Original Article

Cinemeducation for Teaching Medication Safety: A Pre-Post Assessment and Student Reflections in Pakistan

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Abstract

Objective: To assess the improvement in the understanding of third year medical students about medication safety after a brief cinemeducation session.

Methodology: We conducted a single group pre and posttest educational intervention study at the Liaquat National Medical College in Karachi from July to September 2025. A total of 52 third-year undergraduate medical students participated in this study. The educational intervention consisted of a two-hour teaching session. The session included assigned pre readings, a short introductory lecture, several video clips demonstrating medication errors, group discussions, reflective writing based on the Gibbs reflection cycle. Multiple-choice questions were used before and after the course to assess students' knowledge. Post session feedback was obtained and reflections were thematically analyzed. Paired t-test was used to compare participants' overall knowledge scores before and after the test. P < 0.05 was considered as statistically significant. We analyzed the feedback data using descriptive statistical methods.

Results: A total of 52 students participated in the study and completed pre and posttests. The mean knowledge score improved from 9.6 ± 1.6 to 10.2 ± 1.7. This modest but significant improvement had a mean difference of 0.60 ± 2.1 ($p = 0.025$). The group of 22 students provided feedback. The majority of students said that multiple-choice questions helped them learn better (95.4%), the multimedia section was useful (90.9%), and the course helped them identify and avoid medication errors (95.5%). After analyzing the students' reflection, five main themes were identified: recognizing drug safety errors, feelings about adverse events, the personal and systemic factors at play, methods to prevent problems, and how students planned to apply what they had learned to their future work.

Conclusion: Cinemeducation was effective in strengthening students' understanding and attitudes related to medication safety. While knowledge gains were modest, the approach encouraged reflection, emotional engagement, and practical insight. This suggested the value of this tool as an engaging method for teaching patient safety and other longitudinal themes within the medical curriculum.

Keywords: Patient safety, Cinemeducation, Curriculum, Medical Students

Introduction

The instructional potential of visual media has long been recognized; it has evolved from a source of amusement to a deliberate teaching medium.[1] The purposeful use of films, also known as "cinemeducation," in medical and allied health education has recently gained attention as an education methodology that integrates guided reflection with visual storytelling.[1] Alexander et al initially defined the term as either short films or feature length movies that capture the ethical dilemmas, clinical uncertainty, and humanistic challenges that health professionals face.[1] Students are exposed to situations that reflect empathy, compassion, and critical thinking through the use of this narrative.[1,2] Instructors select scenes from movies or television shows that relate to a particular learning objective. Before viewing the selected video, students receive a brief orientation that describes the purpose of the exercise and identifies specific issues to observe. A structured debriefing that occurs either individually or in small groups ensues. The discussion focuses on the emotional responses of the students, the narrative they create regarding the events and how they identify with "actual clinical practice.[20] Globally, the concept of cinemeducation has been applied in various disciplines such as bioethics, psychiatry, general medicine and palliative care.[2] A study at Ludwig Maximilian University of Munich showed that learning through movies facilitated longer retention of essential concepts.[3] Similarly, research conducted in Tehran reported that after reflection on movie-viewing experiences, there was an increase in medical students' empathy and understanding of the whole person.[4] Another study carried out amongst clinical year MBBS students in Pakistan demonstrated high satisfaction and support for the integration of cinemeducation as a teaching methodology into the curriculum.[5]

The World Health Organization defines patient safety as "the absence of preventable harm and the reduction of risks to an acceptable minimum." Patient safety is considered one of the fundamental

components of high-quality healthcare.[6] As one of the top three causes of death worldwide, medication errors put tremendous pressure on the healthcare system in the form of avoidable morbidity, mortality, and costs. Medication errors account for nearly 200,000 deaths every year in the United States alone.[7] To give an incentive for the incorporation of patient safety into the undergraduate syllabus, the Pakistan Medical and Dental Council (PMDC) dedicated a number of hours for students to learn about patient safety with the aim of providing a safe practice environment once they graduated.[8] Liaquat National Hospital (LNH) recognized the need for quality assurance and the integration of patient safety education for undergraduates as a way of encouraging safe clinical practice in line with the national and international recommendations. Since cinemeducation has the potential to engender cognitive and affective-based learning on pharmaceutical safety, we used it as a novel approach to enhance knowledge and attain positive, long-standing changes.[9] However, previous literature in this field has largely focused on quantitative measures and does not explore students' perceptions or how these perceptions impact professional knowledge.[5,10]

Based on this research gap identified, this study was designed to determine the improvement in medication safety knowledge among third-year medical students following a brief film-based teaching intervention. The study integrated quantitative assessment and qualitative reflection, analyzing not just the gain in knowledge but also the effect of the educational intervention on attitudes, emotional engagement, and the sense of professional responsibility for patient safety.
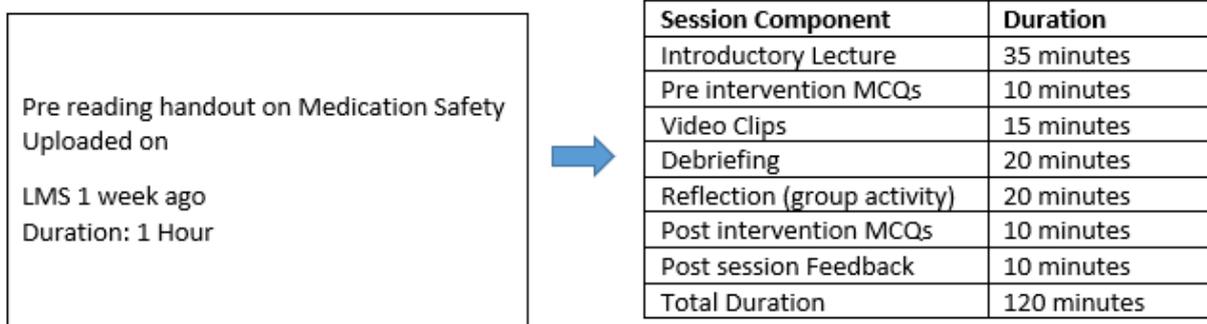
Methodology

This was a mixed-methods educational intervention study conducted at Liaquat National Medical College, Karachi, over a period of three months (July–September 2025). Since the curriculum was introduced in the third year of the MBBS program by the University, the intervention was designed to target learners at the same stage of study. Data collection was initiated after obtaining ethical approval from the Institutional Review Board of Liaquat National Hospital (ERC #1242-2025-LNH-ERC). Before the enrollment of the participants, written informed consent was obtained from all participants.

The sample size was calculated using G*Power based on a previously conducted similar study reported overall mean scores of pretest and posttest score (5.54±1.05 and 7.42±0.82 respectively).[11] Taking a power of 90% and a 95% confidence interval and a correlation of 50%, the required sample size was estimated as 44 participants with effect size of 0. Sampling was performed using a non-probability convenience technique. Third-year students who attended the intervention and provided consent were included; those absent or unwilling were excluded. The total class size was 80 students, all of whom were invited to participate in the study. Of these, 52 attended the session. The non-probability convenience technique may limit the generalizability of findings due to potential selection bias.

This intervention was planned aligning with the principles of Mezirow's transformative learning theory, which emphasizes critical reflection and experiential engagement to challenge existing assumptions.[12] The session was aim to enhanced cognitive understanding and affective aspect of patient safety concept using film-based scenarios and reflective discussions.

The session was facilitated by three faculty members and fifty two students participated. The lesson plan was developed and reviewed by the medical college's patient safety core curriculum committee. In addition, the teaching material, pre and posttest MCQs, and reflection questions developed, were reviewed. The feedback from the expert were incorporated through iterative revisions. Prior implementation, the session's facilitators were oriented to the finalized lesson plan .The teaching session consisted of structured two-hour large-group session, with time allotted to a brief introductory lecture, video clips, group discussion, reflective writing, and debriefing as presented in Figure 1.

Session Component	Duration
Introductory Lecture	35 minutes
Pre intervention MCQs	10 minutes
Video Clips	15 minutes
Debriefing	20 minutes
Reflection (group activity)	20 minutes
Post intervention MCQs	10 minutes
Post session Feedback	10 minutes
Total Duration	120 minutes

Pre reading handout on Medication Safety Uploaded on

LMS 1 week ago
Duration: 1 Hour

Figure 1: Time allocation for different components of the cinemeducation based teaching session

One week before the scheduled teaching session, pre reading material from the WHO Drug Safety Curriculum was shared with the students via college's LMS. During the session, the baseline knowledge was assessed using a pretest MCQ via Google Forms. The session included an introductory lecture on drug safety concepts and high-alert medications, followed by two video clips, a five-minute scene from 'The House' and a ten-minute WHO workshop video, portraying critical medication errors. Students then engaged in small-group discussions (ten-twelve per group) and submitted structured reflections using Gibbs' Reflective Cycle. Reflections were anonymized. The session was completed with a posttest and post session feedback which was filled by students online. The study variables included pre and posttest knowledge scores, students' written reflections, and post session feedback.

Pre and posttest: The recall level MCQs based on medication safety were initially drafted by the committee member, aligned with the predefined learning objectives. The draft questions were shared with the team and their feedback led us to revise the questions, mainly to improve wording, re-

move ambiguity, and ensure each question reflected the intended learning outcomes. Example items included: *'Which of the following is classified as a high-alert medication?'* and *'What is the safest strategy to prevent drug resistance in hospital practice?'* Although the items were reviewed by content expert, however the items were not piloted and formal reliability testing (KR-20 or Cronbach's α) could not be carried out because of the small sample size. This remains a limitation of the study. The same set of MCQs was utilized in both the pre and posttests. Each of the eleven items comprising the online quizzes was given a time allocation of ten minutes, administered through Google Forms. Faculty members were present when the quizzes were administered to enhance standard testing conditions. An anonymous identifier mechanism developed by Google Forms was used to match the pre and post responses to protect the privacy of students. Students were awarded a score of one for every correct response and zero for wrong responses.

A 5-point Likert scale (1 = Strongly Disagree through 5 = Strongly Agree) was utilized to collect post session comments via a Google Form. The "Neutral" label on the midpoint allowed students to convey doubt or strike a balance between two choices. Learners' opinions on the session's clarity, relevance, facilitation, and educational value were obtained using the above questionnaire. Both faculty and subject matter experts assessed it for face validity. However, since the instrument was for formative feedback and not psychometric purposes, neither a pilot nor reliability measurements were conducted. The reflection activity was guided by a series of questions, all of which were based on Gibbs's theory of the cycle of reflection. Students were required to submit reflection reports in groups and not reveal their personal identities. This ensured anonymity and confidentiality throughout the process.

Data analysis was performed using SPSS version 27. Frequency and percentage were calculated for all categorical variables. All numerical data were summarized as mean ± standard deviation. The normality of knowledge scores was assessed using the Shapiro-Wilk test. Paired t-tests were used to assess the significance of pre and post meeting scores. Significance levels for all analyses were set at p-values < 0.05. Descriptive statistics were reviewed to assess post meeting feedback. A total of five group reflection reports were reviewed.

This analysis used five sets of group reflection materials. Thematic analysis was conducted following Braun and Clarke's six-step framework, using an inductive approach. Two investigators independently coded the reflections, after which consensus meetings were held to resolve discrepancies and agree on the final coding scheme. Themes were developed directly from the responses provided by participants. The analysis was performed manually.

Result

A total of 52 third-year MBBS students participated in the pretest and posttest assessments. The comparison of correct responses before and after the cinemeducation session is displayed in Table 1. The knowledge score before and after the session was 9.6 ± 1.6 and 10.2 ± 1.7 respectively. Although the increase was statistically significant (p=0.025), the magnitude of change (mean difference 0.60 ± 2.1) was small, indicating only a modest improvement in factual knowledge. Table 1 displays the comparison of pre and post knowledge scores.

Table 1: Pretest and posttest knowledge scores and mean change (post–pre) after a 2-hour film-based session (n = 52)

Variables	Mean ± SD	Mean difference (post-pre)	95% Confidence interval	Cohen's d Effect size	t-statistics	p-value
Pre test score	9.6 ± 1.6					
		0.60 ± 2.1	0.07 - 1.10	0.211	2.290	0.025
Post test score	10.2 ± 1.7					

Paired t-test was applied after assessing normality assumption with Shapiro-Wilk test. Whereas the general upward trend of pre and posttest scores can be seen in Figure 2, with a higher frequency of correct responses observed for Q2, Q3, Q4, Q5, Q8, and Q10.
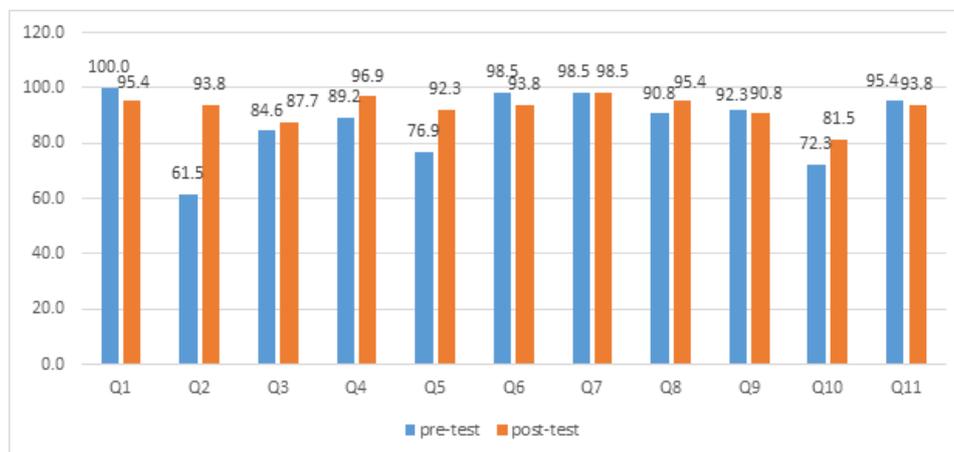
Figure 2: Distribution of correct responses; X-axis represents the number of questions Y-axis represents percentage of correct responses

Post-session feedback was received from 22 out of 52 participants, giving a response rate of 42.3%. Participant feedback was overwhelmingly positive. Agree/Strongly agree were combined for key outcomes. Nearly all agreed that the session objectives were clear (95.4%), the content was relevant (86.4%), and facilitators explained concepts effectively (100%). Most reported improved understanding of drug safety (95.5%) and ability to prevent medication errors (95.5%). Most importantly, multimedia, video, debriefing, and reflection were well received, though group activities were rated lower (50%) agreement. Table 2 outlines data distribution of post-session feedback

Table 2: Frequency distribution of post session feedback (n=22)

Post session Feedback	Strongly agree n(%)	Agree n(%)	Neutral n(%)	Disagree n(%)	Strongly disagree n(%)
The session objectives were clearly defined.	12(54.5)	9(40.9)	1(4.5)	0(0)	0(0)
The content was relevant to my level of training and clinical practice.	10(45.5)	9(40.9)	2(9.1)	0(0)	1(4.5)
The session enhanced my understanding of drug safety and high-alert medications.	8(36.4)	13(59.1)	1(4.5)	0(0)	0(0)
The use of multimedia (PowerPoint, video) helped in understanding the topic.	11(50)	9(40.9)	1(4.5)	0(0)	1(4.5)
Group activities and discussions were engaging and useful.	7(31.8)	4(18.2)	9(40.9)	2(9.1)	0(0)
The facilitators explained the content clearly and responded well to questions.	12(54.5)	10(45.5)	0(0)	0(0)	0(0)
The pre reading material was helpful in preparing for the session.	7(31.8)	10(45.5)	5(22.7)	0(0)	0(0)
The video episode effectively highlighted important drug safety issues.	10(45.5)	10(45.5)	1(4.5)	0(0)	1(4.5)
The timeline debriefing helped connect the video to real-world practice.	7(31.8)	11(50)	3(13.6)	1(4.5)	0(0)
The Reflection exercise helped me reflect on and internalize key lessons.	9(40.9)	9(40.9)	4(18.2)	0(0)	0(0)
The pre and post-session MCQs helped gauge my understanding of the topic.	7(31.8)	14(63.6)	0(0)	1(4.5)	0(0)
The session has improved my ability to recognize and prevent medication errors.	13(59.1)	8(36.4)	0(0)	1(4.5)	0(0)

Thematic analysis of the group reflections resulted in five major themes and their respective subthemes. The themes illustrate that students identified drug safety errors, the emotions they linked with the drug safety concerns, the deficiencies they saw in current practice, the root causes leading to errors, and the solutions they felt would eliminate errors. Students also indicated how they would like to communicate in the future. Tables 3 lists a sample of quotes for each theme and subtheme.

Table 3: Thematic Analysis of Student Reflections on Drug Safety

Theme	Subtheme	Representative Quotes (Student Responses)
1. Recognition of Drug Safety Errors	Wrong drug and wrong route	*"Wrong medicine administered, without double checking, infrequent monitoring, doctor was irresponsible and didn't observe the patient after administering the drug"* (G2) *"In video A we saw vincristine being administered instead of methotrexate and it was also administered intrathecally which when via IV causes paralysis and an immediate death"* (G3)
	Failure to take allergy/ medical history	*"Clip 2: insufficient allergic history"* (G1) *"In the second video, Dr failed to take any form of history and due to lack of communication and willingness from the side of the doctor resulted in a fatal event"* (G5)
	Inadequate labeling and documentation	*"No labeling on medicine"* (G1) *"ROD, expired date and therapeutic index was not properly checked"* (G3)
	Absence of pharmacovigilance	*"No proper monitoring"* (G1) *"There was no double check of drug being administered (pharmacovigilance)"* ; (G2,G3)
	Poor communication and teamwork	*"Lack of communication, coordination"* (G1, G2, G3) *"Lack of professionalism"* (G5)
2. Emotional Responses to Errors	Emotional Impact and Professional Responsibility	*"Sad and disappointment"* (G1) *"Disgust, frustration annoyance"* ; *A sense of personal failure, shame and guilt"* (G3) *"We all got tensed and it was terrifying to see patient dying"* (G4)
3. Pathways to Medication Errors	Individual factors	*"Doctor wanting to sign off, was trying to hurry home which led to patient negligence and violated patient safety"* (G3) *"Lack of training, poor communication, inadequate history taking"* (G4,G5)
	System-level factors	*"High Risk drugs not labelled"* (G3,G2,G1) *"Shortage of staff in video A"*; (G4, G5)
4. Learners' Perspectives on Prevention	Double-checking and labeling	*"Double checking, label high risk and route"*; (G1, G2)
	History-taking and monitoring	*"Proper history should be taken and team should be involved"*; (G2,G4,G5,G3) *"In video B: high alert medication should be separated and should have been administered with extra care and proper monitoring"* (G1)
	Improved teamwork and communication	*"Staff coordination could be better"* (G1,G3) *"Proper communication"* (G2)
5. Intended Professional Practice Changes	Patient-centered care (history, allergy checks)	*"We will take complete history, check MR number, check allergic reaction reactions if any"* (G1)
	Professional behaviors	*"Should not be multitasking, practice proper communication with patient, show some empathy to my patient, take proper history, prioritize my patient's health"* (G4,G5)
	Vigilance in prescriptions and administration	*"To pay more attention and be more careful of the dosage, drug and route of administration along with taking a better and more detailed history, also observe the patient after administering drug for allergic reactions"* ; (G2) *"Verify the medication, good communication with the patient, take care of safety protocols"* (G3)
	Effective Communication	*"Proper communication with the patient and the staff"* (G4) *Better coordination with staff"* (G2, G3)

Note: Clinical facts stated are from quotations of students' reflections and may or may not be accurate.

Discussion

This study analyzed methods for teaching drug safety knowledge to undergraduate medical students using film education. The following teaching strategies were employed to motivate students: pre and posttests, interactive lectures, film clips, post class discussions, and structured guided reflective writing. The pre and posttest results showed significant improvement in students' awareness and knowledge of key elements of drug safety. Specifically, students' factual knowledge significantly improved (mean score modest increase from 9.6 ± 1.6 to 10.2 ± 1.7), a change of 0.60 ± 2.1 ($p = 0.025$). Although the average improvement in factual knowledge was small, the results were statistically significant. However, further investigation is needed into how film education influences students' attitudes and their ability to think critically about clinical situations. Furthermore, post-session feedback indicated that students found the course helpful. Almost all students felt the trainers did a good job explaining the topics and that the course improved their ability to identify potential medication errors (95.4%). Most students also found the video clips helpful for their learning (90.9%). After analyzing the themes of the group reflections, five key aspects were identified: how students remembered medication safety errors, their feelings about these errors, what they believed caused the errors, what different approaches they would take to avoid making the same mistakes, and what experiences they planned to apply to their future careers.

Besides indicating the learning of new knowledge, the students in our study also provided evidence of reflective engagement and affective commitment regarding the issues of patient harm and professional responsibility. These observations are aligned with the previous study, which has also reported that cinemeducation helped strengthen medical students' understanding of patient safety and related professional behaviours.[12] The provision of a pre reading hand out in this study might have contributed to the relatively high baseline scores, this trend is generally observed when students were provided with pre reading material and resources before viewing activities.[13] The significant improvement in overall positive trends across the pre & posttest, are in accordance with the study conducted in Spain which highlighted the significance of structured audiovisual materials and guided discussion in fostering deeper comprehension of patient safety strategies.[14] Similarly, the emphasis on rigorous planning of both the viewing activity and the subsequent debrief likely enhanced engagement and helped consolidate levels of learning assessed through MCQs.[9]

In the study the teaching session was planned in a way that emphasized reflection rather than rote knowledge transfer, which may have produced greater gains in attitudes and awareness than in factual recall. This aligned with literature that highlighted cinemeducation was particularly effective in shaping professionalism and attitudes rather than knowledge alone.[15] In our study, most students reported a high level of satisfaction with the cinemeducation session. This is in line the findings of Sinha et al. (2024), who reported a satisfaction index of 97.6%.[11] The post-test improvements we observed particularly in items that were directly illustrated in the video clips, such as wrong drug or route and failure to check allergy history also align with earlier work, Rueb et al. noted that students were more motivated when films portrayed realistic clinical situations, which appears consistent with the pattern seen in our results.[3] In our study, students' reflections identified systemic and individual factors including inadequate training, poor communication, unlabeled high-risk drugs, and scarcity of staff, that represent the basis of ill- practices. Such findings are in line with those by Kadivar et al. (2018), where

it was established that cinemeducation enables the recognition of systems-based errors and arouses reflective thinking about patient safety.[16] Such elements have been hypothesized to develop not only knowledge but also that kind of critical reflection and awareness so crucial for safe clinical practice.

The students' reflections showed strong emotional reactions, such as sadness, guilt, frustration, and helplessness. In line with research by Patel et al. (2022) in relation to the ability of cinemeducation to foster empathy and ethical awareness by engaging students at the emotional level, standard teaching approaches often fail to engage learners in this way and are less likely to be associated with deep learning.[17] The emotional engagement that our participants described appears to be a particular strength of this learning opportunity. A number of preventative techniques and contributing factors were considered by the students, including double-checking, marking high-alert drugs, getting a complete medical history, working in groups, and being watchful of prescriptions. This is also in keeping with the WHO's worldwide patient safety recommendation.[18] Ninety percent of the student participants rated the video clips as the most useful part of the session since they served to maintain interest and attention in the evaluation that was done at the end of the session. This finding is consistent with previous research that found cinematic cues enhanced motivation, engagement, and learning transfer to the clinical environment.[19]

This study added new insights in the existing literature by demonstrating how film education can enhance students' understanding of drug safety. Students identified numerous drug safety errors and expressed a range of strong emotional responses, including anger, guilt, and heightened professional responsibility. Moreover, they suggested several potential mitigation strategies, including improved teamwork and planning, clearer labeling, and double-checking. Many participants considered how these strategies could be applied in future clinical practice. These findings suggested that this approach not only facilitates immediate cognitive learning but may also contribute to more lasting attitude and behavioral changes. The cognitive and behavioral responses elicited in this study make a noteworthy contribution to the ongoing literature on film education as an instructional intervention. This study laid the foundation for further exploration of the important but under-researched area of drug safety in undergraduate medical education. By integrating various interactive elements such as videos, summary discussions, reflections, and group activities into the teaching process, this study effectively stimulated students' learning interest and promoted meaningful learning. The preventative strategies proposed by the students made a valuable contribution to this study because they provided perspectives on how future clinicians can understand patient safety situations and address these issues in practice.

Limitations

Generalizability may be affected because this was a single institution study with a small sample size. Convenience sampling may have affected selection bias. There was no comparator or control group present. There may have been some nonresponse bias because less feedback response was collected. There may have been practice effects because the same 11 multiple-choice questions were used for assessments both before and after the intervention. There may have been some variability in how each group performed the session because facilitator adherence, group size, and time allocation were not measured independently. The depth of viewpoints acquired may be less because reflections were taken in groups rather than individually. Long-term memory

retention and whether the learning had translated into any clinical behaviors were not considered in this study.

Conclusion

The third-year medical students' knowledge of medication safety was improved after brief film-based session. Medical educators may consider this approach for meaningful educational experience to enhance knowledge gain, motivation and empathy among students. Other longitudinal curriculum topics in undergraduate medical education such as ethics, professionalism, and leadership could similarly be instructed through the cinematography approach. Future studies should look at the long term knowledge retention and behavior through this strategy. The overall efficacy of teaching with the cinema could be clarified through doing larger research, multi-center studies or executing the sessions at different periods in the curriculum.

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