ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 17, Issue, 04, pp.32680-32685, April, 2025
DOI: https://doi.org/10.24941/ijcr.48837.04.2025

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

REVIEW ARTICLE

INTRODUCTION OF SHORT VIDEO-BASED BEDSIDE TEACHING MODULE AS AN ADJUNCT TO TRADITIONAL TEACHING FOR REFINING CLINICAL EXAMINATION SKILLS AMONG UNDERGRADUATE STUDENTS IN GENERAL SURGERY: A PILOT STUDY

***Kusum Meena, Sudipta Saha, Priyanka Dedha and Saba Fatima**

Lady Hardinge Medical College, New Delhi, India

ARTICLE INFO

Article History:
Received 20th January, 2025
Received in revised form
19th February, 2025
Accepted 26th March, 2025
Published online 30th April, 2025

Key words:

Short Video Based Modules, Clinical Examination Skills.

.

**Corresponding author:*
Kusum Meena

ABSTRACT

Background: Despite documented deficiencies in clinical skills, medical school and residency curricula do not emphasize clinical skills teaching or assessment. ***Methodology:*** A Pilot Educational interventional study with a control and an intervention group with 72 participants in each group was conducted with intervention using validated short video-based module for breast examination skill teaching and assessment was done using Mini CEX before and after intervention and results were compared with statistical analysis. ***Results:*** In Mini CEX2: The Intervention group demonstrated a higher mean score (5.96 ± 1.11) compared to the Non-Intervention group (5.53 ± 1.01)(P=0.022) .In Mini CEX3: The mean score in the Intervention group (6.39 ± 1.13) was significantly higher than in the Non-Intervention group (6.01 ± 1.04), (P = 0.018).Within-group comparisons of scores across the three assessments showed highly significant improvements over time for both groups (P < 0.001). ***Conclusion:*** Short video-based module for breast examination can be used as an adjunct to traditional teaching with improved confidence and knowledge retention among undergraduate students.

Citation: Kusum Meena, Sudipta Saha, Priyanka Dedha and Saba Fatima, 2025. *"Introduction of Short Video-Based Bedside Teaching Module as an Adjunct to Traditional Teaching for Refining Clinical Examination Skills Among Undergraduate Students in General Surgery: A pilot study". International Journal of Current Research, 17, (04), 32680-32685.*

INTRODUCTION

Medical education emphasizes practical, hands-on learning, especially in clinical fields like general surgery. Bedside teaching has long been valued for training students in clinical examination skills (1). However, time constraints, varying patient availability, and diverse teaching styles among instructors can affect the uniformity and depth of learning. This project proposes the introduction of short, targeted video-based instruction alongside traditional bedside teaching to enhance the consistency, engagement, and effectiveness of clinical examination training. By providing students with video resources focused on specific examination techniques, we aim to improve skill acquisition, confidence, and preparedness for bedside patient interactions (2).

Challenges in Traditional Bedside Teaching: Traditional bedside teaching offers direct, patient-centered learning but can be inconsistent due to time constraints, patient conditions, and teaching variability. Studies highlight a need for structured, repeatable resources to support student learning in clinical settings.

Effectiveness of Video-Based Learning in Clinical Skills: Evidence from studies across medical disciplines suggests that video-based teaching helps students visualize procedures and retain knowledge better than text-only resources. Video demonstrations enhance procedural memory, increase learner confidence, and enable repetitive practice outside of patient interactions (2).

Blended Learning Models in Medical Education: Research supports a blended approach where video resources complement hands-on clinical training. Authors in one study found that video-based adjuncts to bedside teaching improved diagnostic skills and examination accuracy, while other studies showed increased student satisfaction and reduced anxiety (3).

Outcome Measurements in Clinical Teaching: The Mini Clinical Evaluation Exercise (Mini- CEX) is widely used to assess clinical skills. It offers a structured framework for feedback on real-world clinical encounters, which is ideal for evaluating the impact of video modules on clinical examination skills.

Mini-CEX Tool: A structured assessment tool used to evaluate clinical examination skills in a standardized and objective manner (4). In review of literature we have found a lot about video -based teaching for procedural skills and surgical training but for clinical examination skills it has not been

explored. The current study was endeavored to see the feasibility of short video- based modules as an adjunct to traditional bed side teaching for clinical examination skills.

Aims and Objectives

Primary Aim: To evaluate the effectiveness of short video-based bedside teaching as an adjunct to traditional teaching in improving clinical examination skills among undergraduate students in general surgery.

Specific Objectives

- To assess improvement in students' clinical examination skills using the Mini- CEX assessment tool.
- To measure student satisfaction and engagement with video-based adjunct teaching
- To evaluate the feasibility and effectiveness of implementing a video-based adjunct in the General Surgery curriculum.

METHODOLOGY

Study Design: Pilot Educational interventional study with a control and an intervention group.

Study place: Department of surgery, Lady Hardinge Medical college, New Delhi

Study Participants: Undergraduate medical students undergoing general surgery rotations 4th ,7th, 9th semester, Phase-II, Phase-III Part-I & Phase-III Part-II respectively.

Study time: Preparation and validation of module for Breast examination -October 2024- November 2024 Use of module for student teaching December 2024- January 2025.

Sample Size: Gr 1. Control group & Gr 2. Intervention group
Sample size calculation came out N=62.48 For a pilot study – 72 in each group

Sensitization and need assessment for refinement in clinical examination skill was done through google form questionnaire among faculty and undergraduate students.

Preparation of Breast examination video module: After obtaining informed consent from patient a short video-based module was prepared with help of 3rd year postgraduate students and senior residents for demonstration of breast examination skill with clear instruction what is to be done and what should not be done and how to approach breast and axilla for examination and how to describe findings. Before use, module was approved by MEU & CC faculties of department and also validated for use among first year General Surgery postgraduates.

Intervention: The intervention group was shown short video modules on breast examination techniques before bedside sessions, while the control group relied on traditional bedside teaching alone. The use of video was restricted only during bedside teaching. The video module was not accessible to students for use it on their own.

Assessment Tool: Students were evaluated using the Mini-CEX tool, with standard checklist prepared before hand. There were three encounters of Mini CEX session one at the starting of posting and two in subsequent weeks at minimum interval of 1 week and conducted by senior resident. Assessment and feedback were done by same senior resident for whole batch to avoid bias. Student and assessor satisfaction scores were recorded at the end of Mini CEX proforma.

Student Feedback: A structured satisfaction survey (Google forms) was administered to gauge the intervention's impact on student engagement and confidence, quality of video etc. Students has to respond on 5-point Likert scale. Students sent their responses anonymously to avoid any bias as it was highlighted in ethical committee, students were captive population.

Master chart was prepared with all the responses, scores and other details of Mini CEX 1,2,3 exercise and Google forms. Statistical analysis was done to establish significance of intervention with SPSS 28 version. For comparison of Mini CEX scores, Student and assessor scores for Mini CEX chi square test was used and for comparison of mean scores of Mini CEX and mean scores of student and assessor satisfaction, Mann Whitney U test was used

P-value interpretation: The p-value <0.05 indicated the probability of observing the differences (or more extreme differences) in Mini-CEX scores between time points within the same batch (within-group) and different batches (between-group).

Ethical consideration: Institutional Ethics Committee approval was obtained after presentation in meeting on 17th December 2024 and Approval letter was issued dated 24th December 2024 with reference no LHMC/IEC/1/2024/105

RESULTS

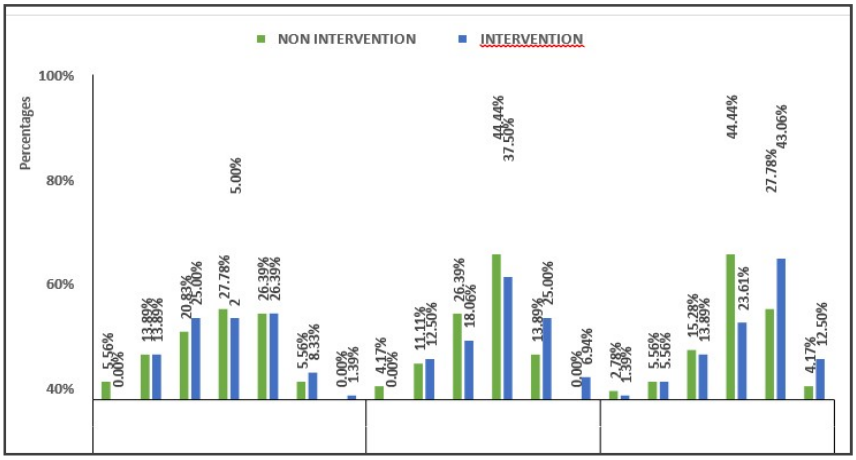
Google survey for need assessment included 24 teaching faculties with >10 years of teaching experience and all of them were at opinion to refine clinical examination skills among UG students .Large number of students ,more inclination towards online mode of teaching ,busy schedule of faculty in OPD ,lack of interest among students were few common factors identified .91.7% thought these adjunct modules can be useful and 87.5% were confident in using modules for teaching purpose .87% students also thought more involvement of faculty in clinical teaching can be beneficial to them .

Table 1. Distribution of Participants by Batch Across Study Groups

BATCH	NON-INTERVENTION		INTERVENTION		
	Frequency	Percent	Frequency	Percent	P-Value
1	15	20.83%	16	22.22%	
2	27	37.50%	26	36.11%	
3	30	41.67%	30	41.67%	
Total	72	100.00%	72	100.00%	0.975

Test used: Chi square test Batch 1: Phase -II Students

Batch 2: Phase -III Part-I Students Batch 3: Phase -III Part-II Students

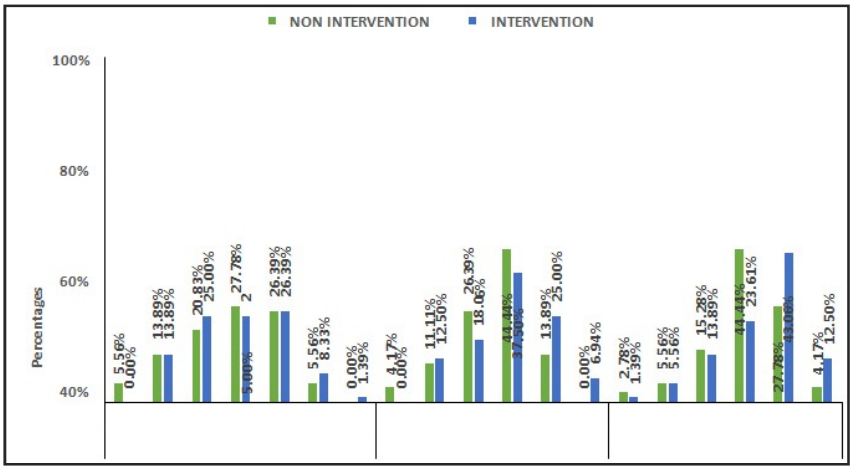


Graph 1. Comparison of MINICEX Scores Between Non-Intervention and Intervention Groups

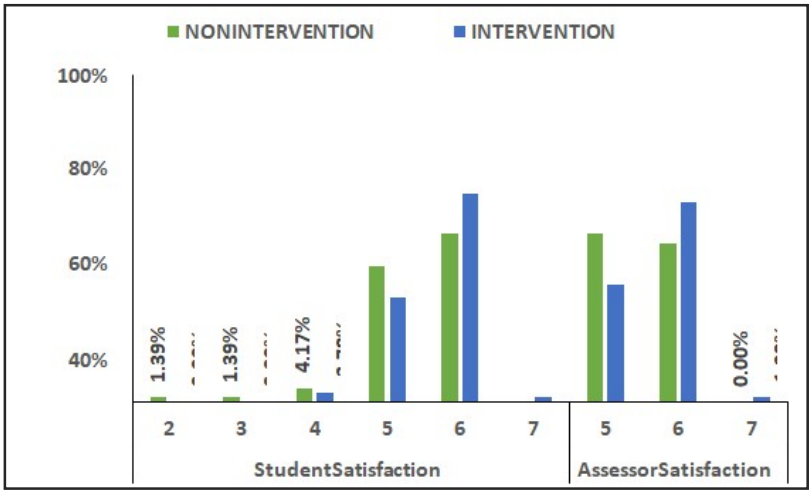
Table 2. Summary of MINICEX Scores Across Non-Intervention and Intervention Groups

	NON-INTERVENTION			INTERVENTION			p value
SCORE OF MINICEX 1	4.72 ±1.30	5.00 (4.00 -6.00)	2 -7	4.94 ±1.24	5.00 (4.00 -6.00)	3 -8	0.434
SCORE OF MINICEX 2	5.53 ±1.01	6.00 (5.00 -6.00)	3 -7	5.96 ±1.11	6.00 (5.00 -7.00)	4 -8	0.022
SCORE OF MINICEX 3	6.01 ±1.04	6.00 (6.00 -7.00)	3 -8	6.39 ±1.13	7.00 (6.00 -7.00)	3 -8	0.018
p values (within the groups)	<0.001			<0.001			

Test used: Mann Whitney U test *signifies significant p value<0.05



Graph 3. Summary of MINICEX Scores Across Non-Intervention and Intervention Groups



Graph 5. Student and Assessor Satisfaction Scores Across Groups

Table 4. Comparison of Student and Assessor Satisfaction Scores

	NON-INTERVENTION			INTERVENTION			p value
STUDENT SATISFACTION	5.40 ±0.76	6.00(5.00 -6.00)	2 - 6	5.64 ±0.56	6.00(5.00 -6.00)	4 - 7	0.061
ASSESSOR ATISFACTION	5.49 ±0.50	5.00(5.00 -6.00)	5 - 6	5.65 ±0.51	6.00(5.00 -6.00)	5 - 7	0.065

Test used: Mann Whitney U test

Table 5. Opinions About the Video Module (Intervention Group Only)

Opinion About Video Module	INTERVENTION	
	Frequency	Percent
3	8	11.11%
4	37	51.39%
5	27	37.50%
Total	72	100.00%

Table 6: Time Taken for Mini CEX Assessments

Variable	NON INTERVENTION (Mean ± SD)	INTERVENTION (Mean ± SD)	P-value
Time for Mini CEX 1	14.97 ± 1.70	15.53 ± 2.06	0.080
Time for Mini CEX 2	15.22 ± 1.46	15.24 ± 1.92	0.961
Time for Mini CEX 3	15.36 ± 1.50	15.44 ± 1.78	0.762

Test used: Student's t test

Table 7. Number of students in superior group

	Nonintervention Group (Number of students securing perfect scores)	Intervention Group (Number of students securing perfect scores)	Chi Square test P value obtained <0.05
Mini CEX 1	4/72(5.56%)	7/72(9.72%)	
Mini CEX2	10/72(13.89%)	23/72(31.95%)	
Mini CEX 3	23/72(31.95%)	40/72(55.56%)	

Table 2 compares the scores for MINICEX assessments (1, 2, and 3) between Non-Intervention and Intervention groups. Descriptive statistics include mean ± SD, median (IQR), and range, analyzed using the Mann-Whitney U test to assess statistical significance.

MINICEX1: The mean score was slightly higher in the Intervention group (4.94 ± 1.24) compared to the Non-Intervention group (4.72 ± 1.30), with identical medians of 5.00 (IQR: 4.00–6.00). Scores ranged from 2 to 7 in the Non-Intervention group and 3 to 8 in the Intervention group. No significant difference was found (P = 0.434).

MINICEX2: The Intervention group demonstrated a higher mean score (5.96 ± 1.11) compared to the Non-Intervention group (5.53 ± 1.01). The median was 6.00 for both groups, with the IQR slightly wider for the Intervention group (5.00–7.00 vs. 5.00– 6.00). This difference was statistically significant (P = 0.022*).

MINICEX3: The mean score in the Intervention group (6.39 ± 1.13) was significantly higher than in the Non-Intervention group (6.01 ± 1.04), with medians of 7.00 and 6.00, respectively. The difference was statistically significant (P = 0.018*). Within-group comparisons of scores across the three assessments showed highly significant improvements over time for both groups (P < 0.001**).

Student Satisfaction: The mean satisfaction score was slightly higher in the Intervention group (5.64 ± 0.56) compared to the Non-Intervention group (5.40 ± 0.76). Both groups had a median score of 6.00 (IQR: 5.00–6.00), with scores ranging from 2 to 6 in the Non-Intervention group and 4 to 7 in the Intervention group. However, this difference was not statistically significant (P = 0.061).

Assessor Satisfaction: The Intervention group also reported higher mean scores (5.65± 0.51) compared to the Non-Intervention group (5.49 ± 0.50), with both groups sharing a median score of 6.00 (IQR: 5.00–6.00). The score range was 5–6 for the Non- Intervention group and 5–7 for the Intervention group. Similar to student satisfaction, the difference was not statistically significant (P = 0.065).

Table 5summarizes opinions about the video module among participants in the Intervention group. Most participants (51.39%) rated the module as 4, followed by 37.50% who rated it as 5, and 11.11% who rated it as 3. This distribution highlights generally positive feedback, with over 88% of participants giving a score of 4 or higher.

Table 6 compares the average time taken to complete the three Mini CEX assessments between Non-Intervention and Intervention groups using Student's t-test.

Mini CEX 1: The Intervention group took slightly longer on average (15.53 ± 2.06 minutes) compared to the Non-Intervention group (14.97 ± 1.70 minutes). However, the difference was not statistically significant (P = 0.080).

Mini CEX 2: The time taken was nearly identical between the groups, with 15.22 ±1.46 minutes for Non-Intervention and 15.24 ± 1.92 minutes for Intervention, yielding no significant difference (P = 0.961).

Mini CEX 3: Similarly, the time taken was comparable between the groups, with 15.36± 1.50 minutes for Non-Intervention and 15.44 ± 1.78 minutes for Intervention (P = 0.762). This table depicts, with intervention there was a significant increase in number of students securing place in superior group which represent impact of short video -based module in knowledge retention.

DISCUSSION

Sir William Osler (1849–1919) gave emphasis to practice. He said: "*Observe, record, tabulate, communicate. Use your five senses… Learn to see, learn to hear, learn to feel, learn to smell, and know that by practice alone you can become expert*". This statement stands true for today also. The importance of structured clinical education has long been recognized. It provides equal learning opportunities and a suitable environment for everyone to acquire clinical skills and competencies. A study done by Orientale et al in 2008 in US medical students examined the effect of a Web- based physical examination curriculum on first-year medical student PE skills. Web-based video clips, consisting of instruction in 77 elements of the physical examination, were created using Microsoft Windows Moviemaker software. Medical students' PE skills were evaluated by standardized patients before and after implementation of the Internet-based video. Following implementation of this curriculum, there was a higher level of competency (from 87% in 2002-2003 to 91% in 2004-2005), and poor performances on standardized patient PE exams substantially diminished (from a 14%-22%failure rate in 2002-2003, to 4% in 2004- 2005 (5). Similarly, in our study introduction of short video-based module for physical examination demonstrated a statistically significant improvement after intervention with Mini CEX assessment tool. Significant difference was observed in Mini CEX 2&3, however no significant difference was observed in Mini CEX 1 which was before intervention in both groups. In Mini CEX1: The mean score was slightly higher in the Intervention group (4.94 ± 1.24) compared to the Non-Intervention group (4.72 ± 1.30), with identical medians of 5.00 (IQR: 4.00–6.00). Scores ranged from 2 to 7 in the Non-Intervention group and 3 to 8 in the Intervention group. No significant difference was found (P = 0.434). In Mini CEX2: The Intervention group demonstrated a higher mean score (5.96 ± 1.11) compared to the Non-Intervention group (5.53 ± 1.01). The median was 6.00 for both groups, with the IQR slightly wider for the Intervention group (5.00–7.00 vs. 5.00–6.00). This difference was statistically significant (P = 0.022). In Mini CEX3: The mean score in the Intervention group (6.39 ± 1.13) was significantly higher than in the Non-Intervention group (6.01 ± 1.04), with medians of 7.00 and 6.00, respectively. The difference was statistically significant (P = 0.018). Within-group comparisons of scores across the three assessments showed highly significant improvements over time for both groups (P < 0.001). In 2014 a randomized study with two comparable groups was conducted by Buch et al on Sixty medical students. The groups were given either a video- or text/picture-based e-learning module and subsequently underwent both theoretical and practical examination. A follow-up test was performed 1 month later. Students in the video group performed better than the illustrated text-based group in the practical examination, both in the primary test (P<0.001) and in the follow-up test (P<0.01). Regarding theoretical knowledge, no differences were found between the groups on the primary test, though the video group performed better on the follow- up test (P=0.04) (6). Similarly, in our study with introduction of short video based modules students' performance score were significantly improved in intervention group and in context with Mini CEX 3, 40/72 (55.56%) students were in superior grade in interventional group while in non-intervention group only 23/72 (31.95%) were in superior grade. A study by Ramani **S** highlights Physical examination as a crucial aspect in patient-physician interactions, a valuable contributor to accurate clinical diagnosis and can be taught effectively using practical tips. To reverse the trend of deficient clinical skills the paper describes twelve practical teaching tips that can be used to promote high quality Physical examination teaching in 5 minutes or 45 minutes. TEACHING TIPS: (1) Diagnostic hypotheses should guide reflective exam; (2) Teachers with the best clinical skills should be recruited; (3) A longitudinal and systematic curriculum can tailor teaching to multiple learner levels (4) Integration of simulation and bedside teaching can maximize learning; (5) Bedside detective work and games make learning fun; (6) The 6-step approach to teach procedures can be adopted to teach PEx; (7) Clinical teaching at the bedside should be increased; (8) Linking basic sciences to clinical findings will demonstrate relevance; (9) Since assessment drives learning, clinical skills should be systematically assessed; (10) Staff development can target improvement of teachers' clinical skills for effective teaching; (11) Technology should be used to study utility of clinical signs; (12) Institutions should elevate the importance of clinical skills teaching and recognize and reward teachers (7). Our study also emphasizes the importance of innovations in teaching clinical skills as per current generations need and using short video-based modules can be an effective adjunct to traditional teaching for bedside clinics.

Martens et al conducted a qualitative study in 2008 on 30 randomly selected students, divided into three groups. They discussed what teaching skills helped them to acquire better physical examination skills. They organized focus group discussions with students from Years 1-3 of a 6-year undergraduate medical curriculum. The teaching skills and behaviors that most facilitate student acquisition of physical examination skills were interpersonal and communication skills, followed by a number of didactic interventions. They also appreciated enthusiasm in teachers. Important preconditions included: the integration of skills training with basic science teaching; linking of skills training to clinical practice; the presence of clear goals and well-structured sessions; good time management; consistency of teaching, and the appropriate personal appearance of teachers and students (8). In our study also a google form was prepared and circulated among students who were not part of the final study to know the student need and their opinion about how improvement in physical examination skills can be achieved.

Clinical skills acquisition is a major focus of education for health professionals extending from undergraduate to postgraduate and continuing to professional education [(9)]: In order to improve the PE skills of residents and future practitioners, we need to better understand the barriers that hinder skill development and the teaching methods that promote it. By understanding these issues from the perspectives of both the learner (resident) and the teacher (faculty), we can design curriculum interventions which better address the concerns of both groups and promote wider support (10). Physical examination skills are largely psychomotor skills. For teaching physical examination skills, Irby's three stages of clinical teaching (Preparation, Teaching and Reflection) were used by Piryani RM. Skill acquisition was based on Millers' Learning Pyramid at the 'Show how level' and Dreyfus' competency model at the 'Competent level' (i.e. consciously competent) (11). Physical Examination (PE) skills are vital for patient care, and many medical students receive their first introduction to them in their pre-clinical years. A substantial amount of curriculum time is devoted to teaching these skills in most

schools. Little is known about the best way to introduce PE skills to novice learners. (12).A good teacher should always remain in search of answers to question like What technologies augment PE learning?

Danielson highlighted in his paper that in literature various studies have evaluated the addition of technology to PE courses for novices and studied the effect of these adjuncts on learning viz replacement of live demonstration of physical examination with video demonstration and assessment by OSCE, adding point-of-care ultrasound to PE sessions in comparison to students in the prior year taught without ultrasound (11,12). Instructional sessions, including online modules and videos of how to perform physical examination, learner attitudes towards online modules as preparation for physical examination sessions has been widely studied and it has been observed that learners preferred an online module to reading a traditional textbook(10,11,12). Kurihara et al conducted a four-arm RCT comparing text book preparation, a computer-based module, and textbook reading plus a computer-based module to a control group as methods of preparing for PE sessions and found that all of the preparation methods improved learners' performance on OSCE and multiple-choice tests, but found no difference between these interventions (13).

Limitations of study

- Use of only one module for teaching and assessment by Mini CEX, only for physical examination skills.
- This study is single center study and conducted in only 2 units of department

Future recommendations: A multicentric study involving whole batch of Phase 3 part 2 students with all the topics suggested in google form survey and with Short video-based modules prepared for all of them over a period of 6-9 months and incorporating blinding for assessor in Mini CEX assessment.

CONCLUSION

Short video-based bedside teaching modules as an adjunct to traditional teaching in general surgery can be effectively introduced in undergraduate curriculum to improve clinical examination skills.

ACKNOWLEDGEMENTS

I extend my sincere gratitude to ACME Faculties and ACME 2024B batch participants for their valuable inputs since conceptualization of this project to preparing final draft of project report and poster.

REFERENCES

Youssef SC, Aydin A, Canning A, Khan N, Ahmed K, Dasgupta P. Learning Surgical Skills Through Video-Based Education: A Systematic Review. Surg Innov. 2023 Apr;30(2):220-238. doi: 10.1177/15533506221120146. Epub 2022 Aug 14. PMID: 35968860; PMCID: PMC10280671.

Li L, Hu Z, Yi Z, Ma G, Xiao C, Wan L. Exploration of standardized clinical skills instruction video based on QR code management in clinical hospital teaching. Am J Transl Res. 2021 Dec 15;13(12):14067-14073. PMID: 35035749; PMCID: PMC8748109.

Grüter AAJ, Van Lieshout AS, van Oostendorp SE, Henckens SPG, Ket JCF, Gisbertz SS, Toorenvliet BR, Tanis PJ, Bonjer HJ, Tuynman JB. Video-based tools for surgical quality assessment of technical skills in laparoscopic procedures: a systematic review. Surg Endosc. 2023 Jun;37(6):4279-4297. doi: 10.1007/s00464-023-10076-z. Epub 2023 Apr 26. PMID: 37099157; PMCID: PMC10234871.

Batra P, Batra R, Verma N, Bokariya P, Garg S, Yadav S. Mini clinical evaluation exercise (Mini-CEX): A tool for assessment of residents in department of surgery. J Educ Health Promot. 2022 Aug 25;11:253. doi: 10.4103/jehp.jehp_1600_21. PMID: 36325223; PMCID: PMC9621368.

Orientale E Jr, Kosowicz L, Alerte A, Pfeiffer C, Harrington K, Palley J, Brown S, Sapieha- Yanchak T. Using web-based video to enhance physical examination skills in medical students. Fam Med. 2008 Jul-Aug;40(7):471-6. PMID: 18928073.

Buch SV, Treschow FP, Svendsen JB, Worm BS. Video- or text-based e-learning when teaching clinical procedures? A randomized controlled trial. Adv Med Educ Pract. 2014 Aug 16;5:257-62. doi: 10.2147/AMEP.S62473. PMID: 25152638; PMCID: PMC4140394.

Ramani S. Twelve tips for excellent physical examination teaching. Med Teach. 2008;30(9- 10):851-6. doi: 10.1080/01421590802206747. PMID: 18821164.

Martens MJ, Duvivier RJ, van Dalen J, Verwijnen GM, Scherpbier AJ, van der Vleuten CP. Student views on the effective teaching of physical examination skills: a qualitative study. Med Educ. 2009 Feb;43(2):184-91. doi: 10.1111/j.1365-2923.2008.03283.x. PMID: 19161490.

Artandi M,Norcini J,Garibaldi B, Israni ST ,Kugler J,Kumar A, Russell S. Improving the physical exam: a new assessment and evaluation tool for physical examination skills.Diagnosis 2022 9 (3) DOI:10.1515/dx-2022-0014

Ragsdal JW , Habashy C, Warrier S.Developing Physical Exam Skills in Residency: Comparing the Perspectives of Residents and Faculty About Values, Barriers, and Teaching Methods .Journal of Medical Education and Curricular Development Volume 7: 1–6 DOI: 10.1177/2382120520972675

Piryani RM, Shankar PR, Thapa TP, Karki BM, Kafle RK, Khakurel MP, Bhandary S. Introduction of structured physical examination skills to second year undergraduate medical

students. F1000Res. 2013 Jan 16;2:16. doi: 10.12688/f1000research.2-16.v1. PMID: 24555027; PMCID: PMC3901509

Danielson, A. R., Venugopal, S., Mefford, J. M., & Clarke, S. O. (2019). How do novices learn physical examination skills? A systematic review of the literature. *Medical Education Online*, *24*(1). https://doi.org/10.1080 /1087 2981. 2019.1608142

Kurihara Y, Kuramoto S, Matsuura K, et al. Academic performance and comparative effectiveness of computer- and textbook-based self-instruction. Stud Health Technol Inform. 2004;107(Pt 2):894-897.

****