit [8].

Video is one of the many digital instructional tools available to teach nursing skills. This teaching method encourages more active learning strategies, as compared with the more conventional teaching methods of demonstrating and repeating procedures [9]. Videos that teach particular nursing skills have been the subject of several research publications [10-13], and appear to be a promising, pertinent, and widely-used instructional technique that could improve the standard

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of clinical skills teaching, even if there is a need for further research in the field [14].

Video is useful in the therapeutic setting for putting theoretical information into practice and developing various competencies [15]. Due to its effectiveness as a learning tool that students frequently favour, it is the medium of choice for teaching specific procedures [16]. Additionally, research demonstrates that video lectures are equally successful in imparting knowledge on particular subjects, such as crisis management [17], and necessary skills to students of various learning preferences [18]. A study documented that medical students preferred video-based instruction over traditional teaching for clinical skills such as surgical hand-washing [16]. Furthermore, participants reported great satisfaction with the effectiveness of video in imparting the knowledge and technical skills necessary for chest tube insertion [19]. Even though skill-based videos are growing in popularity among students [11], some studies show that they still prefer video as a complement to demonstration, rather than a replacement [20-21].

Video is becoming more important as a teaching tool, despite the cost and the requirement for teams of highly skilled people to generate even the briefest video content [22]. While video is an effective teaching and learning tool in the digital era, many video resources are less valuable without considering the best pedagogical practices, learning contexts in which video is most effective, and production methods for creating helpful video learning resources [23]. Since the literature contends that the effectiveness of teaching methods determines the calibre of nursing education, there is still some disagreement over the value of clinical educational videos [24-25]. Thus expert teams must create [26], and rigorously evaluate, high-quality educational movies [27].

When designing and implementing a video to be a useful component of the learning process, the instructor must consider three factors: cognitive load, the element of engagement, and encouragement of active learning [8]. A conversational, upbeat approach can augment engagement by using audio and visual components to convey the various aspects of an explanation, and signalling to highlight key ideas or concepts [8]. Studies endorsing the ideas of Brame suggest using short videos [7] and video-based environment technologies with embedded questions to encourage student learning [28, 29].

The setting is highly specialised, and is where clinical educators train new nurses, nurse trainees, and interns. The educational authorities, having investigated creative training methods, developed video-based education with a view to serving a larger number of trainees and using time and resources efficiently. With their recommendations for instructional videos, the study authors created an instructional film using their extensive simulation, clinical, and educational experience. They also considered other suggestions for creating instructional videos [8]. The result was an educational video on External Ventricular Drain (EVD); a medical device used to drain extra cerebrospinal fluid (CSF) from the ventricles of the brain to control elevated intracranial pressure (ICP) developed specifically for the study, to compare the effectiveness of video training versus lecture/demonstrations in enhancing the skills and knowledge of nurse interns on the subject of EVD. We aimed to identify effective teaching strategies, and to examine whether video recordings of lectures improved students' ability to retain information immediately after hearing them. In this study, it was expected that nurse interns in Saudi Arabia would learn more from a recorded lecture than from a live one.

II. MATERIALS AND METHODS

Research design

The study utilised a quasi-experimental research method with a post-test-only design. The experimental group learned about EVD by watching the video, while the control group learned through a lecture/demonstration.

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Setting and study participants

The research was conducted in an acute healthcare setting in Riyadh, KSA, between June 2019 and May 2020. Nurse interns participating in the internship programme at the time of the study were eligible to participate; none had any prior knowledge about the procedure.

The study participants were those nursing interns who fulfilled the sample selection criteria. The estimated sample size was 80; 40 in the experimental group and 40 in the control group.

Group sample sizes of 12 and 12 achieve 99% power to detect a difference of 17.4 between the hypotheses that both group means are 55.1. The alternative hypothesis is that the mean of group 2 is 37.7, with an estimated group standard deviation of 7.8 and 10.5, and with a 0.05 level of significance, using a two-sided sample test.

Inclusion and exclusion criteria

Nurse interns who were available during the study period and had not been exposed to the EVD procedure during their clinical practice in the current setting were included in the study. Interns who were not willing to participate were excluded.

Intervention: Instructional video

The researchers created a video on the subject of EVD, lasting 28 minutes and 18 seconds. The video dealt with aspects of EVD such as its purpose, indications, equipment, procedure, care, and aftercare issues, including zeroing, sampling, leveling, and reading of intracranial pressure (ICP). Using a whiteboard, the video first explained cerebrospinal fluid (CSF), intracranial pressure and external ventricular drainage, indication, care, and complications. The setting for the second part of the video was a well-equipped simulation lab. EVD system parts were clearly shown and explained using real parts and materials, followed by a demonstration of priming the system, calibrating the pressure transducer; fixing zeroing, draining, monitoring, sampling, and dressing.

The script and the steps in the video were based on the literature [30-31]. The video recording, voice recording, and final production were undertaken by a professional team from the (audiovisual) advertising field. The video was recorded on mini-DVD disks (digital) and edited using Adobe Premiere Pro. Five experts reviewed the video for content, clarity, audiovisual technique, setting, voice, and procedure. Their suggestions for content and clarity were incorporated into the final product, but the information presented in the video and lecture remained unchanged.

Data collection instrument

Data were collected using a demographic form, a questionnaire to assess knowledge of EVD, and a competency checklist to assess skills. The questionnaire consisted of 15 multiple-choice questions with a score of 1 for a correct response and 0 for each incorrect answer, while each of the 15 items on the skills checklist could be answered with the options ‘met’ or ‘unmet’. These questionnaires, prepared from the same literature that was used for the video content, were presented to a panel of experts whose suggestions were incorporated. The Cronbach’s alpha value was 0.741, considered a good tool reliability benchmark.

Data collection procedure

Data collection was initiated after receiving approval from the Institutional Review Board. The researchers explained the nature and purpose of the study to the participants and obtained their consent, after which the data were collected. The professional video, based on the latest evidence, was prepared and presented by certified nurse educators supported by video production staff. It was presented on a 50-inch television screen, to groups of 8-10 interns at a time.

The data were collected first from the control group, and then from the experimental group.

Before the intervention, the knowledge questionnaire was completed by the interns and the clinical educators assessed their skills via the checklist.

The participants in the experimental group were

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shown the video, which involved a lecture followed by a demonstration, while the procedure was demonstrated to the control group by a clinical instructor following a lecture. The participants were then given the same questionnaire, and the same educators assessed their skills on the same day.

Statistical analysis

Data were analysed using MS Excel-13 and IBM SPSS 25.0 software. The interns' demographic characteristics, along with their knowledge and skill scores, formed part of the descriptive statistics. Categorical variables were described as frequency, with the frequency percentage and mean ±SD for metric variables. Comparisons were determined by independent t-test to measure mean differences, and the chi-squared or Fisher exact test was used to measure association between categorical variables. Binary logistic regression was performed to explore the association, and all inferences were drawn at 95% confidence interval (CI).

Ethical aspects

The study was approved by the hospital's Institutional Review Board (IRB LOG No. 19-313). Before enrollment, potential participants were informed of the purpose of the research. All participants were assured anonymity and confidentiality, and informed that they could voluntarily terminate their participation at any time.

III. RESULTS

Demographic data

The data analysis showed no significant differences in the random allocation of the 40 nurse interns or the socio-demographic characteristics across the two study groups. Table 1 shows the participants' demographic data.

Table 1. Demographic characteristics of respondents attending EVD training

Characteristic	Description	Control N=40	Experimental N=40	p-value
Gender	Female	26 (65.0)	26 (65.0)	1.000
	Male	14 (35.0)	14 (35.0)	
University	Private	6 (15.4)	2 (5.1)	0.263
	Government	33 (84.6)	37 (94.9)	
Age (yrs)	min - max	22 - 30	22 - 32	0.793
	Mean ± SD	23.5 ± 1.7	23.4 ± 1.7	
Grade	min - max	2.5 - 4.8	2.2 - 4.6	0.991

Knowledge score

Table 2 is a statistical summary of the responses to the items in the knowledge questionnaire. The lecture group had a slightly higher knowledge score than the video group, but the difference was insignificant (p=0.583).

Skill score

Table 3 summarises the skill score of the participants in both groups.

Table 2. Knowledge score of the respondents in both groups

Items	Description	Lecture	Video	p-value
Identifying the action most likely to increase ICP	Incorrect	25 (62.5)	19 (48.7)	0.218
	Correct	15 (37.5)	20 (51.3)	
Calculation of CPP	Incorrect	12 (30.0)	8 (20.5)	0.332

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	Correct	28 (70.0)	31 (79.5)	
The anatomical landmark in the patient's brain used to level the EVD	Incorrect	13 (32.5)	13 (33.3)	0.937
	Correct	27 (67.5)	26 (66.7)	
The nursing intervention in case of decreased level of consciousness, pupillary changes	Incorrect	23 (57.5)	31 (79.5)	.036*
	Correct	17 (42.5)	8 (20.5)	
The acceptable CPP for a patient with severe traumatic brain injury	Incorrect	26 (65.0)	26 (66.7)	0.876
	Correct	14 (35.0)	13 (33.3)	
Controlling the patient's ICP from an environmental viewpoint	Incorrect	13 (32.5)	7 (17.9)	0.137
	Correct	27 (67.5)	32 (82.1)	
The structure that does not have a role in changing ICP	Incorrect	9 (22.5)	9 (23.1)	0.951
	Correct	31 (77.5)	30 (76.9)	
Patients at most risk for increased ICP	Incorrect	5 (12.5)	13 (33.3)	0.027*
	Correct	35 (87.5)	26 (66.7)	
The finding on EVD that must be immediately reported to the doctor	Incorrect	7 (17.5)	10 (25.6)	0.379
	Correct	33 (82.5)	29 (74.4)	
The procedure contraindicated in a patient with increased ICP	Incorrect	18 (45.0)	15 (38.5)	0.556
	Correct	22 (55.0)	24 (61.5)	
The principle to be followed during tracheal suctioning or CSF collection or mobilisation of the patient	Incorrect	9 (22.5)	15 (37.5)	0.143
	Correct	31 (77.5)	25 (62.5)	
The normal value for the ICP reading	Incorrect	10 (25.0)	6 (15.0)	0.264
	Correct	30 (75.0)	34 (85.0)	
Identification and reporting of the Cushing triad, which indicates increased ICP	Incorrect	13 (32.5)	17 (42.5)	0.356
	Correct	27 (67.5)	23 (57.5)	
The bed position to be avoided for patients with increased ICP	Incorrect	18 (45.0)	18 (45.0)	1.000
	Correct	22 (55.0)	22 (55.0)	
Identifying problems with CPP level	Incorrect	29 (72.5)	27 (67.5)	0.626
	Correct	11 (27.5)	13 (32.5)	
Total Percentage Knowledge Score (TPKS)	min - max	20.0 - 93.3	26.7 - 93.3	0.583
	Mean ± SD	61.7 ± 18.5	59.3 ± 19.3	

*Statistically significant
EVD: Extraventricular drain; ICP: intracranial pressure; CPP: Cerebral perfusion pressure; CSF: Cerebrospinal fluid.

Table 3. Skill scores of the respondents in both groups

Items	Description	Lecture	Video	p-value
Introduced self to the patient	Unmet	7 (17.5)	3 (7.5)	0.311
	Met	33 (82.5)	37 (92.5)	
Performed hand hygiene and donned gloves	Unmet	13 (32.5)	9 (22.5)	0.317
	Met	27 (67.5)	31 (77.5)	
Identified the patient by two identifiers	Unmet	9 (22.5)	7 (17.5)	0.576
	Met	31 (77.5)	33 (82.5)	
Explained the procedure to the patient	Unmet	14 (35.0)	10 (25.0)	0.329
	Met	26 (65.0)	30 (75.0)	
Placed the patient in the correct (supine) position	Unmet	6 (15.0)	2 (5.0)	0.263
	Met	34 (85.0)	38 (95.0)	
Placed the transducer at the level of the patient's external meatus (tragus)	Unmet	12 (30.0)	8 (20.0)	0.302
	Met	28 (70.0)	32 (80.0)	
Set the drip chamber to the correct pressure level above the foramen of Monro, as prescribed by the physician, using the spirit level/laser level device	Unmet	8 (20.0)	7 (17.5)	0.775
	Met	32 (80.0)	33 (82.5)	
Drained as ordered by opening and closing the drainage stopcock between the ventricular drainage chamber and the drip bag	Unmet	5 (12.5)	4 (10.0)	1.000
	Met	35 (87.5)	36 (90.0)	
Performed hand hygiene, donned sterile gloves and facemask	Unmet	14 (35.0)	8 (20.0)	0.133
	Met	26 (65.0)	32 (80.0)	
Clamped the tubing to the drain for 5 to 10 minutes before drawing a sample	Unmet	26 (65.0)	18 (45.0)	0.072
	Met	14 (35.0)	22 (55.0)	
Cleaned the CSF sampling port on the EVD tubing with antiseptic solution and allowed the solution to dry	Unmet	23 (57.5)	9 (22.5)	0.001*
	Met	17 (42.5)	31 (77.5)	
Turned the distal stopcock of the transducer tubing off to the transducer	Unmet	15 (37.5)	13 (32.5)	0.639
	Met	25 (62.5)	27 (67.5)	
Slowly withdrew the required CSF sample volume	Unmet	15 (37.5)	14 (35.0)	0.816
	Met	25 (62.5)	26 (65.0)	
Turned the stopcocks to resume monitoring or drainage as prescribed	Unmet	18 (45.0)	12 (30.0)	0.166
	Met	22 (55.0)	28 (70.0)	
Documented the volume, colour, and clarity of CSF drainage	Unmet	6 (15.0)	5 (12.5)	0.745
	Met	34 (85.0)	35 (87.5)	
Total Percentage Skill Score (TPSS)	min - max	20.0 - 100	26.7 - 100	0.034
	Mean ± SD	68.2 ± 21.1	78.5 ± 21.6	

*Statistically significant
EVD: Extraventricular drain; CSF: Cerebrospinal fluid

The mean score in the lecture group was 68.2 +/- 21.1; in the video group, it was 78.5 +/- 21.6. Thus, the video group had a significantly higher skill score than the lecture group (p=0.034). A highly significant difference was observed in the specific skill of cleaning the CSF sampling port (p<0.001).

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Table 4. Association of knowledge and skill with sociodemographic characteristics

Factor (Reference)	Odds ratio	95% CI Lower	95% CI Upper	p-value
Gender (Female)	1.005	0.316	3.202	0.993
Age	0.962	0.688	1.345	0.822
Grade	0.743	0.247	2.235	0.597
University (Private)	3.264	0.472	22.578	0.231
Total Percentage Knowledge Score	0.979	0.951	1.008	0.148
Total Percentage Skill Score	**1.028**	**1.003**	**1.053**	**0.027**
Constant	1.387			0.949

$R^2 = 0.134$

The odds of attaining a high Overall Percentage Skill Score were 1.003 times more likely in the video group (95% CI: 1.003–1.053); otherwise, the difference was not significant. The association between knowledge and skills related to EVD and the four studied variables—gender, age, grade, and type of university—is 13.4%.

IV. DISCUSSION

A high-quality educational video was created for this study, covering the advanced procedure of EVD, with the aim of assessing the knowledge and skills gained through two different educational methods. The findings showed no statistically significant difference between the groups' overall knowledge and competence ratings. The lecture group had a slightly higher knowledge score than the video group, but the difference was insignificant (p=0.583), and the video group outperformed the lecture group with regard to skill. The variation in knowledge might be due to the interactive discussion during the lecture, which was not available for the video group. Numerous studies have found that classroom instruction and video are equally effective in enhancing procedural knowledge [32-36]; however, this study found that video-based lectures are more successful than the standard teaching methods of lecture and demonstration.

Concerning the skill score, the video group performed better than the lecture group in the present study. Other studies have demonstrated the effectiveness of video presentation [37,38], and our results agree with one study that showed great promise for the use of videos in education [39]. While the literature generally supports the use of video in clinical skills, one study contradicted that view [40], noting that video is not an adequate substitute for a live demonstration by teachers for mastering practical skills.

That the lecture group had a slightly higher knowledge score than the video group, while the video group outperformed the lecture group in skill, supports the notion that no one method can replace another. Instead, research generally supports the integration of video into the lecture format, rather than as a substitute [41,42]. The literature also suggests the importance of combining multimedia with standard methods when teaching complex procedures [43, 44].

When interpreting the study results, several limitations should be taken into consideration. This study only involved nurse interns at a frontline hospital care provider site, and the limited sample size is a limitation. Moreover, surveys with self-administered questionnaires conducted cross-sectionally have recall, framing, and rating bias limitations which can result in distorted findings.

These limitations can be addressed by conducting future research with a larger sample size, choosing an advanced procedure in which participants have no prior knowledge, carefully selecting the research questions, and choosing an appropriate data collection method. In addition, as technology advances to im-

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prove high-quality video, the questionnaire and checklist should be revisited for additional changes when conducting future research on this topic.

V. CONCLUSION

This study found no distinction in knowledge acquisition between live lectures with demonstrations and videotaped lectures with demonstrations. Knowledge was gained via both the live demonstration method and the video method. Although the difference was not statistically significant, nursing interns' skill performance was somewhat better in the video group than in the conventional one. The study concluded that video could complement other teaching strategies and training in advanced clinical skills. Based on our conclusions, it is recommended that traditional classroom instruction be combined with video tutorials to enhance clinical proficiency in complex procedures such as EVD. The nurse education and quality improvement administration can use these findings as evidence to support the development of methods to raise the standard of clinical education, with a focus on instructional design. In the long run, video-assisted training may prove to be a financially prudent intervention.

NURSING /PRACTICE IMPLICATIONS

This study shows educators the advantages of combining teaching and learning techniques to better impart clinical skills. It is the duty of nursing educators to integrate various teaching techniques in order to optimise learning, rather than limiting it to the classroom. Nurse educators should encourage the administration to use the study findings to inform data-driven decisions on technology investments, thereby ensuring high-quality and cost-effective video production in clinical education.

FUNDING

This work was financially supported by the research centre of the study setting (Grant no. 019-046).

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGMENTS

The authors wish to express their sincere gratitude to the nurse interns who volunteered to participate. They also wish to thank the research centre in the study setting for the services provided to facilitate the success of the study.

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