

RESEARCH REPORTS

FACILITATED VIDEO CASE-BASED LEARNING: AN EXPLORATORY SINGLE-CASE STUDY OF PARAMEDIC WORKPLACE LEARNING

Adiel Garcia, EdD, NRP^{*1,2}

Author Affiliations: 1. Johnson County EMS (MED-ACT), Olathe, KS, USA; 2. Creighton University, Omaha, NE, USA.

Recommended Citation: Garcia, A. (2026). Facilitated video case-based learning: An exploratory single-case study of paramedic workplace learning. *International Journal of Paramedicine*. (16). 128-143. <https://doi.org/10.56068/HBMC9019>

Keywords: clinical simulation, facilitated video case-based learning, higher-order thinking skills, workplace learning, emergency medical services, EMS, paramedicine

Disclosures: None.

Funding: External funding was not used to support this work.

Presentation: A poster of the work described in the manuscript was presented at the National Association of EMS Educators Symposium & Trade Show in Orlando, FL, USA, on August 4-9, 2025.

Received: June 2, 2026

Revised: August 9, 2026

Accepted: August 10, 2026

Published: October 22, 2026

**Corresponding Author:*

adiel.medic@gmail.com

ABSTRACT

The purpose of this exploratory single-case study was to explore whether facilitated video case-based learning might provide an alternative teaching and learning solution to high-fidelity patient simulation for paramedic workplace learning. The study was informed by the New Kirkpatrick Model® for training evaluation and Bloom's revised taxonomy for the identification of higher-order thinking skills. Five paramedics who work in a city fire department within a high-performance EMS system in the midwestern United States participated in the study. The participants engaged in a facilitated video case-based learning intervention that presented a novel case of a medical emergency. Through observation of participant behavior and thematic analysis of post-intervention interviews, the study examined the influence of this learning approach on the development of higher-order thinking skills. Findings revealed that facilitated video case-based learning was perceived as highly engaging and relevant and contributed meaningfully to knowledge acquisition and the development of higher-order thinking skills. The results influence our understanding of paramedic learning and can address policy and practice issues that make ongoing paramedic education more accessible, especially in resource-poor areas globally.

INTRODUCTION

In emergency medical services (EMS) education, clinical simulation has positioned itself as a principal tool of experiential learning, with 89% of paramedic programs in the United States utilizing it for teaching and learning (Diamond & Bilton, 2021; Herrera-Aliaga & Estrada, 2022). Although clinical simulation is an effective instructional intervention, its resource intensiveness, space constraints, and economic investment present substantial challenges (Au et al., 2023).

Facilitated video case-based learning (FVCBL) is the presentation of clinical cases via video, which have embedded discussion pauses, and are facilitated by a subject matter specialist. There is little to no evidence in the literature about the use of this approach in EMS education. This study examines that gap,

reporting on the research to examine the potential of FVCBL for the development of higher-order thinking skills in EMS education.

This study examined the following research questions:

1. What are the experiences of paramedics participating in facilitated video case-based learning?
2. How do paramedics demonstrate higher-order thinking skills in facilitated video case-based learning?

The results suggest that facilitated video case-based learning may offer a viable, more accessible educational strategy for paramedic learning. The findings indicate that FVCBL was perceived as highly engaging and contextually relevant and supported knowledge acquisition and higher-order cognitive development.

LITERATURE REVIEW

CLINICAL SIMULATION

The creation of scenarios or settings that enable simulated healthcare experiences for the purpose of practicing, learning, evaluating, testing, and/or researching, is defined as clinical or healthcare simulation (Lioce, 2020). One of its primary benefits is that clinical simulation provides a safe environment for practice prior to engaging in real-life application. Clinical simulation has also been shown to increase competence and minimize time for clinicians when conducting patient assessment, medication administration, and medical procedures, ultimately resulting in lower levels of stress for patients (Maw-yin-Muñoz et al., 2025; Turan & Pekmezci, 2026).

Evidence supporting the educational value of clinical simulation spans multiple areas of healthcare education. A meta-analysis by Okuda et al. (2009) reviewed clinical simulation's utility in different areas of medical education and demonstrated clinical improvement in laparoscopic surgery and advanced cardiac life support protocols during cardiac arrest. Additionally, clinical simulation indicated valuable educational benefits across basic science, physical examination, anesthesiology, surgery, obstetrics, pediatrics, critical care, and emergency medicine. Despite these benefits, clinical simulation was found to require more faculty, preparation time, up-front and maintenance costs, and space than traditional teaching methods. Clinical simulation's effectiveness also depended on the simulator's capacity to emulate human physiology/pathophysiology, the infrastructure, and the educators' expertise. These requirements may present significant challenges for educational programs, even when advanced simulation resources are available but cannot be effectively implemented. McKenna et al. (2015) established that even when advanced, fully programmable manikins are available to some educational programs, those expensive resources are not used consistently, or at all, mostly because of lack of faculty training. Furthermore, Okuda et al. (2009) argued that debriefing processes were imperative to simulation; without them, non-technical skills showed no improvement.

More recent research has continued to demonstrate both the potential and limitations of simulation-based education. Daneshfar and Moonaghi (2025) reported notable enhancements in the clinical decision-making, judgment, and self-confidence of nursing students using high-fidelity simulation. However, they cautioned that without ongoing reinforcement, these skills may diminish over time. Some noteworthy challenges includ-

ed variability in debriefing processes, lack of continuous practice, and inadequate faculty training.

In addition to these implementation challenges, the potential for unintended effects of high-fidelity simulation warrants consideration. Concerningly, Massoth et al. (2019) found that high-fidelity simulation participants exhibited overconfidence, regardless of similar or lower test scores than the low-fidelity group, which may lead to increased risk-taking and medical errors in the field. Finally, Meyers et al. (2020) suggested future research on video-based learning, citing high human and technological needs for high-fidelity simulation.

VIDEO-BASED LEARNING

Video-based learning (VBL) refers to the acquisition of knowledge and/or skills through watching videos as the primary source of information, supplemented by audio, images, and text (Sabli et al., 2021). VBL demonstrates pedagogical benefits, including consistency of instruction, flexibility, scalability, and the ability to visually demonstrate complex or otherwise inaccessible processes (Curtis et al., 2018). Studies show that videos enhance recall, understanding, and engagement, connect new content to prior knowledge, and are most effective when videos are short, purposeful, and embedded with guided discussions and active learning tasks (Mitra et al., 2010). When effectively designed, video-based learning can increase interactivity, collaboration, and engagement (Sherer & Shea, 2011).

In medical education, VBL has demonstrated comparable or superior performance to traditional instruction for practical skills, including disaster medicine procedures, simulation debriefing, and CPR training (Curtis et al., 2018; Grant et al., 2010; Lynch et al., 2005). However, marked limitations persist, including depersonalization, lack of real-time support, technology dependence, excessive video length, and reduced learner interaction when videos are poorly designed (Iskru & Schulz, 2020; Sabli et al., 2021).

CASE-BASED LEARNING

Case-based learning (CBL) stimulates knowledge and skills acquisition through contextualized, authentic cases that promote inquiry, collaboration, and application of prerequisite knowledge (Perez et al., 2022; Williams, 2005). Effective cases are realistic, concise, thought-provoking, contain conflict, lack clear-cut answers, demand decision-making, and promote empathy and reflection (Davis, 1993).

In medical education, CBL is associated with greater student engagement, enjoyment, and perceived learning compared to lectures, particularly in fostering clinical reasoning, diagnostic interpretation, logical thinking, and teamwork (Kassebaum et al., 1991; Williams, 2005). Learners value challenging cases and benefit from expert facilitation, preparatory work, and timely feedback (Perez et al., 2022). Multiple comparative studies demonstrate improved satisfaction, deeper learning, and enhanced critical thinking with CBL (George et al., 2020; Parmar, 2018). Recent evidence supports the effectiveness of independent, blended, and online CBL formats, with reported improvements in knowledge scores, interest, and satisfaction when supplemented with faculty feedback (Clancy et al., 2024; Donkin et al., 2023).

In emergency medical systems, CBL is used for education, reflection, and quality improvement through structured review of real cases. This approach supports reflective practice, shared learning, and system-level improvements in educational and operational policies (Carenzo et al., 2022).

HIGHER-ORDER THINKING SKILLS

Bloom's revised taxonomy reframed cognition as an active process and distinguished between the knowledge dimension (factual, conceptual, procedural, and metacognitive) and the cognitive process dimension (remembering, understanding, applying, analyzing, evaluating, creating) (Krathwohl, 2002). Higher-order thinking skills (HOTS) require the reorganization of knowledge through understanding, breaking apart, integrating, judging information, and creating original solutions to complex problems (Chaojing, 2023; Muhibbuddin et al., 2023). Creativity is positioned as the pinnacle of HOTS, emphasizing the production of original patterns or solutions, while highlighting that all knowledge types can intersect with all cognitive processes.

Effective strategies for enhancing HOTS include complex open-ended questioning, inquiry formulation, collaborative discussion, and guided metacognitive reflection (Chaojing, 2023). Critical thinking is central to HOTS (Zhong & Song, 2024), and can be cultivated through explicit instruction, authentic learning environments, reflective self-assessment, and sustained practice, enabling how to think rather than what to think (Nippold, 2024).

Empirical evidence in medical education demonstrates that critical thinking is positively correlated with professional competence, caregiving quality, reduced medical errors, and improved patient outcomes (Chang et al., 2011; Karaca et al., 2023). These findings underscore the imperative for paramedics to develop HOTS through comprehensive education that integrates scientific evidence, technology, and innovation.

CONCEPTUAL FRAMING

CONSTRUCTIVISM

Facilitated video case-based learning employs many concepts and features of constructivism, which encourages experimentation, participation, and action through active learning. The tenets of constructivism assert that knowledge is constructed; occurs through interactions and experiences with the environment; is dynamic and changing; and is rooted in biological, social, and cultural interactions (Doolittle & Hicks, 2003). Through inquiry, exploration, dialogue, and reconciliation with prior knowledge, constructivism posits that formulation of meaning and understanding develops through experiences and reflection (Harasim, 2017).

THE KIRKPATRICK MODEL

Kirkpatrick's four-level model—reaction, learning, behavior, and results—is a widely used framework for evaluating training effectiveness (Kirkpatrick, 1979; Morra et al., 2024). The New Kirkpatrick Model® incorporates relevance, engagement, confidence, commitment, critical behaviors, required drivers, and on-the-job learning to the original model, while elucidating that results need to be defined globally in the context of profitability or mission accomplishment (Kirkpatrick & Kirkpatrick, 2022). Kirkpatrick and Kirkpatrick (2016) clarify that the levels do not have to be evaluated sequentially, nor are they causal

or of equal importance, but evidentiary, and therefore, not every program “requires a full evaluation package” (p. 22).

METHODS

Given the uniqueness of the learning intervention and the lack of existing research in this specific area, an exploratory single-case study design was appropriate for this study. Facilitated video case-based learning was designed to contain similar instructional features that have led to learning in clinical simulation (e.g., realism, scenario validation, debriefing, expert guidance). Prior to the study being conducted, an ethics review was submitted and approved by the Institutional Review Board (IRB) of Sam Houston State University (IRB-2025-117).

PARTICIPANTS

A cohort of five fire-medics, who work in a fire department as part of a high-performance EMS system, was utilized in the study. The EMS system is comprised of one county ambulance third-service, eight city or consolidated fire departments or districts, the Office of the Medical Director, and the Emergency Communications Center. The study’s researcher is an employee of the county ambulance service.

An internal email was sent by the fire department’s EMS chief, informing their employees of the opportunity to participate in this study and directing them to an external Qualtrics link which contained detailed information about the study and the consent forms. The inclusion criteria required certified paramedics who:

1. Were licensed and employed full-time by the fire department;
2. Were credentialed at the paramedic level;
3. Had a minimum of one year of professional experience within the EMS System;
4. Had a maximum of 25 years of professional, paramedic work experience;
5. Were willing to participate in a face-to-face FVCBL scenario (learning intervention); and
6. Were willing to participate in a one-on-one interview after the learning intervention.

VIDEO SELECTION

The video utilized for the FVCBL scenario was from *Untold Stories of the ER* (Harmon & Massar, 2015), available on YouTube (FilmRise, 2015). The case selected is titled *Continuing Ed* and features a patient in cardiac arrest (with several instances of return of spontaneous circulation [ROSC] and re-arrest) that is transported to the hospital by paramedics, with a final diagnosis of Brugada syndrome. Video timing, sequence markers, pauses, activities, and questions were identified and compiled into a facilitation guidebook. Learning objects (e.g., electrocardiograms, laboratory results, infographics) were developed and introduced throughout the scenario. Since the video did not have a pedagogical design, creation of the learning objects was indispensable to support teaching and learning. The content validity of the clinical case, learning objects, and facilitation guidebook were corroborated through separate expert consultations with two emergency medicine physicians who served as medical directors for that EMS system.

LEARNING INTERVENTION

The participants sat as a group, side-by-side, and in one row while viewing the video. Each participant was provided with a blank sheet of paper to take notes, and a protocol book and field reference manual were placed on the table for their reference. The protocol book delineates treatment guidelines in the EMS system as authorized by the Office of the Medical Director. The field reference guide is a supplement to the protocol book and contains mostly drug dosages, checklists, and clinical assessment scales.

When volunteering through the Qualtrics link, each participant selected a pseudonym (Akakael, Jax, Justin Case, OFD 187, Tar O'Reilly) for themselves, which was used during the learning intervention and interview. The FVCBL experience was recorded with a smart phone and that recording, along with the participants' handwritten notes, informed the observation field notes. Although the video length was less than 15 minutes, the learning intervention lasted 85 minutes due to strategic discussion pauses. During the pauses, the facilitator inquired, guided, introduced learning objects, and even partnered with the participants, making the learning more interactive and collaborative. Wrong answers were not immediately corrected but were recognized by the facilitator who elicited perspectives from the other participants, introduced supplemental information, and/or engaged in open-ended inquiry.

DATA COLLECTION

An observation protocol captured contextual factors, participant behaviors, engagement, and attitudes, and included pre-determined categories from the New Kirkpatrick Model® (reaction and learning) and Bloom's revised taxonomy HOTS levels (analyzing, evaluating, and creating). One-on-one participant interviews, via videoconference, took place within 14 days of the learning intervention and consisted of semi-structured, open-ended questions.

DATA ANALYSIS

Descriptive and reflexive observation notes were taken from the FVCBL recording, documenting the participants' body language, verbal/nonverbal expressions, interactions, discussions, and actions. The interviews underwent inductive and deductive analysis, with prior member checking. The initial coding cycle utilized in vivo coding and the second cycle consisted of axial coding. A predetermined codebook was created for the deductive analysis and included a priori categories taken from the New Kirkpatrick Model® and Bloom's Revised Taxonomy. To increase trustworthiness, an external coder (Doctor of Education and professor of paramedicine, with complete and current Collaborative Institutional Training Initiative trainings) conducted a separate analysis of the interview transcripts.

FINDINGS

OBSERVATIONS

Non-verbal expressions demonstrated emotional, social, and cognitive reactions to the subject matter, video elements, and learning environment. Examples include leaning forward toward the television, frowning, smiling and laughing, raising eyebrows, audible paralinguistics, and a myriad of head-nodding, -shaking, and -tilting.

Participant communications largely centered on clinical discussions about patient assessment and treatment, medical protocols, and best practices. Peer teaching and collaborative learning to discuss differential diagnoses, stratify prognosis, reinforce protocols, validate clinical impressions, and analyze case details were witnessed throughout the intervention.

Participant actions and interactions involved each other, the facilitator, and the learning objects. There were debates about the doctor's orders, leading to cross-checking medication dosages and clinical interventions. Participants were observed consulting the protocol book (and app), field guide, and Internet to cross-reference information. Additionally, the participants reanalyzed the ECGs and laboratory results at different points throughout the scenario, as differential diagnoses were ruled out or reinforced.

Examples of the aforementioned include an early discussion where Tar O'Reilly highlighted that the paramedics in the video were in the back of a moving ambulance which presented a safety issue that needed to be considered when determining the most immediate actions to best manage the cardiac arrest. Also, the participants differentiated between the priorities of a medical versus a traumatic cardiac arrest, making a real-world connection between the video content and their protocols/procedures, which was an imperative factor in determining whether the ambulance would need to pull over or proceed to the hospital if the cardiac arrest had occurred en route.

Later, when discussing reversible cardiac arrest causes, Tar O'Reilly shared that the patient's medical history is key in ruling in/out hyperkalemia in the field. Also, Justin Case, Tar O'Reilly, Jax, and Akakael discussed the value, or lack thereof, of the laboratory exams which the doctor ordered once the patient had arrived at the hospital, influencing one another's perspectives of how the results of a complete blood count (CBC) versus a comprehensive metabolic panel (CMP) might change their treatment. Subsequently, as the video played, Jax was observed examining the printed laboratory results in response to the doctor mentioning that the lab values were normal. Then, OFD 187 turned to Akakael and stated, "Torsades," interpreting the changed ECG rhythm on the screen, while Jax assented with a nod. As the case progressed, the participants collectively analyzed the repeat ECG, sharing their findings out loud, with Akakael identifying ST elevations in multiple leads and OFD 187 noting the presence of reciprocal changes. And after the final diagnosis of Brugada syndrome was revealed, the participants were witnessed explaining concepts to each other, with Jax pointing out to OFD 187 some features on the ECG printout. Tar O'Reilly then asked Jax how he knew the patient had Brugada syndrome and Jax responded in part, "...Brugada looks like a slide, it's called 'coved,' it looks like a slide on a playground."

Finally, at the end of the learning intervention, all participants were observed using their phone to scan a printed QR code on a table at the back of the classroom, which they were told would give them access to all the studies that were referenced during the learning intervention.

PARTICIPANT INTERVIEWS

The inductive analysis led to three themes: participant reactions, perceptions of learning, and demonstration of higher-order thinking skills.

THEME 1: PARTICIPANT REACTIONS

Participant reactions assess the perceptions of, and attitude toward, the training. This theme considers the participants' immediate responses to FVCBL, capturing their approval, perceived relevance, and engagement during the training experience. Participant reactions includes three sub-themes: favorability, engagement, and relevance.

Favorability deals with the satisfaction of having participated in the learning intervention. Engagement deals with the participants' attentiveness, active participation, and contributions to the discussions. And relevance deals with the participants' feelings that the scenario represented a real-life event and/or depicted the complexities of their work.

Key phrases that emerged were: "it was enjoyable and I did learn some interesting things" (Akakael), "was representative of the cases we run in the field...had a positive experience for sure" (Justin Case), "I was locked in...I was pretty engaged" (Jax), and "was surprised by the effectiveness and how well it was engaging me...it provides a safe area to learn immersed" (OFD 187).

Although some participants expressed a preference for hands-on learning and initial skepticism regarding the clinical validity of the dramatic video content, with Akakael (who was the most critical of the learning intervention) stating, "it's hard to take those [television videos] seriously because most of the time they're so ridiculous," the findings signal that they nevertheless viewed the learning intervention positively.

THEME 2: PERCEPTIONS OF LEARNING

Perceptions of learning assess the participants' knowledge acquisition from the learning intervention. This theme accounted for the attainment of intended knowledge, skills, and abilities during the learning scenario. Perceptions of learning includes three sub-themes: attitude, confidence, and commitment.

Attitude deals with whether the participants thought the training was worthwhile and would be beneficial to patient care. Confidence deals with the participants' feelings that they are or can be prepared to apply the learnings in real life. And commitment deals with the participants' intent to use what was learned.

Key phrases that emerged were: "appreciated this type of learning style" (Tar O'Reilly), "easier for me to learn" (Justin Case), "our interactive discussions provided confidence in what I am doing and lessons on what we should be doing" (Akakael), and "it was presented in a way that I'll never forget" (OFD 187).

Participants perceived the learning as extending beyond the immediate session and described how the concepts would remain part of their future clinical reasoning. After participating in the learning intervention, Justin Case shared that he had responded to real syncope/near-syncope patients and had performed 12-lead ECGs on them, reflecting, "I had that class in the back of my mind, but didn't see any of the indicators for that [Brugada syndrome], but it was part of my thought process with those patients." This enduring vigilance was reinforced by a shift in how participants interpreted normal findings, exemplified by Tar O'Reilly's conclusion that his "biggest takeaway was just saying, 'I'm not gonna use the term normal anymore,'" emphasizing that a normal looking ECG does not rule out cardiac pathology and should instead be referred to and documented as

“non-diagnostic.” Similarly, Akakael reflected that after perhaps forgetting the name of the actual syndrome he had learned, he would “at least be able to voice concern or know that something is abnormal, as opposed to just thinking that it’s perfectly fine.” Together, these reflections support the assertion that participants anticipated long-term retention, maintaining diagnostic caution, and a heightened index of clinical suspicion.

THEME 3: DEMONSTRATION OF HIGHER-ORDER THINKING SKILLS

Demonstration of higher-order thinking skills (HOTS) includes evidence of information reorganization and/or the creation of original methods or actions to resolve the intricate clinical issue. This theme encompasses cognitive processes that require learners to engage in complex reasoning, problem-solving, and the application of knowledge in novel situations. Demonstration of HOTS includes three sub-themes: analyzing, evaluating, and creating.

Analyzing refers to the participants dissecting information, identifying relationships and patterns, and/or making connections among ideas. Evaluating refers to the participants making criteria-based judgments and assessing the information’s value to justify decisions. And creating refers to the participants combining different elements to produce new ideas, outputs, and/or plans.

Key phrases that emerged were: “your questions led us down the road of opening up the case and I think that was very beneficial” (Akakael); “the way it was paused and then I had to [think]: ‘What would I do here?’ ‘What did I see?’ ‘What could be going on?’ ‘What would I do differently’?...I think that’s what really made the difference” (OFD 187); “I was kind of going down the same routes that the doctor [in the video] was going down” (Jax); “the case was taking place in an ER and they have more tools available to them...so we [prehospital] have to stop and figure out a different way to go about [the assessment and treatment]” (Justin Case).

Participants voiced a range of complimentary and constructive feedback about the learning intervention, with OFD 187 remarking,

Videos that are high quality cause the participants to feel immersed in the subject. ...breaking it down the way we did there, I’d be very inclined to take [another class like this] one again, especially just because I’d be interested to compare it to see if it was as effective for me as yours was.

And Jax appreciated putting together all the information presented, commenting,

I like the pauses, and you giving us the time to recap what was going on, like ‘What just happened?’ ‘Did you guys catch this?’ ‘Did you guys catch that?’ Giving us the opportunity to write down notes and to try to get our mind to kick in and key into some of the differential diagnoses.

The participants seemed to overwhelmingly appreciate the discussions, and Akakael expounded on their significance:

I liked how you stopped [the video] often enough so that we would have discussions in between some of the scenes. We were watching part of a TV show and talking about treatment modalities and then moving on. I think if it would have been just the video without the pauses and the discussions, it wouldn’t have been nearly as valuable. As I would wane paying attention to the video, is about the time that you would stop and make it an open discussion, which drew me back in.

To end each interview, the participants were asked to finish the sentence: "Facilitated video case-based learning is..." Akakael stated, "a valuable tool that provides some critical thinking;" Tar O'Reilly answered, "effective. I was gonna say 'awesome,' but I think everybody else will use 'awesome;'" Jax declared, "beneficial in continuing education;" OFD 187 responded, "captivating and fun to participate in;" and Justin Case stated, "more engaging and easier to partake in than other forms of learning." And although Akakael added, "I will always take hands-on over video watching and discussions," in another question (Do you feel you learned less, as much, or more through facilitated video case-based learning than through other teaching methods?) he admitted that he learned "similar" with FVCBL. The other participants answered the same question by stating that through FVCBL they learned "more, because it keeps me engaged. I don't get bored" (Jax); "at least as much and probably more...I think it was more engaging for sure, so it helped me participate more and stay engaged" (Justin Case); "more" (OFD 187); and "more...I'm going to implement it into some [of my] training" (Tar O'Reilly). Finally, the participants answered that they were "somewhat likely" (Akakael); "likely" (Jax); "pretty likely" (Justin Case); "very interested" (OFD 187); and "I'm in" (Tar O'Reilly), to the question about how likely they were to sign up for future FVCBL classes.

ADDITIONAL CODING

From the participant interview transcripts, the external coder developed four themes that aligned with the a priori categories in the deductive codebook. These included learner engagement and interaction, which aligned with the engagement subtheme; effectiveness of video-based learning, which aligned with the attitude subtheme; application to EMS practice, which aligned with both the confidence and commitment subthemes; learning retention and critical thinking, which aligned with the higher-order thinking theme.

Although the a priori categories were developed based on the literature, the same themes emerged organically from the participant data, which indicated that convergence was a sign of triangulation between the theoretical expectations and empirical reality.

DISCUSSION

Participants described the session as engaging, realistic, and relevant to their practice. A critical feature of facilitated video case-based learning was the ability to pause, reflect, and engage in structured dialogue, which created a space for learners to interrogate the clinical scenario collaboratively and foster deeper learning.

Participants consistently noted the realism of the clinical scenario, which enhanced their ability to visualize clinical presentations, identify patient care priorities, and consider differential diagnoses. This suggests that, when properly facilitated, video case-based learning can meet the criteria of a high-fidelity simulation. While fidelity traditionally refers to simulation's replicability of clinical reality, Rashid and Gianduzzo (2016) also characterize fidelity as encompassing the believability and contextual precision of the learning environment. By this definition, FVCBL achieved a high degree of fidelity, as it replicated not just the visual components of clinical care, but also its cognitive and emotional complexities.

Participants demonstrated clinical reasoning, differential diagnoses formulations, critical questioning, and application of theory to practice. The structured environment supported the cognitive shift from lower order thinking levels to more complex tasks such as analyzing, evaluating, and creating. Learners engaged in activities that required them to examine the case from interdisciplinary angles, formulate hypotheses, and refine their understanding in real time through peer and facilitator interactions. The instructional progression from case observation to active discussion and real-world application was central to HOTS development. The facilitation method strategically employed interrogation, redirection, and scaffolding, allowing learners to explore their reasoning paths while offering timely support.

Necessarily, the scenario's instructional design avoided over-complicating an already clinically challenging scenario. Perez et al. (2023) caution that overly complex or "unsolvable" cases can diminish learning and engagement. The present study addressed this by introducing complementary and supplemental information and/or alternative perspectives when learners encountered cognitive roadblocks, maintaining interest without compromising rigor.

Furthermore, the participants revealed that as the video played, they formulated their own questions and subsequently engaged in collaborative discussions while the facilitator posed complex open-ended questions. Chaojing (2023) emphasizes that such reflective practices help learners become more self-directed, adaptive, and capable of managing complexity in uncertain clinical contexts, which are all critical attributes in paramedicine.

Notably, all five participants expressed that the learning concepts would extend beyond the immediate session, especially in maintaining a high index of suspicion for underlying serious illness/injury even when all assessments are within normal limits. Recognizing that something is not right reflects a valuable form of prediagnostic awareness, often acquired through clinical experience and critical thinking, and is grounded in tacit knowledge and pattern recognition. By encouraging learners to focus on clinical deviation rather than definitive diagnoses, educators can cultivate curiosity, situational awareness, and reflective judgment. These enduring FVCBL qualities may very well sustain the learning for subsequent clinical application.

IMPLICATIONS FOR PRACTICE

The findings of this study suggest several key implications for the design and delivery of paramedic education. First, given that the participants found the video case study highly engaging and effective, educators should consider the integration of FVCBL as a central instructional approach in paramedic education, training, and ongoing workplace learning.

Second, FVCBL offers a scalable and cost-effective alternative to high-fidelity clinical simulation. When strategically integrated into course design and ongoing professional learning, video cases can maintain realism while reducing the costs associated with the staff (faculty, operations specialist, standardized patients), stuff (equipment, patient simulators, technology), and space (square footage, mobile trailer, utilities) (Senvisky et al., 2023) necessary for the execution of high-fidelity clinical simulation scenarios.

Third, there is an opportunity for educational institutions and paramedic training programs to produce their own clinically focused case-study videos and share them within their clinical and educational network. Such locally relevant content may improve contextual alignment with clinical practice and ensure coherence with institutional and national learning standards.

Next, training programs should incorporate structured opportunities for learner reflections and guided discussions within the video case presentations, to foster higher-order thinking skills. Facilitators should be trained in inquiry-based instructional strategies that promote student-led questioning, exploration, and collaborative reasoning, as the discussion component in FVCBL suggests that it is analogous to the debriefing component in clinical simulation, which is vital to learning (Grant, 2010; Okuda et al., 2009).

Finally, curricula should be designed to include video case scenarios that span varying levels of complexity to challenge learners at different stages of expertise. A progressive design approach allows for scaffolding of knowledge, skills, and abilities, supporting learners as they transition from novice to proficient clinician. Collectively, these implications highlight the potential for facilitated video case-based learning to serve as a transformative instructional strategy in paramedic learning.

RECOMMENDATIONS FOR FUTURE RESEARCH

Future studies should compare facilitated video case-based learning with other instructional approaches, for example, traditional lectures, hands-on clinical simulations, flipped classrooms, game-based learning, and experiential learning. FVCBL should also be examined for its adaptability to various educational formats, including online and hybrid settings, which may help support more scalable, flexible, and inclusive training opportunities for remote learners. FVCBL's group composition (varying skill levels), size, and diversity should also be investigated to gauge their effects on collaborative learning, engagement, and critical thinking. Additionally, given the importance of the structured discussions, future studies should examine how different facilitation skills and styles affect learner engagement, critical thinking, and knowledge retention.

Finally, further investigation is needed to determine whether the competencies developed through FVCBL transfer effectively to real-world clinical decision-making in paramedicine. Specifically, behavior and results, corresponding to levels 3 and 4, respectively, of the New Kirkpatrick Model®, should be evaluated to assess the broader impact of FVCBL on paramedic performance and patient outcomes.

LIMITATIONS

The study was limited by a relatively small sample size in one fire department; however, the sample size was purposefully kept at the level in which clinical simulation has been shown to be most effective, which is five participants (Au et al., 2023). Another limitation was that the structured classroom environment does not fully replicate the dynamic, high-pressure context of real-world paramedic emergencies. Finally, the dual role of the researcher as both facilitator and interviewer introduced the possibility of observer bias and participant reactivity. Since the participants were volunteers, they were probably self-motivated in seeking further education and inclined to consider the learning intervention as worthwhile. While self-reported data is valuable for understanding learner

perceptions, it may be influenced by the participants' desires to meet perceived expectations.

CONCLUSION

This study explored the impact of facilitated video case-based learning within paramedic workplace learning. The findings revealed that FVCBL learning was not only perceived as highly engaging and relevant but also contributed meaningfully to knowledge acquisition and the development of higher-order thinking skills.

Participants consistently emphasized the value of the realistic case scenario and structured facilitation in deepening their understanding and application of clinical practice and protocols. These findings suggest that FVCBL holds significant potential as a pedagogically robust and scalable alternative to more resource-intensive teaching and learning strategies, such as high-fidelity clinical simulation.

As paramedic learning continues to evolve, instructional strategies like FVCBL can offer a flexible, cost-effective, and comprehensive strategy for preparing paramedics for real-world medical emergencies. This study contributes to a growing body of evidence supporting the use of case-based, technology-enhanced learning modalities in paramedic and health professions education. It affirms the potential of facilitated video case-based learning to enrich paramedic learning, foster reflective and critical thinking, and ultimately improve clinical acumen and patient outcomes.

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