

Simulation vs Video-Assisted Learning on Retentivity of Clinical Competency and Knowledge of Basic Airway Devices in Medical Students: A Preliminary Study

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Abstract

Introduction: Teaching and learning challenges are common in clinical learning settings and this research was conducted to determine the effectiveness of learning about simple airway devices using video assistance compared with face-to-face simulated learning.

Methodology: A randomized single-blinded comparative study was conducted over 2 months, employing OBA (One Best Answer) and DOPS (Direct Observation of Practical Skills) to evaluate knowledge and practical skills of 20 third-year medical students without prior exposure to airway adjuncts. Assessments were conducted immediately, at 2 weeks and at 8 weeks post-exposure to either a video or simulated activity. Learning style was identified using a VARK questionnaire before the study.

Results: Mann -Whitney U test showed that during the third DOPS assessment ($U = 17.50$, $p = 0.011$), the simulation group performed better than the video-assisted group with no difference in the first and second assessments. No difference was noted in OBA scores. Friedman test, followed by a Wilcoxon signed-rank test, showed a decrease from the first to the third OBA scores within the video group ($Z = -2.038$, $p = 0.042$), and no change in the simulation group. Learning styles did not influence performance. No differences in knowledge were noted between the two groups but knowledge decay was identified within the video-assisted group.

Conclusion: No difference in knowledge was identified between the two groups. There was knowledge decay within the video-assisted group. Retention of procedural skills was better for the simulation group. The learning styles of students did not affect the outcome. Video-assisted learning can be useful for simple devices for remote learning and enhance blended learning. Further research with a larger sample size would be beneficial.

Keywords: Clinical competency, Simulation, Video-Assisted, Retention, and Knowledge

Introduction

It is deemed unethical to first learn the use of life-changing devices in the workplace, as the lack of knowledge and skills about them equals a breach of patient safety. Education theories theorize that students' performance is directly related to their learning methods, with time,

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their study focus changes from theory-based to critical thinking. Research suggests that video is a powerful tool with research applauding (Dong & Goh 2015 Tayade *et al.* 2018) its use to effectively enhance and complement face-to-face teaching and learning.

Medical education should ensure that graduates are competent with the use of life-saving devices, especially those devices required during the management of a medical emergency such as the bag valve mask, the



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oropharyngeal airway, and the nasopharyngeal airway to name a few.

We aimed to identify if knowledge and practical skills of application of basic airway adjuncts such as the oropharyngeal airway (OPA) and nasopharyngeal airway (NPA) can be taught using video-assisted teaching compared to face-to-face simulated experiences. Visual, Aural, Reading, and Kinaesthetic (VARK Version 8.01), a questionnaire used to determine a learner's learning style was used to identify the learning styles of each participant before the research. (VARK 2014).

Methodology

Study design and setting

This was a randomized single-blinded comparative study involving 20 third-year medical students that explored the outcome of two teaching modalities utilized to teach about airway adjuncts and their application. Consenting students, with no prior knowledge or exposure to oropharyngeal/ nasopharyngeal airway devices were recruited. The study was conducted over 2 months, at the clinical campus of a private medical university.

VARK questionnaire was used to identify learning styles at the beginning of the research. Systematic random sampling was carried out to randomize the students into 2 groups: a simulation group (SG) and a video-assisted Group (VAG). The SG had hands-on learning on a part-task trainer guided by a lecturer while the VAG watched a demonstration on a part-task trainer by the same lecturer with the same learning content. Each time, the same researcher assessed the students' performance on knowledge and practical skills using a 20-item one-best answer question (OBA) and direct observation of procedural skills (DOPS) respectively using a standardized DOPS checklist, blinded to the students' study grouping, and this process was repeated at 2 weeks and 8 weeks post-exposure.

The study was presented and approved by the university's ethical board, IMU Joint Committee

on Research and Ethics Research (IMUJC); Project ID No: CSc /Sem6(18)2019.

Results

There were 10 students in each group, 5 females and 5 males in the VAG and 3 males and 7 females in the SG.

OBA scores

An independent t-test conducted showed no significant difference in OBA scores between the SG and VAG in the immediate, 2 weeks, and 8 weeks post-exposure. Friedman test to test retention showed a statistically significant difference in OBA scores within the VAG in the immediate, 2 weeks, and 8 weeks post-exposure ($\chi^2(2) = 8.162$, $p = 0.017$). (Table 1) Following that, a Wilcoxon signed-rank test was performed as a post hoc test, which showed a statistically significant decrease in participants' OBA scores between the first and third tests ($Z = -2.038$, $p = 0.042$). However, in the SG, Wilcoxon signed-rank test performed after a Friedman test as a post hoc analysis showed no significant difference in performance on the OBA scores from the immediate to 8th week ($Z = -1.613$, $p = 0.107$).

DOPS assessment

Both the video and simulation groups showed no change in performance within their groups during the DOPS assessment in the immediate, 2 weeks, and 8 weeks post-exposure.

An independent t-test conducted on DOPS showed no significant difference between the 2 groups in the first ($t(18) = -1.319$, $p = 0.204$) and second ($t(18) = -1.431$, $p = 0.169$) assessment. However, statistically significant difference was noted in the third DOPS assessment between the video-learning and simulation-assisted groups ($t(18) = -2.795$, $p = 0.012$). (Table 1) In the third DOPS assessment, the mean score in the simulation-assisted group (19.45 ± 0.96) was higher compared to the video-learning group (18.00 ± 1.33) with a difference of 1.45 (95% CI). Mann -Whitney U test showed a significant difference in the third DOPS assessment ($U = 17.50$, $p = 0.011$).

Table 1: Comparing the direct observation procedural skills (DOPS) performance of the teaching modalities (VAG and SG groups)

Test	Method	N	Mean (SD)	t	p-value
DOPS 1	Video	10	18.25 (1.36)	-1.319	0.204
	Simulation	10	18.95 (0.99)		
DOPS 2	Video	10	17.85 (1.87)	-1.431	0.169
	Simulation	10	19.05 (1.86)		
DOPS 3	Video	10	18.00 (1.33)	-2.795	0.012
	Simulation	10	19.45 (0.96)		

DOPS 1,2 and 3 are immediate, post-2 weeks and post-8 weeks respectively

Two major learning styles were identified in both learning groups, which were the multimodal learning style and strong kinesthetic learning style. There was no relationship noted between the learning styles and students' performance in the OBA ($t(20) = 0.646$, $p = 0.526$) and DOPS assessment ($t(20) = 1.184$, $p = 0.252$).

Discussion

Participants from both VAG and SG demonstrated improvement in knowledge and no statistical difference was noted in the OBA scores. The VAG did demonstrate decay in knowledge by 8 weeks which was not noted in the SG. The decay was not significant when scores were compared with the SG. Video-assisted learning can be used for a large group, it is reproducible and helps to compensate for the lack of facility and time. It could be cost-effective as once produced, it can be part of the e-learning curriculum with access to any student at their own time and premises. It affords the freedom of revisiting the pre-recorded procedural skills multiple times if needed (Tayade *et al.* 2018).

A similar study compared the efficacy of video-assisted and simulation-based learning on 144 final-year medical students on skills such as bag and mask ventilation, laryngoscopy, and tracheal intubation. Both groups showed significant improvement in knowledge in the post-test scores in all scenarios, like ours (Morgan *et al.* 2002).

Simulation is more hands-on, albeit on a task trainer, allowing students to repeatedly practice the skill. The use of simulators in clinical training

is an effective way to escalate the student's clinical reasoning and judgment, which ensures patient safety and decreases the incidence of medical error (Offiah *et al.* 2019). The downside is that it needs resources for practice, and often a simulated environment, and cannot be accessed whenever learners want and remotely. Our findings in the 8th week were similar to a study that showed a greater improvement in skills among participants who underwent simulation training for microsurgery compared to video-assisted learning (Sakamoto *et al.* 2017). We found that retention of procedural skills over a short period was the same for both groups in the immediate and post-2 weeks assessments, however, the SG's procedural skills were significantly better than the VAG at week 8. Simulation-based learning might be superior to video-assisted learning by allowing students to apply their knowledge.

Conclusion

There was no significant difference in knowledge between both groups, though there was knowledge decay within the video-assisted group. Retention of procedural skills for a short period may be the same for video-assisted and simulation though simulation seems to be better for longer periods. The learning styles of students did not appear to affect learning outcomes. Video-assisted learning can be useful for simple devices to improve knowledge and skill, especially in situations of remote learning, and enhance blended learning. Further research with a bigger sample size and a follow-up study using more complex devices would be beneficial.

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