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ORIGINAL ARTICLE

Comparison of Effectiveness of Teaching Steps of Abdominal Palpation Using Manikin vs Video Demonstration for First Clinical Year Students

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Abstract

Introduction: Acquiring fundamental procedural skills is crucial for medical graduates to ensure patient safety. Traditional teaching methods may compromise safety, leading to the rise of Simulation-based Medical Education (SBME) and video-based instructional approaches. This study compares the effectiveness of manikin-based and video-based training for abdominal palpation techniques among second-year MBBS students. **Objectives:** The primary objective is to compare the proficiency of students undergoing manikin-based (Group A) and video-based (Group B) training in abdominal palpation techniques. Secondary objectives include assessing specific skill aspects, understanding student perceptions, and exploring gender differences. Methods: A comparative study was conducted among 146 second-year MBBS students, randomly assigned to Group A (manikin skill training) or Group B (video-based skill training). A structured questionnaire with 15 questions assessed skill proficiency. Data were analyzed using SPSS 27, with descriptive statistics, Student's t-test, and subgroup analyses for gender differences. **Results:** High proficiency (>93%) was observed in both groups. Group A had a statistically higher overall score than Group B (14.2 ± 0.69 vs. 13.83 ± 0.98, $P<0.05$). Group A also showed significant advantages in posture and hand position (43.2% vs. 28.2%), superficial palpation (100% vs. 94.4%), and spleen palpation (100% vs. 93%). No significant gender differences were noted within the groups. **Conclusion:** Manikin-based training is superior to video-based training for abdominal palpation techniques, emphasizing the importance of active engagement and hands-on practice in medical education.

Keywords: Simulation based training, video-based training, abdominal palpation, medical education, procedural skills

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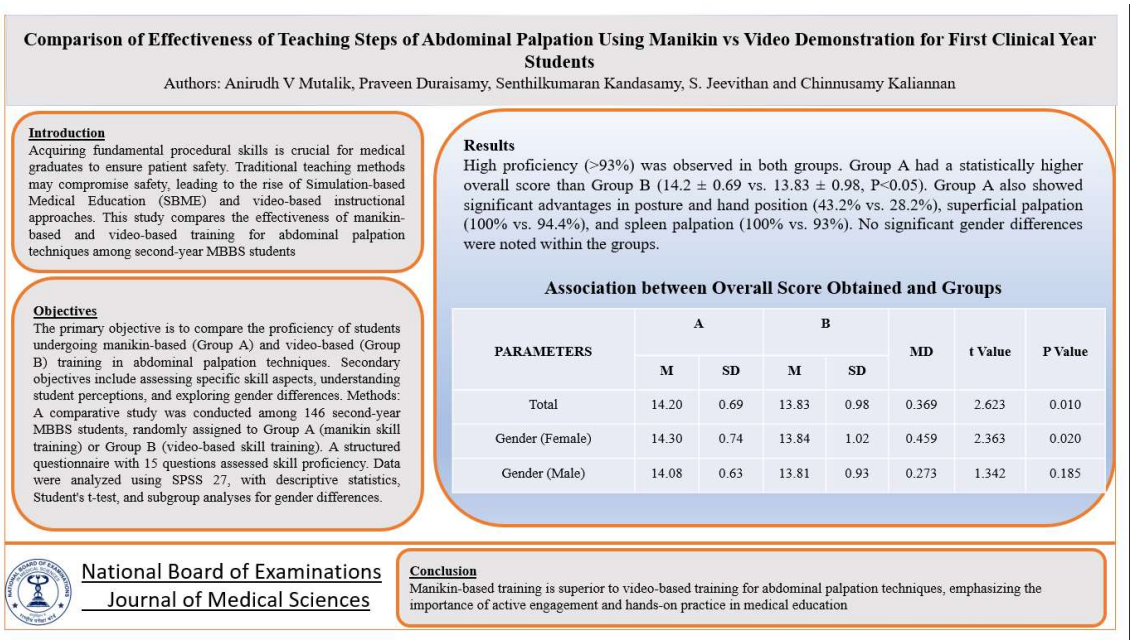
Graphical Abstract



Introduction

Acquiring fundamental procedural skills stands as a crucial competency for medical graduates to ensure patient safety [1]. Traditionally, these skills were imparted through observation of experienced practitioners at the bedside, followed by independent execution on actual human patients [2]. However, this traditional approach raises concerns about compromising patient safety due to potential medication errors. To address these issues, Simulation-based Medical Education (SBME) has emerged as a viable solution [3].

The use of video-based instructional methods presents distinct advantages, particularly in teaching large groups with consistency and authenticity [4]. Studies indicate that video-based education enhances students' ability to learn and replicate clinical skills effectively [5]. This is attributed to the simultaneous processing of auditory and visual information, promoting active learning experiences, increased concentration, and motivation. Structured clinical skill demonstrations through video not only facilitate the acquisition of specific skills and knowledge but also ins till the essential attitudes required for patient care [6-9].

Simulation, defined as a training and feedback method involving practice in lifelike circumstances, has gained prominence in medical education. Initially pioneered in industries such as aviation and aerospace, simulation techniques have found widespread usage in emergency care, anesthesia, and various clinical settings [10]. The adoption of simulation in standardized clinical training creates a safe learning environment where students can engage in repeated learning and retraining without the fear of causing harm to real patients [3,11,12].

Despite significant investments in simulation labs to replicate real clinical settings, the integration of human-like manikins has become common. These advanced manikins offer realistic features to enhance the learning experience. The primary rationale behind using manikins is

to allow students to practice and refine their skills and competencies without posing any risk to human patients.[13]

The effectiveness of simulation in health professionals' education is well-supported by numerous studies, validating its inclusion as a valuable component in training programs. But there are a very few studies that compares the effectiveness between video demonstrations and manikin demonstrations. This study has been aimed to compare the effectiveness of simulation training imparted by video demonstrations with manikin demonstrations.

Materials and Methods

This comparative study, conducted by the Department of General Medicine, involved 146 second-year MBBS students from a tertiary care medical college. The study, conducted between January and July 2022, received ethical committee clearance (01/IHEC/2022), and informed consent was obtained from all participating students.

The participants were divided into two groups: Group A, comprising 75 students exposed to manikin skill training, and Group B, consisting of 71 students who underwent video-based skill training for abdominal palpation techniques. Before the commencement of the study, all students received a comprehensive briefing on abdominal palpation, including its necessity, applications, and implications. Subsequently, the students were randomly assigned to either Group A or B.

To assess their proficiency, a structured questionnaire consisting of 15 questions covering essential steps in abdominal palpation was developed. Each correct step was awarded one mark, partially correct responses received 0.5 marks, and incorrect responses received zero marks. The collected data were entered into Microsoft Excel and analyzed using SPSS 27. Descriptive statistics, including frequency and percentages, along with mean ± standard deviation, were employed. The difference between the two groups was measured using the Student's t-test. Additionally, an analysis of the score differences between male and female students was conducted separately. A significance level of $P<0.05$ was considered statistically significant.

Results

In both groups, a high percentage (>93%: n=136) of participants demonstrated proficiency in various aspects, including self-introduction, hand hygiene before the procedure, positioning the patient correctly, assuming the correct stance, explaining the procedure, deep palpation, liver palpation, inguinal orifice and lymph node palpation. Additionally, approximately 84.2% (n=123) observed the patient's face during the procedure. No statistically significant differences were found between Group A and Group B in these parameters.

In terms of posture and hand placement of the students, 43.2% (63) of the study population excelled. Among them, 57.3% (43) belonged to Group A, while 28.2% (20) were from Group B. A notable 97.3% (142) of students performed superficial palpation correctly, with 100% (75) accuracy in Group A and 94.4% (67) in Group B. For spleen palpation, 96.6% (141) performed correctly overall, with all participants (75) in Group A and 93% (66) in Group B. A statistically significant difference between the two groups was observed in these specific parameters (Table 1).

Table 1. Distribution of Marks obtained According To OSCE Check List

	Over all						**Group A**						**Group B**					
	0		**0.5**		**1**		**0**		**0.5**		**1**		**0**		**0.5**		**1**	
Introduce self	0	0.0	2	1.1	144	98.6	0	0.0	2	2.7	7.3	97.3	0	0.0	0	0.0	75	100.0
Wash hands	0	0.0	1	0.7	145	99.3	0	0.0	1	1.3	74	98.7	0	0.0	0	0.0	75	100.0
Patient in right position	0	0.0	2	1.4	144	98.6	0	0.0	2	2.7	73	97.3	0	0.0	0	0.0	75	100.0
Student in right position	0	0.0	1	0.7	145	99.3	0	0.0	0	0.0	75	100.0	0	0.0	1	1.4	74	98.6
Explaining the procedure to patient	0	0.0	4	2.7	142	97.3	0	0.0	4	5.3	71	94.7	0	0.0	0	0.0	75	100.0
Posture and hand placement of the student	1	0.7	82	56.2	63	43.2	1	1.3	31	41.3	43	57.3	0	0.0	51	71.8	20	28.2
Superficial palpation	0	0.0	4	2.7	142	97.3	0	0.0	0	0.0	75	100.0	0	0.0	4	5.6	67	94.4
Deep palpation	0	0.0	3	2.1	143	97.9	0	0.0	0	0.0	75	100.0	0	0.0	3	4.2	68	95.8
Observe patient face	0	0.0	23	15.8	123	84.2	0	0.0	10	13.3	65	86.7	0	0.0	13	18.3	58	81.7

Liver palpation	0	0.0	2	1.4	144	98.6	0	0.0	0	0.0	75	100.0	0	0.0	2	2.8	69	97.2
Spleen palpation	0	0.0	5	3.4	141	96.6	0	0.0	0	0.0	75	100.0	0	0.0	5	7.0	66	93.0
Renal palpation	0	0.0	40	27.4	106	72.6	0	0.0	16	21.3	59	78.7	0	0.0	24	33.8	47	66.2
Gallbladder palpation	0	0.0	100	68.5	46	31.5	0	0.0	49	65.3	26	34.7	0	0.0	51	71.8	20	28.2
Inguinal orfice palpation	0	0.0	5	3.4	141	96.6	0	0.0	0	0.0	75	100.0	0	0.0	5	7.0	66	93.0
Inguinal lympnode palpation	0	0.0	10	6.8	136	93.2	0	0.0	3	4.0	72	96.0	0	0.0	7	9.9	64	90.1

Table 2. Association between Overall Score Obtained and Groups

PARAMETERS	**A**		**B**		**MD**	**t Value**	**P Value**
	M	**SD**	**M**	**SD**			
Total	14.20	0.69	13.83	0.98	0.369	2.623	0.010
Gender (Female)	14.30	0.74	13.84	1.02	0.459	2.363	0.020
Gender (Male)	14.08	0.63	13.81	0.93	0.273	1.342	0.185

When comparing the overall scores of Groups A and B, a statistically significant difference emerged (14.2 ± 0.69 in Group A vs 13.83 ± 0.98 in Group B). Further analysis based on gender revealed a significant difference between procedures for females (13.24 vs 13.84), while no difference was observed among males (14.08 vs 13.81) (Table 2).

Discussion

This cross sectional study was conducted to understand the effectiveness of manikin teaching on video based skill teaching. Students were able to impart better skill and knowledge using simulated techniques compared to traditional methods of teaching [9,10,13]. There was a slight significant high score in manikin teaching compared to video based teaching. Similar result was observed in a study done by Adiyeninka et al. [14].

The results of the study indicate that there was a statistically significant difference between the two groups, favouring manikin-based skill training (Group A) over video-based training (Group B). The argument that manikin training is superior may stem from the active involvement of students in performing procedures rather than merely observing them in a video.

The Peyton Four-Step Approach, which includes Demonstration, Deconstruction, Comprehension, and Performance, is a relevant framework to consider in this context. In Group A (manikin training), students likely experienced a comprehensive Peyton approach. They were first demonstrated the procedure using the manikin, followed by a step-by-step breakdown (deconstruction) of the skill, ensuring a deep understanding (comprehension). Finally, students actively performed the procedure on the manikin, achieving the final step of the Peyton approach (performance).

On the other hand, in Group B (video training), students might have had limited opportunities to actively engage with the procedure. While video-based education offers the advantage of simultaneous auditory and visual processing, it may lack the hands-on, experiential learning component that is crucial in developing procedural skills. The Peyton approach emphasizes the importance of active participation and hands-on practice for effective skill acquisition [9,11-15].

The statistically significant difference in overall scores between the two groups suggests that the manikin-based training approach had a more positive impact on students' performance in abdominal palpation techniques. The tactile feedback, realistic simulation, and active participation offered by manikin training likely contributed to a better understanding and execution of the skills compared to video-based training.

Conclusion

The findings support the notion that manikin-based skill training is more effective than video-based training in this context. The Peyton Four-Step Approach aligns with this observation, emphasizing the importance of active engagement and hands-on practice in the learning process. Incorporating manikin-based training methodologies in medical education can enhance procedural skills, ensuring that students are not merely passive observers but active participants in their learning journey.

Statements and Declarations

Conflicts of interest

The authors declares that they do not have conflict of interest.

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Ethical Approval

Ethical approval from ethical committee clearance (01/IHEC/2022)

Informed Consent

Informed consent was obtained from all participating students.

References

1. Kundra S, Singh T. Feasibility and acceptability of direct observation of procedural skills to improve procedural skills. Indian Pediatr. 2014;51(1):59-60.
2. Yaeger KA, Halamek LP, Coyle M, Murphy A, Anderson J, Boyle K, et al. High-fidelity simulation-based training in neonatal nursing. Adv Neonatal Care. 2004;4:326-31.
3. Kalaniti K, Campbell DM. Simulation-based medical education: time for a pedagogical shift. Indian Pediatr. 2015;52(1):41-5.
4. Hansen M, Oosthuizen G, Windsor J, Doherty I. Enhancement of medical interns' levels of clinical skills competence and self-confidence levels via video iPods: Pilot randomized controlled trial. J Med Internet Res 2011;13:e29.
5. Coffee J, Hillier S. Teaching pre-cursor clinical skills using an online audio-visual tool: An evaluation using student responses. MERLOT J Online Learn Teach 2008;4:469-76.
6. Baggett P. Role of temporal overlap of visual and auditory material informing dual media associations. J Educ Psychol 1984;76:408-17.
7. Choi HJ, Johnson SD. The effect of problem-based video instruction on learner satisfaction, comprehension and retention in college courses. Br J Educ Technol 2007;38:885-95.
8. Choi HJ, Johnson SD. The effect of context-based video instruction on learning and motivation. Am J Dist Educ 2005;19:215-27.
9. Padmavathi R, Omprakash A, Kumar AP. Video demonstration as a teaching-learning method for a core clinical skill among undergraduate medical students: An interventional study. Nat J Physiol Pharm Pharmacol 2019;9(6):547-550.
10. Zafar M. Medical students' perceptions of the effectiveness of integrated clinical skills sessions using different simulation adjuncts. Adv Physiol Educ. 2016;40(4):514-21.
11. Doo H, Lee Y. Perception of nursing students' experience of simulation based learning: an application of Q-Methodology. International Journal of Bio-Science and Bio-Technology. 2016;8(1):313-28.
12. Lavanya SH, Kalpana L. Mannequin-based simulation as an educational tool for learning injection techniques: medical students' view points. Int J Basic Clin Pharmacol 2018;7:882-7.
13. Handeland JA, Prinz A, Ekra EMR, Fossum M. The role of the manikins in nursing students' learning: A systematic review and thematic metasynthesis. Nurse Education today. 2020;98:104661.

14. Adeyinka A, Chahin N, Bochankova T, Caprusso F, Pinto R, Pierre L. Video versus mannequin training as a teaching tool for paediatric advanced airway management. Critical Care Medicine 2013: 41(12): A116.
15. Giacomino K, Caliesch R, Sattelmayer KM. The effectiveness of the Peyton's 4-step teaching approach on skill acquisition of procedures in health professions education: A systematic review and meta-analysis with integrated meta-regression. PeerJ. 2020 Oct 9;8:e10129.