

Instructional Video versus Real-time Demonstration for Training Phase I MBBS Students in Basic Clinical Skills: A Quasi-experimental Study

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ABSTRACT

Introduction: Clinical skill training is traditionally imparted through demonstrations, where students directly observe the procedure. However, with increasing student numbers and limited faculty, real-time demonstrations may face issues such as overcrowding, limited opportunities for supervision and inconsistency when taught by different faculty. Instructional videos for clinical skills are now gaining attention as an alternate teaching method.

Aim: To compare the effectiveness of instructional video with real-time demonstration, for training in basic clinical skills, among phase I MBBS students, and to analyse the perception of students of the two methods.

Materials and Methods: This quasi-experimental study was conducted in the Department of Physiology of Sree Gokulam Medical College and Research Foundation, Thiruvananthapuram, Kerala, India, from February 2025 to July 2025. It included 150 MBBS students of phase I. Six clinical skills in physiology were selected for teaching, which included knee jerk, biceps jerk, plantar reflex, pupillary light reflex, ocular movements and Rinne's test. Students were divided into three batches of 50 each. Each batch was further divided into two groups of 25 each; one group was trained in a clinical skill by real-time demonstration, whereas the other group was taught using an

instructional video, recorded in the department. Following the intervention, the students in both groups were assessed by an Objective Structured Practical Examination (OSPE) by faculty in the department. After three sessions, crossover was done so that all students could be exposed to both teaching methods. The preference of students to both methods was assessed by a 5-item Likert scale. The post-intervention OSPE scores were compared, and statistical analysis was performed using the Mann-Whitney U test.

Results: Out of the 150 students included in the study, 108 were females and 42 were males. The participants were aged 18–21 years, with a mean age of 19.2 ± 1.4 years. Students taught via instructional videos showed significantly higher median and mean OSPE scores for plantar reflex {median of 4 (IQR 3-4), mean score of 3.68 ± 1.03 , p-value < 0.01 } and pupillary reflexes {median=4, IQR (3-4.5), mean= 3.8 ± 0.91 , p-value=0.001}. For the other skills, knee jerk, biceps jerk, ocular movements, and Rinne's test, although differences were not statistically significant, the instructional video method showed higher central tendency measures. The mean preference score was significantly higher for instructional videos across all five items.

Conclusion: Instructional videos were found to be an effective and preferred method for clinical skill training among students in phase I of the MBBS.

Keywords: Bachelor of Medicine and Bachelor of Surgery, Clinical competence, Medical education, Undergraduate teaching, Video recording

INTRODUCTION

The acquisition of clinical skills is a fundamental component of undergraduate medical education. With increasing student numbers and limited faculty availability, alternative teaching strategies such as instructional videos are gaining prominence [1,2]. Although real-time demonstrations allow students to observe procedures directly, they present challenges, including overcrowding, variability in demonstration styles, limited faculty oversight of student performance, and difficulty for students in recalling steps during revision [1,3-5].

Evidence suggests that video-assisted demonstrations are effective for clinical and practical skills training. Das A and Praseeda I reported significantly higher OSPE scores among students taught haematology exercises using video-assisted methods compared to conventional demonstrations [1]. Similarly, Padmavathi R et al., showed that a video-based tool improved undergraduate students' performance in blood pressure measurement [3], while Subhash S et al., demonstrated that multimedia-enhanced teaching improved both knowledge and psychomotor skills in physiology practical [6]. Arun Kumar AS also found higher mean scores with

video-assisted teaching of knee joint examination compared to traditional demonstration [7]. Studies in dental education, such as that by Mirkarimi M et al., have shown that live and videotaped demonstrations can be equally effective and complementary [8]. Furthermore, Jang HW et al., reported that online clinical videos had a positive impact on clinical skills learning and OSPE preparation among students across 31 Korean medical schools [2]. Research also supports the role of instructional videos in improving student confidence and skill competence [9].

Despite growing evidence, limited studies have evaluated the effectiveness of instructional videos for clinical skill training among phase I MBBS students [3]. The present study was therefore conducted to address this gap. Hence, the study aimed to compare the effectiveness of instructional video with real-time demonstration, for training in basic clinical skills, among phase I MBBS students and to analyse the perception of students of the two methods.

The Null Hypothesis was that there is no significant difference in the effectiveness of teaching basic clinical skills using instructional videos versus real-time demonstrations, for phase I MBBS students. The alternate hypothesis stated that there is a significant

difference in the effectiveness of teaching basic clinical skills using instructional videos versus real-time demonstrations, for phase I MBBS students.

MATERIALS AND METHODS

This quasi-experimental study was conducted in the Physiology Department of Sree Gokulam Medical College and Research Foundation, Thiruvananthapuram, Kerala, India, from February 2025 to July 2025. The study commenced after obtaining Ethics committee approval, SGMC (IEC/63/832/05/2025/F). The study's objectives were presented to the students at the beginning of the study, and informed consent was obtained from them.

Inclusion criteria: Phase I MBBS students who were willing to participate were included.

Exclusion criteria: Students who were absent on the day of the study were excluded.

Sample size calculation: The sample size was calculated for comparison of two independent means using a two-sided test with significance level (α) of 0.05 and statistical power of 80% ($1-\beta=0.80$). The required sample per group was estimated using the formula:

$$n=2(Z_{1-\alpha/2}+Z_{1-\beta})^2/d^2$$

where:

- n = required sample size per group
- $Z_{1-\alpha/2}$ = standard normal deviate corresponding to the desired two-sided significance level (for $\alpha=0.05$, $Z=1.96$)
- $Z_{1-\beta}$ = standard normal deviate corresponding to the desired power (for 80% power, $Z=0.84$)
- d = standardised effect size (Cohen's d)

Assuming a large effect size of $d=0.8$ based on previous literature [9], the minimum required sample size was approximately 25 participants per group. However, the entire eligible cohort of 150 students was included to enhance study power.

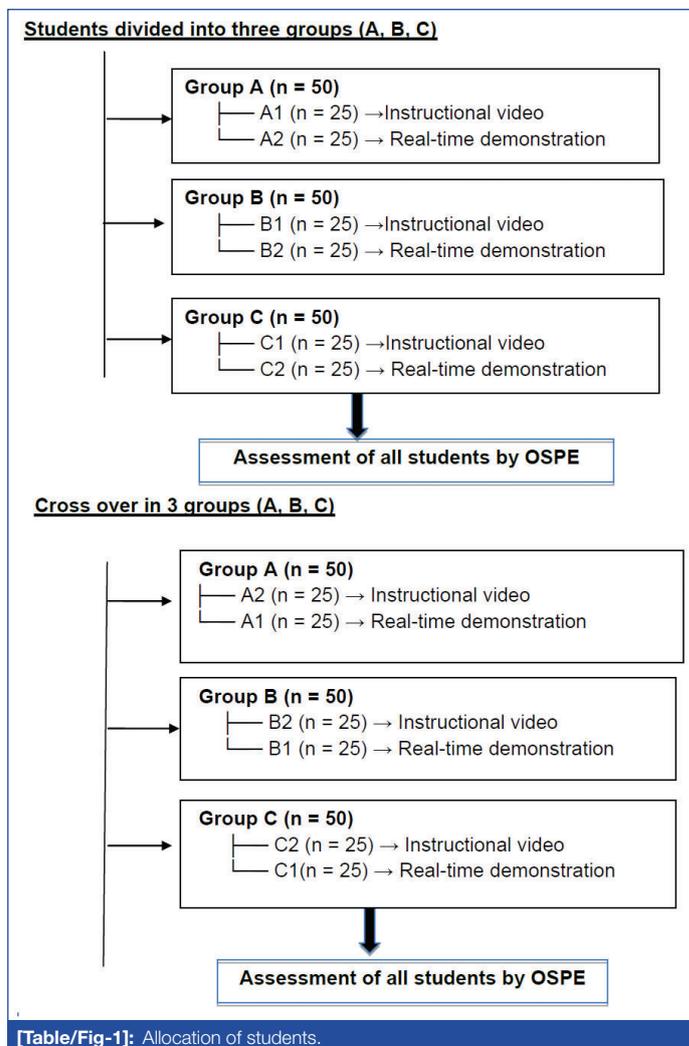
Study Procedure

A total of six clinical skills were selected for teaching the students, which included knee jerk, biceps jerk, plantar reflex, pupillary light reflex, ocular movements and Rinne's test. The study was conducted during the scheduled laboratory hours in the Department of Physiology by postgraduate faculty. Total 150 students of phase I MBBS were divided into three batches of 50 each (A, B, C). The allocation was non random, consistent with the quasi-experimental design. As the allocation was non random, the possibility of selection bias cannot be excluded. Each batch was further divided into two groups of 25 each; one group was trained in a clinical skill by real-time demonstration, whereas the other group was taught the same skill using an instructional video, recorded in the Physiology Department. After the intervention, the students in both groups were assessed by an OSPE using a prevalidated checklist developed through faculty consensus, for skill assessment [ANNEXURE-1].

After three sessions, a cross-over was done where the group which was taught by an instructional video previously was trained by real-time demonstration and vice versa. In this manner, each of the students was trained in two of the selected skills, one by instructional video and the other by real-time demonstration, so that it was possible to obtain their perception of both the teaching methods [Table/Fig-1]. The perception of students of both methods was assessed by a 5-item Likert scale, through a Google form [ANNEXURE-2].

Data collection tools:

- **OSPE assessment score sheet:** For each skill, it was observed as to whether the students were performing all the steps of the examination correctly. Marks were allotted as per the validated checklist for skill assessment in the department of physiology, on a scale of 0 to 5. Students performing all the steps correctly



[Table/Fig-1]: Allocation of students.

were awarded a score of five, and marks were deducted for each incorrect step as per the checklist [Annexure-1].

- **A 5-point questionnaire, using a Likert scale-** was used for student perception, based on a similar previous study [10]. This was collected through Google form and included the following questions: (i) Instructional videos have helped me understand the clinical skills more effectively than real-time demonstrations; (ii) Chance of missing out on important steps is more during real-time demonstrations as compared to Instructional videos; (iii) I could retain in my memory the information from Video assisted demonstrations better compared to real-time demonstrations; (iv) Instructional videos are more convenient than real-time demonstrations for learning at my own pace; (v) Instructional videos ensure better uniformity in the teaching process compared to Real-time demonstrations, when taken by different faculty. Reliability coefficient (Cronbach's alpha) of this questionnaire was 0.87, indicating good internal consistency [ANNEXURE-2].

STATISTICAL ANALYSIS

Post-intervention OSPE scores obtained were entered in Excel Sheet. Categorical and quantitative variables were expressed as frequency (percentage) and mean \pm SD, respectively. Mann-Whitney U Test, a non parametric alternative to the t-test, was used to compare ordinal parameters between groups, given the ordinal nature of the OSPE scores and potential non normality. Transformed z score was obtained. For all statistical interpretations, a p-value <0.05 was considered the threshold for statistical significance. Statistical analysis was performed by using IBM Statistical Package for Social Sciences (SPSS) Statistics version 20.0. Responses of students regarding the perception of both methods were analysed using descriptive statistics.

RESULTS

Out of the 150 students who had participated in the study, 108 were female, and 42 were male. Participants were in the age group of 18-21 years with a mean age of 19.2 ± 1.4 years. The median and mean OSPE scores were found to be higher in the instructional video group across most skills.

For plantar reflex, students taught through instructional videos obtained a median score of 4 (IQR: 3–4) and a mean score of 3.68 ± 1.03 , which was significantly higher than that of the real-time demonstration group (median: 2, IQR: 1–3; mean: 2.36 ± 1.29 ; p -value < 0.01). Similarly, for the pupillary light reflex, the instructional video group demonstrated significantly higher scores (median: 4, IQR: 3–4.5; mean: 3.8 ± 0.91) compared to the demonstration group (median: 3, IQR: 2–3.5; mean: 2.68 ± 1.22 ; p -value = 0.001). Although the differences for knee jerk, biceps jerk, ocular movements and Rinne's test were not statistically significant, the instructional video method consistently showed higher central tendency measures [Table/Fig-2].

Clinical skill	Instructional video (Mean±SD)	Real-time demonstration (Mean±SD)	Instructional video median (IQR)	Real-time demonstration median (IQR)	z* score	p-value
Plantar reflex	3.68±1.03	2.36±1.29	4 (3 - 4)	2 (1 - 3)	3.52**	$p < 0.01$
Pupillary light reflex	3.8±0.91	2.68±1.22	4 (3 - 4.5)	3 (2 - 3.5)	3.25**	0.001
Biceps jerk	2.68±1.18	2.24±1.05	2 (2–3.5)	2 (1.5–3)	1.53	0.125
Ocular movements	3.52±0.82	3.28±1.14	3 (3–4)	3 (2–4)	0.76	0.447
Rinne's test	2.60±1.19	2.24±1.01	2 (2–3.5)	2 (1.5–3)	1.12	0.262
Knee jerk	3.52±1.08	3.52±0.82	4 (2.5–4)	3 (3–4)	0.12	0.903

[Table/Fig-2]: Comparison of OSPE scores between instructional video and real-time demonstration groups for training in clinical skills.

*Mann-Whitney U Test; U statistic transformed into z-score; **Significant at 0.01 level

Overall, combined analysis revealed a significantly higher mean OSPE score for the instructional video group (3.3 ± 1.13) than for the real-time demonstration group (2.72 ± 1.19) p -value < 0.01 , indicating the effectiveness of video-based instruction in enhancing clinical skill acquisition. Despite similar median values, the distribution differed significantly between groups [Table/Fig-3].

OSPE score	Instructional video	Real-time demonstration	Z*	p-value
	n (%)	n (%)		
0	2 (1.3)	1 (0.7)	4.19*	$p < 0.01$
1	3 (2.0)	25 (16.7)		
2	36 (24.0)	40 (26.7)		
3	39 (26.0)	45 (30.0)		
4	47 (31.3)	27 (18.0)		
5	23 (15.3)	12 (8.0)		
Mean±SD	3.3±1.13	2.72±1.19		
Median (IQR)	3 (2-4)	3 (2-4)		

[Table/Fig-3]: Overall effectiveness of instructional videos over real-time demonstrations for training among MBBS Phase I students based on the OSPE scores.

*Mann-Whitney U Test; U statistic transformed into z-score; **Significant at 0.01 level

Perception of students to both methods showed a higher mean preference score for instructional videos across all five items [Table/Fig-4].

Question	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)	Mean±SD
1. Better understanding with instructional videos	38 (25.3%)	57 (38.0%)	41 (27.3%)	14 (9.3%)	0	3.79±0.93
2. Higher chance of missing steps during real-time demonstration	47 (31.3%)	76 (50.7%)	20 (13.3%)	7 (4.7%)	0	4.11±0.85
3. Better retention with instructional videos	46 (30.7%)	63 (42.0%)	27 (18.0%)	14 (9.3%)	0	3.94±0.93
4. More convenient for self-paced learning	45 (30.0%)	70 (46.7%)	26 (17.3%)	9 (6.0%)	0	4.01±0.85
5. Better uniformity in teaching with instructional videos	43 (28.7%)	75 (50.0%)	27 (18.0%)	5 (3.3%)	0	4.04±0.78

[Table/Fig-4]: Student response: preference for instructional video versus real-time demonstration.

DISCUSSION

In this quasi-experimental study, instructional videos produced higher overall OSPE scores than traditional demonstrations (mean 3.30 ± 1.13 vs 2.72 ± 1.19 , p -value < 0.01), with statistically significant gains for two skills—the plantar reflex and pupillary light reflex. These findings align with earlier Indian studies reporting superior performance following video-assisted learning, including the study by Das A and Praseeda I [1], which demonstrated significantly higher haematology practical scores in students exposed to video-assisted demonstrations, as well as Padmavathi R et al., who reported better outcomes for students trained through video demonstration in a core clinical skill [3]. These findings also parallel evidence from dental and allied health education, where procedure-specific instructional videos significantly enhanced skill competency compared with live demonstration alone [Table/Fig-5] [11-17].

The obtained findings also align with systematic reviews, which conclude that video-based learning improves psychomotor skill

acquisition when procedures are standardised and have visual clarity [18,19].

Not all skills in this study showed statistically significant improvement. This is similar to the study by Kaur K et al., which showed that while videos enhance demonstration fidelity and learner autonomy, they cannot fully substitute the haptic and interactive components of bedside skill teaching [20]. The higher mean preference score for instructional videos obtained from students is similar to the findings of other studies where medical students reported a high acceptability and positive attitudes towards online instructional videos [1,6].

Limitation(s)

The study was conducted among students from a single phase within one institution, which may restrict the generalisability of the findings to broader student populations. Skill acquisition was assessed immediately after the intervention, reflecting mainly short-term recall; therefore, further research is needed to determine long-term retention and the translation of these skills into actual clinical performance. In addition, the use of a quasi-experimental design with convenience sampling and non random group allocation introduces the possibility of selection bias, which may affect the internal validity of the study.

CONCLUSION(S)

Instructional videos were found to be an effective and preferred method for teaching selected basic clinical skills to undergraduate

S. No.	Author(s)	Place and year of study	Participants / Skill	Objectives	Main finding
1.	Hamzah NR et al., [11]	Malaysia, 2025	Healthcare students/ procedural skills	To evaluate the effect of segmented-interactive video demonstrations on procedural skill performance among healthcare students.	Segmented-interactive video demonstrations resulted in better procedural performance compared to conventional demonstration.
2.	Madavan K and Kakkoprath T [12]	India,2022	Medical interns/ ACLS	To compare the effectiveness and perception of DOAP versus video-assisted learning in ACLS training among interns.	Video-assisted learning was as effective as DOAP for cognitive and psychomotor skill acquisition, with positive learner perception.
3.	Ghahfarokhi MM et al., [13]	Iran,2022	Nursing students/ haemodialysis skills	To compare demonstration, video display, and virtual social networks in teaching haemodialysis clinical skills.	Video-based learning produced comparable skill outcomes to live demonstration, with greater accessibility and engagement.
4.	Pillai SS and Pillai SK [14]	India,2020	Medical students/ deep tendon reflexes	To compare DOAP and video-assisted teaching for learning deep tendon reflex examination.	Video-assisted teaching yielded OSPE scores comparable to the DOAP method.
5.	George PP et al., [15]	India	Medical students/ paediatric clinical skills	To compare video demonstrations and bedside tutorials for teaching paediatric clinical skills to large student groups	Video demonstrations were as effective as bedside tutorials, particularly useful for large-group teaching.
6.	Chuang YH et al., [16]	Taiwan,2018	Nursing students/ clinical skills	To determine the effect of smartphone-based skill videos on clinical competence and self-confidence of nursing students.	Smartphone-based video demonstrations significantly enhanced skill competence and self-confidence.
7.	Hansen M et al., [17]	New Zealand, 2011	Medical interns/ procedural clinical skills	To assess whether video-based learning improves clinical skill competence and self-confidence among medical interns.	Video-assisted learning significantly improved clinical competence and self-confidence compared to standard instruction.
8.	Present study	India,2025	Phase I MBBS students	To compare the effectiveness of Instructional video with real-time demonstration, for training in basic clinical skills, among Phase I MBBS students and to analyse the perception of students, to the two methods	Instructional videos were found to be an effective and preferred method of clinical skill training, with students attaining higher median and mean OSPE scores

[Table/Fig-5]: Research studies showing the comparative effectiveness of video-assisted or multimedia-based teaching versus traditional demonstration methods [11-17].

medical students, particularly those that are visually demonstrable and stepwise in nature. While videos improved overall OSPE performance and student satisfaction, their optimal use would be a blended learning strategy that combines standardised video demonstrations with supervised hands-on practice and timely feedback. Therefore, incorporation of structured instructional videos may be considered in skill-training modules while ensuring adequate opportunities for deliberate practice to maximise competency development.

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Date of Submission: **Oct 22, 2025**Date of Peer Review: **Nov 13, 2025**Date of Acceptance: **Feb 16, 2026**Date of Publishing: **Apr 01, 2026****[ANNEXURE 1]****Checklist for OSPE****1. Elicit Knee Jerk**

S. No.	Procedure	Marks
1	Stand on the right-side of the subject and take consent	½
2	Instruct the subject Position the subject (Subject may be examined either supine or sitting) Sitting: Subject should sit on a table with legs dangling down Lying down: The examiners hand is passed under the knee to be tested and placed on the opposite knee. Knee to be tested, rests on the dorsum of the examiners forearm	1
3	Feel the patellar tendon	½
4	Strike the quadriceps tendon just above its insertion over the patella	1
5	Look for extension of the knee	½
6	Repeat the procedure on the opposite side	1
7	Report your findings	½
	Total	5

2. Elicit Biceps Jerk

S. No.	Procedure	Marks
1	Stand on the right-side of the subject, take consent	½
2	Explain the procedure. Position him appropriately (test can be done in a sitting or supine position, elbow is flexed at right angles and forearm is placed in a semi prone position)	1
3	Examiner then places his thumb on the biceps tendon and strikes it with the knee hammer	1 ½
4	Repeat the procedure on the opposite side	1 ½
5	Report your findings	½
	Total	5

3. Elicit Plantar reflex

S. No.	Procedure	Marks
1	Stand on the right-side of the subject, take consent	½
2	Ask the subject to lie on the examination table and fix the foot in position by holding the leg just above the ankle	1
3	Run a blunt object along the lateral edge of the sole of the foot moving towards the base of the little toe and then turn medially towards the base of the big toe	1
4.	Observe the movement of the big toe and other toes	1
5	Repeat on the other side	1
6	Report your findings	½
	Total	5

4. Elicit pupillary light reflex

S. No.	Procedure	Marks
1	Stand on the right side of the subject take consent	½
2	Explain the test procedure. Ask the subject to look at a distant object and check the functioning of the torch	½
3	Direct light reflex: Cover one eye and shine the light into the other eye (bring the light source from behind) Simultaneously look for constriction of the pupil of that eye.	1
4	Repeat step 4 in the other eye	½
5	Indirect light reflex: Ask the subject to place the palm of the hand in between the two eyes. The light is shone into one eye and pupillary constriction is looked for in the unstimulated eye	1
6	Repeat step 6 on the other side	1

7	Report your findings	½
	Total	5

5 Elicit Ocular Movements (III, IV, VI Cranial nerves)

S. No.	Procedure	Marks
1	Stand on the right-side of the subject take consent	½
S. No.	Look for the presence of Ptosis or squint. Ask the subject to keep the head still. Hold your finger vertically around 50 cm in front of the patient and ask the subject to follow the finger with his eyes.	2
1	The examiner moves his finger steadily to one side, then up and down, then to the other side describing the letter H in the air	1 ½
4	Check for diplopia while testing for ocular movements	½
5	Report your findings	½
6	Total	5

6. Rinnes test (Vestibulocochlear nerve)

S. No.	Procedure	Marks
1	Stand on the right-side of the subject take consent	½
2	Select the Tuning fork with appropriate frequency (256 or 512 Hz) Explain the procedure to the subject, Set the tuning fork to vibrate and keep the base over the mastoid process	2
3	Instruct the subject to indicate by raising his finger, when he can no longer hear the sound	½
4	Transfer the still vibrating tuning fork to the side of the subject's head close to the ear and ask the subject if he can still hear the sound	½
5	Repeat on the other side	1
6	Report your findings	½
	Total	5

[ANNEXURE 2]

Likert Scale Questionnaire Instructional video versus real-time demonstration for training phase I MBBS students in basic clinical skills

Instructions: Please indicate your level of agreement with the following statements by selecting one of the options (1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree).

S. No.	Question	1	2	3	4	5
1	Instructional videos have helped me understand the clinical skills more effectively than real-time demonstrations					
2	Chance of missing out on important steps is more during real-time demonstrations (due overcrowding and distractions) as compared to instructional videos.					
3	I could retain in my memory the information from video-assisted demonstrations better compared to real-time demonstrations					
4	Instructional videos are more convenient than real-time demonstrations for learning at my own pace					
5	Instructional videos ensure better uniformity in the teaching process compared to real-time demonstrations when taken by different faculty					