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Evaluating the Effectiveness of AI-Generated Health Educational Videos on Nursing Students' Knowledge Acquisition of the International Patient Safety Goals (IPSG)

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Abstract. This study addressed the limited focus on the specific educational needs of undergraduate nursing students in existing AI in healthcare research, particularly in relation to the International Patient Safety Goals (IPSG). While AI-generated health educational videos offer potential benefits, their effectiveness in enhancing understanding of IPSG remains underexplored. A true experimental pretest–posttest design was employed with 60 first-year nursing students from a university in Quezon City, who were selected through stratified random sampling and randomly assigned to either a control or experimental group. A researcher-made questionnaire, consisting of a 30-item multiple-choice test and a six-item situational test, was used to measure both knowledge acquisition and practical application. The pretest revealed comparable baseline knowledge levels (control: M = 26.33, SD = 4.11; experimental: M = 27.17, SD = 2.76), both of which were categorized as "Average." Following the intervention, the experimental group demonstrated a significant improvement (M = 29.63, SD = 2.13), as indicated by a paired-sample t-test yielding a statistically significant t-value of 6.251 ($p < .001$). These results suggest that AI-generated videos are a valuable supplementary instructional tool in nursing education. Limitations included the short intervention period, absence of long-term retention measures, and the study's single-institution scope. The contribution of this study lies in demonstrating the potential of AI-generated videos as a transformative approach in nursing education. If validated on a larger scale, these tools could establish a more standardized, scalable, and accessible mode of teaching patient safety concepts. Beyond supporting individual learning, they may address gaps in instructional quality across institutions, promote consistency in patient safety training, and strengthen clinical preparedness among nursing students. In this way, the study provides both theoretical insights into the role of AI in education and practical evidence to inform curriculum development, institutional policies, and future research on technology-enhanced learning in healthcare.

Keywords: AI-generated health educational videos; International patient safety goals; Knowledge acquisition; Nursing education; True experimental research

1.0 Introduction

Artificial intelligence (AI), once a theoretical concept, has become a transformative force across disciplines, particularly in education and healthcare. Defined as the simulation of human cognitive processes by machines, AI now plays a vital role in solving complex problems and delivering scalable solutions (Xu et al., 2021). In education, the application of AI has revolutionized the creation, personalization, and delivery of knowledge. With advances in deep learning and multimedia integration, AI technologies are capable of generating digital educational materials that incorporate audio-visual content, interactive graphics, and adaptive learning pathways, resulting in more engaging and individualized learning experiences (Ali et al., 2023).

AI-powered educational tools such as intelligent tutoring systems, virtual simulations, and automated content generation are increasingly being utilized to enhance student learning outcomes and motivation (Abd Karim, 2023). These tools respond to learners' progress in real time and offer targeted feedback, making them particularly relevant in disciplines that demand both theoretical knowledge and practical competence. However, despite their potential, the integration of AI into education raises legitimate concerns regarding authenticity, misinformation, and the possible deterioration of human-centered learning values (Cheng, 2024). Such challenges are especially significant in healthcare education, where ethical decision-making, empathy, and interpersonal communication remain central to safe and effective clinical practice.

In nursing education, the urgency to modernize teaching methods is particularly evident in the instruction of patient safety principles. The 6th edition of the International Patient Safety Goals (IPSG), established by the Joint Commission International, serves as a foundational framework to promote quality and safety in healthcare settings (Joint Commission International, 2023). These goals address critical domains, including patient identification, effective communication, medication safety, infection prevention, and risk reduction. Despite their importance, research indicates that many nursing students struggle to fully grasp and apply these principles in clinical settings due to the limitations of conventional didactic instruction (Kalinowski et al., 2024). Traditional classroom-based methods often lack the interactivity and contextualization necessary for deep learning, especially when teaching abstract safety protocols and high-risk clinical scenarios.

Video-based learning has emerged as a promising pedagogical alternative, offering visual and narrative-driven content that can enhance knowledge retention and engagement. Navarrete et al. (2023) found that video-assisted instruction not only supports self-directed learning but also accommodates diverse learning styles. When integrated with AI, video-based learning becomes even more dynamic, allowing for the creation of personalized, data-informed instructional content tailored to learners' performance and needs (Limna et al., 2022). In high-stakes disciplines such as nursing, where learners are expected to transition seamlessly from theoretical learning to real-world application, AI-generated videos offer potential as tools for simulating clinical situations, reinforcing safety standards, and enhancing comprehension.

Nonetheless, existing literature on AI in healthcare education remains largely exploratory and generalized. Most studies focus on broad applications of AI in medicine or healthcare training, often overlooking the specific pedagogical needs of undergraduate nursing students and the unique requirements of patient safety education (Hirani et al., 2024). Moreover, while AI-generated content may offer consistency and scalability, its actual effectiveness in improving conceptual understanding of patient safety — particularly through the lens of IPSG — is underexplored. Salem (2020) highlighted the discrepancy between students' perceived clinical readiness and their actual competency, revealing a critical gap in patient safety education that current methods have yet to address.

This research aims to address that gap by examining the impact of AI-generated health educational videos on nursing students' knowledge acquisition of the International Patient Safety Goals. Through an actual experimental pretest-posttest design, the study investigates whether exposure to AI-generated content leads to significant improvement in students' conceptual understanding and preparedness for clinical practice. Findings from this research may contribute to the development of more engaging, scalable, and effective educational strategies in nursing curricula, supporting the broader integration of AI in healthcare education and ultimately advancing patient safety outcomes.

2.0 Methodology

2.1 Research Design

This study utilized an actual experimental pretest-posttest control group design, a subtype of experimental research design. According to Asenahabi (2019), an experimental design is a research approach in which the researcher manipulates one or more variables to measure their effects on a dependent variable. A proper experimental design, in particular, involves the random assignment of participants to different treatment groups to ensure the reliability of causal inferences. In this study, participants were randomly assigned to two groups: an experimental group that received the intervention (an AI-generated health education video alongside a pamphlet) and a control group that received only the standard method (a pamphlet). Both groups underwent a pretest to assess baseline knowledge of the International Patient Safety Goals (IPSG), followed by a posttest to measure changes after the intervention. The researchers exercised control over key aspects of the study—such as sample selection, assignment to treatment conditions, environmental control, and standardized instructions—to minimize the influence of extraneous variables and ensure that any observed changes in the dependent variable (knowledge of IPSG) were directly attributable to the independent variable (AI intervention). This design was selected because it is considered the most rigorous method for establishing cause-and-effect relationships. By incorporating randomization, controlled conditions, and pretest-posttest comparisons, the study was able to objectively determine whether the AI-generated video had a statistically significant impact on improving nursing students' knowledge acquisition of IPSG.

2.2 Research Locale

The study was conducted at a private higher education institution in Quezon City, Philippines, offering a Bachelor of Science in Nursing program. The institution was chosen as the research locale because it provides access to first-year nursing students who were the primary respondents of the study. The school has established nursing laboratories and classrooms equipped for instructional delivery, making it a suitable environment for implementing the intervention.

2.3 Research Participant

The participants in this study were 60 first-year nursing students from a university in Quezon City, Philippines, who were officially enrolled in the mid-year semester of the 2024–2025 academic year. These students had not yet been introduced to the International Patient Safety Goals in formal academic or clinical training. A stratified random sampling technique was used to ensure equal representation from 12 block sections. Each block contributed five students, resulting in 60 participants who were then equally divided into a control group and an experimental group (30 participants each).

Inclusion Criteria

The inclusion criteria for this study required participants to be first-year Bachelor of Science in Nursing students, aged between 18 and 25 years old, and officially enrolled during the mid-year term of the 2024–2025 academic year. Eligible participants must have successfully passed the university's admission screening process, which included an interview, personality test, and battery examination. Furthermore, only students with a General Weighted Average (GWA) of 2.00 and above for the previous academic year were considered qualified.

Exclusion Criteria

The exclusion criteria involved students who had dropped out or were under academic probation during the mid-year term. Students with extensive prior knowledge or formal training related to the International Patient Safety Goals (IPSG) were also excluded to avoid bias in knowledge acquisition. Additionally, participants who were unresponsive or failed to complete the entire study protocol were excluded from the final analysis.

2.4 Research Instrument

The study employed a researcher-designed, paper-based questionnaire comprising two parts: a 30-item multiple-choice questionnaire (MCQ) to assess theoretical knowledge and a 6-item situational judgment test (SJT) to evaluate the practical application of IPSG concepts. The MCQs were developed in alignment with the six domains of the International Patient Safety Goals (IPSG) set by the Joint Commission International (JCI). At the same time, the SJTs presented clinical scenarios modeled on common patient safety issues encountered in Philippine healthcare settings (Heier et al., 2022). Content validity was established through a panel of five experts: three specialists in IPSG, one in experimental design, and one in language and assessment. A pilot test was conducted with a separate group of students to assess item clarity and alignment with learning objectives, after which

revisions were made based on the feedback received. The instrument demonstrated strong internal consistency, with Cronbach's alpha values of .840 (pretest) and .850 (posttest). The Intraclass Correlation Coefficient (ICC) ranged from .840 to .850, indicating acceptable reliability. To minimize recall bias, identical test items were used in both the pretest and posttest, but were presented in a rearranged order.

2.5 Data Gathering Procedure

The data collection process began after obtaining approval from the institutional ethics review committee and securing informed consent from participants. The study was conducted over one week, using a face-to-face medium, during the mid-year term of the 2024–2025 academic year. Participants were randomly assigned to either the control or experimental group using simple randomization techniques. Both groups initially completed a pretest using the researcher-made questionnaire to assess baseline knowledge and application of the International Patient Safety Goals (IPSG). A one-week interval was observed to minimize the recall effect of the questionnaire (Al-Za'areer et al., 2023). To simulate a baseline traditional method, both groups were provided with a printed educational pamphlet, which they were instructed to read for nine (9) minutes. Immediately afterward, the experimental group was shown an AI-generated educational video lasting another nine (9) minutes, covering the duplicate content as the pamphlet and aligned with JCI standards. This method was informed by Asif and Kazi (2024), who emphasized that modern learners usually exhibit an attention span of approximately 30 minutes; thus, educational content should be structured within this timeframe to maintain engagement and effectiveness. Following the intervention, a post-test was administered to both groups using the same set of rearranged questions to assess changes in knowledge.

2.6 Ethical Considerations

Ethical principles were strictly observed throughout the study. Approval was obtained from the institutional ethics review board prior to the commencement of data collection. Participants were provided with an informed consent form that detailed the study's purpose, the voluntary nature of participation, the procedures involved, and assurances of data confidentiality. No identifying information was collected, and all responses were treated with strict confidentiality. Participants were also informed of their right to withdraw from the study at any point without penalty. The researchers ensured that the educational materials used posed no risk or harm to the participants and were aligned with academic and professional standards.

3.0 Results and Discussion

3.1 Pretest Knowledge of the Control Group on IPSG

In the initial assessment of the control group (n = 30), pretest scores ranged from 10 to 31, with most participants scoring between 25 and 31. This distribution reflects a generally average baseline understanding of the International Patient Safety Goals (IPSG), though the presence of lower scores (e.g., 10, 21, 22) reveals noticeable variability in prior knowledge levels. The group's mean score was 26.33 (SD = 4.11), falling within the 60–75% range, which was classified as "Average Knowledge" based on criteria adapted from Attia et al. (2021).

Table 1. *Pretest Knowledge of the Control Group on IPSG*

Group	n	Mean (M)	Standard Deviation (SD)	Percentage	Interpretation
Control	30	26.33	4.11	≥60% - ≤75%	Average Knowledge

Legend: <60% (0–21) = **Poor Knowledge** | ≥60% – ≤75% (22–27) = **Average Knowledge** | >75% (28–36) = **Good Knowledge**

These results suggest a relatively uniform baseline awareness of IPSG concepts, yet they also highlight the limitations of pre-existing knowledge without structured educational reinforcement. The moderate standard deviation indicates that most students were clustered around the mean, with a few outliers that were extreme. As emphasized by Kim et al. (2025), theoretical knowledge alone may not guarantee competence in clinical application, particularly in safety-sensitive domains. This aligns with Alquwez et al. (2019), who observed that nursing students often displayed only moderate familiarity with critical IPSG principles, such as accurate patient identification and medication safety, in the absence of hands-on simulation and formal instruction.

Since the control group did not receive any intervention, including the AI-generated video used with the experimental group, these scores serve as a benchmark for evaluating the educational value of the intervention. The observed knowledge levels reinforce the necessity for more engaging and contextually relevant teaching strategies. Galmarini et al. (2024) emphasized that visual and interactive learning materials significantly enhance health-related comprehension, especially when compared to passive, text-based methods. In this context, the

control group's performance supports the demand for integrating targeted, technology-enhanced instruction to elevate nursing students' understanding and practical application of IPSG.

3.2 Pretest Knowledge of the Experimental Group on IPSG

The experimental group's pretest scores, ranging from 22 to 34, with most falling between 25 and 30, revealed a moderate to good baseline understanding of the International Patient Safety Goals (IPSG). The mean score was 27.17 (SD = 2.76), equivalent to 75.47%, and categorized as "Average Knowledge," which is closely approaching the threshold for "Good Knowledge" as per Attia et al. (2021). Unlike the control group, no extremely low scores were observed, suggesting a more consistent level of prior knowledge among participants.

Table 2. *Pretest Knowledge of the Experimental Group on IPSG*

Group	n	Mean (M)	Standard Deviation (SD)	Percentage	Interpretation
Experimental	30	27.17	2.76	≥60% - ≤75%	Average Knowledge

Legend: <60% (0–21) = **Poor Knowledge** | ≥60% – ≤75% (22–27) = **Average Knowledge** | >75% (28–36) = **Good Knowledge**

This performance may reflect prior curricular exposure to IPSG content, yet literature warns against equating perceived familiarity with actual readiness. Høegh-Larsen et al. (2023) and Salem (2020) have emphasized that theoretical knowledge does not always translate to competent clinical decision-making, especially in high-stakes patient safety scenarios. Additionally, Pehlivan et al. (2022) and Ghasemi et al. (2020) noted that traditional instructional methods can lead to gaps in knowledge retention when misaligned with learner needs.

Given these limitations, the relatively uniform pretest performance of the experimental group reinforces the need for adaptive, learner-centered educational interventions. AI-generated videos, which offer visual, interactive, and personalized learning experiences, have been shown to enhance comprehension and engagement (Pivač et al., 2021; Hinkle, 2023). As such, the pretest scores provide a stable benchmark for evaluating the effectiveness of the AI-based intervention in promoting a deeper, more consistent understanding of patient safety standards among nursing students.

3.3 Post-Test Knowledge of the Experimental Group on IPSG

The experimental group's posttest scores ranged from 25 to 34, with a mean score of 29.63 (SD = 2.13), corresponding to a "Good Knowledge" level or over 75% based on the interpretation scale of Attia et al. (2021). Out of 30 participants, 27 showed improvement from their pretest scores, while three exhibited no change or slight decline. This upward trend, along with the group's tighter score distribution, suggests that the AI-generated health educational video supported a consistent increase in IPSG knowledge.

Table 3. *Posttest Knowledge of the Experimental Group on IPSG*

Group	n	Items	Mean	Std. Dev.	Percentage	Interpretation
Experimental	30	36	29.633	2.125	>75%	Good Knowledge

Legend: <60% (0–21) = **Poor Knowledge** | ≥60% – ≤75% (22–27) = **Average Knowledge** | >75% (28–36) = **Good Knowledge**

The improved performance indicates the effectiveness of AI-generated videos in reinforcing patient safety concepts. The structured, engaging, and accessible nature of the video likely contributed to stronger knowledge retention and understanding. These findings align with Matsiola et al. (2024) and Bozkurt et al. (2021), who emphasized that AI-powered instruction supports meaningful learning through interactive and personalized formats. Additionally, the reduced variability in scores implies that the intervention supported both higher and lower-performing students equally, promoting more balanced learning outcomes.

Furthermore, the results are consistent with De Gagne (2023), who noted that AI-simulated environments enhance clinical reasoning and decision-making in nursing education. By offering consistent delivery and accommodating diverse learning preferences, AI-based tools present a promising strategy for reinforcing critical safety knowledge. The experimental group's posttest results confirm the potential of AI-generated videos as a practical, learner-centered approach in nursing instruction, particularly in high-stakes topics such as the International Patient Safety Goals (IPSG).

3.4 Pretest and Posttest Knowledge Comparison of the Experimental Group on IPSG

The experimental group demonstrated a statistically significant improvement in post-test scores following the AI-generated video intervention. The mean score increased from 27.17 (SD = 2.76) in the pretest to 29.63 (SD = 2.13)

in the posttest. A paired sample t-test confirmed the significance of this improvement ($t = 6.251$, $p < .001$), indicating that the observed difference was not due to chance. This suggests that the AI-generated health educational video effectively enhanced nursing students' knowledge of the International Patient Safety Goals (IPSG).

Table 4. *Pretest and Posttest Knowledge Comparison of the Experimental Group on IPSG*

	n	Mean	Std. Dev.	Compared t-value	p-value	Decision
Pretest	30	27.167	2.755			
Posttest	30	29.633	2.125	6.251	.000000802	Reject H_0

Legend: <60% (0–21) = **Poor Knowledge** | ≥60% – ≤75% (22–27) = **Average Knowledge** | >75% (28–36) = **Good Knowledge**

While most participants improved, individual score analysis revealed variations in learning outcomes. One participant experienced a slight decline in score, while three showed no change, and others demonstrated substantial gains of up to five or six points. These individual differences may reflect varying levels of motivation, prior knowledge, or engagement. Gavarkovs et al. (2025) emphasized that motivation and perceived competence are key factors in the effectiveness of digital learning interventions. In contrast, Moeyaert et al. (2021) noted that learner engagement can moderate the extent to which students benefit from technology-based instruction.

These findings validate the potential of AI-generated videos to promote significant knowledge gains in nursing education. The consistency and statistical significance of the results support the integration of AI tools into nursing curricula, particularly for critical topics such as patient safety. As highlighted by the American Association of Colleges of Nursing (AACN, 2021), the incorporation of digital and AI-enhanced learning methods is crucial for preparing nurses to succeed in increasingly complex healthcare systems.

3.5 Education Implications and Integration of AI Media

Based on the results, AI-generated health educational videos proved to be an effective supplementary tool for improving nursing students' knowledge of the International Patient Safety Goals (IPSG). The videos were structured according to the Cognitive Theory of Multimedia Learning (CTML), emphasizing segmentation, dual coding (visual-auditory input), and signaling of key information, which supported learner engagement and comprehension. The experimental group's significant improvement in posttest scores, along with a reduced standard deviation, indicated not only higher overall performance but also more consistent learning outcomes.

These findings align with previous studies by Jallad et al. (2024) and Montejo et al. (2024), who emphasized the value of adaptive, technology-based learning in professional education. To build on this success, the study recommends future interventions such as modular AI-generated video lessons per IPSG domain, adaptive AI quizzing systems, and AI-driven simulations using avatars for real-world clinical scenarios. These applications offer flexibility and immediate feedback, encouraging reflective learning and deeper understanding.

Integrating AI-generated audiovisual content into nursing curricula presents a scalable and practical approach to reinforcing patient safety education. These tools can be easily updated and customized to meet learners' needs, and delivered across digital platforms for convenient access. This supports just-in-time learning, allowing nursing students to review material at their own pace and on demand, ultimately enhancing their competence, retention, and preparedness for clinical practice.

4.0 Conclusion

This study demonstrated that AI-generated health educational videos are a promising tool for advancing nursing students' knowledge of the International Patient Safety Goals (IPSG). By utilizing multimedia learning principles, such as dual coding and cognitive load management, the intervention effectively supported the delivery of complex patient safety content in an accessible and engaging format. The statistically significant improvement in the experimental group's posttest scores, compared to the control group, underscores the capacity of AI-generated videos to foster measurable knowledge gains, even with brief exposure.

Beyond the quantitative outcomes, the study contributes to the growing body of evidence supporting the use of technology-enhanced learning in nursing education. Its findings highlight how AI can be more than a supplementary tool—it can function as a strategic pedagogical resource that supports self-directed learning, fosters digital confidence, and promotes the standardized delivery of critical concepts, such as patient safety. These implications are particularly relevant in a post-pandemic educational landscape where hybrid and flexible

learning models are increasingly the norm. Integrating AI-generated content into curricula can help bridge gaps in instructional quality, provide accessible refresher materials, and accommodate diverse learning preferences, ultimately strengthening student competence and readiness for clinical practice.

From a policy and institutional standpoint, the study encourages nursing schools and health education providers to establish ethical guidelines, infrastructure, and faculty development programs to support the responsible use of AI in instruction. It also calls on future researchers to expand the inquiry by exploring AI's long-term educational impact, the influence of design features (e.g., interactivity, animation), and its applicability across various nursing domains, such as clinical judgment and infection control. Larger sample sizes, longitudinal research, and qualitative methodologies may further reveal how AI interventions affect student learning behaviors, knowledge retention, and professional preparation. Finally, by equipping students with the skills to critically engage with AI tools—through prompt engineering, content validation, and ethical reflection—nursing education can better align with the evolving digital healthcare environment and ensure future nurses are prepared to uphold both technological and clinical excellence.

The implications for practice underscore that incorporating AI-generated educational tools can help standardize patient safety training, minimize instructional variability, and enhance clinical preparedness. Nursing students exposed to such tools may develop stronger baseline knowledge of IPSG, thereby reducing preventable errors and improving patient outcomes. In terms of research, this study lays the groundwork for developing AI-integrated teaching frameworks in nursing education. Future investigations may compare AI-generated videos with other digital modalities, such as virtual simulations and VR-based clinical scenarios (Bozkurt et al., 2021; Montejo et al., 2024), to determine the most effective approaches for specific competencies. Additionally, exploring how AI can support not only cognitive learning but also affective and psychomotor domains will be essential in preparing well-rounded practitioners. Looking ahead, future works may examine adaptive AI platforms capable of tailoring content to individual learning styles, as well as collaborative AI-driven simulations that promote team-based learning (De Gagne, 2023). Cross-institutional and cross-cultural studies are also recommended to assess how AI-generated videos can be scaled across diverse educational settings, ensuring global relevance in advancing patient safety education. Finally, by equipping nursing students with the ability to critically engage with AI tools—through prompt engineering, content validation, and ethical reflection—nursing education can better align with the evolving digital healthcare environment and ensure future nurses are prepared to uphold both technological and clinical excellence.

5.0 Contributions of Authors

The authors indicated equal contribution to each section and approved the final work.

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7.0 Conflict of Interests

The authors declare no conflicts of interest regarding the publication of this paper.

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