



Effect of an Emergency Severity Index-Based Triage Video on Preparedness for Traffic Accident Emergencies

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ABSTRACT

Background: Traffic-related emergencies remain a major global public health concern, requiring healthcare professionals to perform rapid and accurate triage to optimize patient outcomes. Educational videos incorporating the Emergency Severity Index (ESI) have emerged as a promising instructional approach for improving disaster preparedness and triage competence among anesthesiology nursing students. **Objective:** This study aimed to evaluate the effectiveness of an ESI-based triage educational video in improving the preparedness of undergraduate anesthesiology nursing students to respond to traffic-related emergencies. **Methods:** A quasi-experimental study using a nonequivalent control group design was conducted with 68 undergraduate anesthesiology nursing students. Participants were allocated to either the intervention group (n = 34) or the control group (n = 34). Preparedness was assessed before and after the intervention using a questionnaire adapted from the LIPI-UNESCO/ISDR preparedness framework. **Results:** Before the intervention, 47.1% of participants demonstrated a moderate level of preparedness. Following the intervention, 97.1% achieved a high level of preparedness. The Wilcoxon signed-rank test demonstrated a significant improvement in preparedness scores after exposure to the ESI-based educational video ($p < 0.001$). In addition, the Mann-Whitney U test revealed significantly higher post-intervention preparedness scores in the intervention group than in the control group ($p < 0.001$). **Conclusion:** ESI-based triage educational videos significantly enhanced anesthesiology nursing students' preparedness to respond to traffic-related emergencies. These findings support integrating video-assisted learning into emergency nursing education as an effective strategy to strengthen preparedness and triage competencies.

Keywords: Emergency Severity Index, Triage, Educational video, Preparedness; Traffic accidents

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1. INTRODUCTION

Traffic accidents remain one of the leading causes of mortality and disability worldwide and continue to pose

substantial challenges to emergency healthcare systems. In traffic-related emergencies, healthcare professionals are expected to rapidly assess patients,

establish treatment priorities, and allocate healthcare resources efficiently to minimize morbidity and mortality. Consequently, triage competency is regarded as a fundamental skill that healthcare professionals should acquire during their professional education.

The Emergency Severity Index (ESI) is one of the most widely implemented triage systems in emergency departments. It is a five-level triage algorithm designed to classify patients according to clinical acuity and anticipated resource utilization during emergency care. The ESI categorizes patients from Level 1, representing the most critical condition requiring immediate intervention, to Level 5, indicating the least urgent condition (Emergency Nurses Association, 2023). Previous studies have demonstrated that the ESI possesses high validity and reliability for supporting rapid and objective triage decision-making (Ariyani, 2020). Developed by Wuerz and Eitel, the system aims to improve the efficiency and consistency of clinical decision-making in emergency settings. Furthermore, Ganjali et al. (2020) reported that the five-level ESI triage system accurately predicts patient outcomes in emergency departments, supporting its effectiveness in prioritizing patients who require immediate assessment and intervention.

The primary objective of implementing the ESI is to identify critically ill patients requiring immediate treatment while improving the efficiency of emergency department services (Ramli et al., 2024). Previous studies have shown that the ESI reduces patient waiting times and accelerates triage processes (Utami, 2023). In addition, ESI-based triage training has been reported to improve healthcare professionals' ability to categorize patients accurately while reducing both over-triage and under-triage rates (Pontisidis et al., 2024). Razavian et al. (2024) further demonstrated that the ESI facilitates more effective resource allocation, thereby optimizing emergency care delivery.

Within nursing education, triage competency constitutes an essential component of emergency and disaster preparedness. Preparedness refers to an individual's capacity to respond effectively to emergencies through an integration of knowledge, practical skills, and psychological readiness (Tulungen & Rantung, 2024). As one of the key phases of disaster management, preparedness plays a critical role in mitigating the impact of emergency events (Lubis et al., 2024). Therefore, strengthening preparedness among nursing students is essential for

developing competent and responsive future healthcare professionals.

Han and Chun (2021) proposed that healthcare preparedness comprises four major dimensions: knowledge, personal preparedness, professional preparedness, and organizational preparedness. Their findings indicated that preparedness levels are influenced by previous experience, emergency training, and disaster education. Similarly, Winarti and Gracya (2023) identified institutional support and prior experience as significant predictors of disaster preparedness among healthcare professionals. However, Lase et al. (2025) reported that the limited frequency of disaster preparedness training remains a major barrier to achieving optimal preparedness during the pre-disaster phase.

Advances in educational technology have created new opportunities to enhance the effectiveness of learning through digital learning media. Among these, educational videos have gained increasing attention because they integrate visual and auditory information, thereby facilitating more effective knowledge acquisition than conventional instructional methods. In triage education, video-based learning enables students to observe patient assessment, triage categorization, and clinical decision-making within scenarios

that closely resemble real-world emergencies.

Several studies have demonstrated the effectiveness of educational videos in improving nursing students' competencies. Pranatio et al. (2025) reported that ESI-based educational videos significantly improved triage knowledge among nurse anesthesiology students. Similar findings were reported by Pawilliyah et al. (2024), who observed significant improvements in students' knowledge following video-assisted emergency triage education. Moreover, Kavakli et al. (2024) found that simulation-based triage education enhanced clinical decision-making and emergency preparedness among nursing students. Likewise, Berk et al. (2024) demonstrated that educational videos improved clinical reasoning and decision-making skills during mass casualty triage training.

At the policy level, the Indonesian government has demonstrated a strong commitment to strengthening disaster preparedness through various regulations and strategic initiatives. Law Number 24 of 2007 on Disaster Management and Government Regulation Number 21 of 2008 emphasize that disaster preparedness is a shared responsibility among government agencies, communities, and educational institutions. This commitment

is reinforced by the National Disaster Management Master Plan 2020–2044, which identifies the development of healthcare human resources as a national priority (BNPB, 2025). Furthermore, the Directorate General of Higher Education, Research, and Technology has promoted the integration of disaster education, public safety, and public health into higher education curricula through the Impactful Campus Program (Kampus Berdampak) (DIKTI, 2025).

Despite the growing body of evidence, previous studies have primarily focused on improving knowledge, triage skills, or clinical decision-making abilities. Research specifically investigating the effectiveness of ESI-based educational videos in enhancing preparedness among nurse anesthesiology students, particularly across preparedness domains such as knowledge, attitudes, emergency response planning, warning systems, and resource mobilization, remains limited. Therefore, this study addresses an important gap in the literature by evaluating the effectiveness of an ESI-based educational video for traffic accident scenarios in improving preparedness among future emergency healthcare professionals. Specifically, this study aimed to evaluate the effect of an ESI-based triage educational video on the preparedness of

undergraduate nurse anesthesiology students at Universitas Aisyiyah Yogyakarta in managing traffic-related emergencies.

2. METHODS

This study employed a quasi-experimental, non-equivalent control group design to evaluate the effect of an Emergency Severity Index (ESI)-based triage educational video on the preparedness of undergraduate nurse anesthesiology students to manage traffic-related emergencies. Both the intervention and control groups completed pretest and posttest assessments to evaluate changes in preparedness before and after the intervention. The intervention group received the ESI-based educational video, whereas the control group received no video-based instruction.

The study was conducted in February 2026 at the Undergraduate Nurse Anesthesiology Program, Universitas Aisyiyah Yogyakarta, Indonesia. The study population comprised all active undergraduate nurse anesthesiology students enrolled during the even semester of the 2024/2025 academic year who met the eligibility criteria, totaling 156 students. The minimum sample size was determined using the Slovin formula with a 10% margin of error, yielding a required

sample size of 60 participants. To account for potential attrition, an additional 10% was added, yielding a final sample of 68 participants. Participants were allocated into an intervention group ($n = 34$) and a control group ($n = 34$).

Eligible participants were active undergraduate nurse anesthesiology students who had completed the disaster emergency nursing course, agreed to participate voluntarily, and completed all stages of the study, including the pretest, intervention, and posttest. Students who were absent during data collection, submitted incomplete questionnaires, or withdrew from the study were excluded from the analysis.

The independent variable was an ESI-based triage educational video focusing on traffic accident scenarios, whereas the dependent variable was students' emergency preparedness. Potential confounding variables considered in this study included previous experience, cumulative grade point average (GPA), sex, and age.

The educational video lasted 3 minutes and was presented three times using an LCD projector. The instructional content covered the fundamental principles of the Emergency Severity Index (ESI), ESI Levels 1–5, assessment of traffic accident victims, prioritization of patient

care, and initial clinical decision-making during emergencies. The posttest assessment was administered immediately after completion of the video session.

Preparedness was measured using a self-administered questionnaire adapted from the LIPI–UNESCO/ISDR Disaster Preparedness Framework and modified to reflect traffic accident triage scenarios. The instrument consisted of 19 Likert-scale items, each scored from 1 (strongly disagree) to 5 (strongly agree). Preparedness scores were categorized into five levels: very low (1.00–1.80), low (1.81–2.60), moderate (2.61–3.40), high (3.41–4.20), and very high (4.21–5.00).

Instrument validity was evaluated in a pilot study involving 34 respondents using Pearson's product-moment correlation. All 19 items demonstrated corrected item-total correlation coefficients exceeding the critical value ($r = 0.339$, $p < 0.05$), indicating satisfactory construct validity. Internal consistency reliability was assessed using Cronbach's alpha, yielding a coefficient of 0.930, which indicates excellent reliability.

Data collection began with the administration of the pretest questionnaire to both groups. Subsequently, participants in the intervention group received the ESI-based educational video, whereas those in the control group received no educational

video. Following completion of the intervention, both groups completed the posttest using the same questionnaire. Before participation, all respondents received a detailed explanation of the study objectives, procedures, potential benefits, and their rights as research participants. Written informed consent was obtained prior to data collection.

Ethical approval was obtained from the Health Research Ethics Committee of Universitas Aisyiyah Yogyakarta (Approval No. 5257). The study was conducted in accordance with established ethical principles, including voluntary participation, written informed consent, anonymity, confidentiality, and equitable treatment of all participants.

Data were analyzed using IBM SPSS. Descriptive statistics were used to summarize participants' characteristics and preparedness levels. Within-group differences in preparedness scores before and after the intervention were analyzed using the Wilcoxon signed-rank test, and between-group differences using the Mann-Whitney U test. Statistical significance was established at $p < 0.05$.

3. RESULTS

A total of 68 undergraduate nurse anesthesiology students participated in this study, with 34 students assigned to the

intervention group and 34 students to the control group. The majority of participants in the intervention group were 19 years old (61.8%, $n = 21$), while the remaining participants were 20 years old (38.2%, $n = 13$). Similarly, most participants in the control group were 19 years old (67.6%, $n = 23$), with 32.4% ($n = 11$) aged 20 years.

Female participants predominated in both groups. In the intervention group, 70.6% ($n = 24$) were female, and 29.4% ($n = 10$) were male. Likewise, the control group comprised 67.6% ($n = 23$) female and 32.4% ($n = 11$) male participants. Regarding academic performance, most students achieved a cumulative grade point average (GPA) of 3.51–4.00, representing 82.4% ($n = 28$) of the intervention group and 79.4% ($n = 27$) of the control group. The remaining participants had a GPA ranging from 2.76 to 3.50.

Before the intervention, preparedness levels in the intervention group were predominantly categorized as moderate (47.1%, $n = 16$), followed by high (41.2%, $n = 14$), low (8.8%, $n = 3$), and very low (2.9%, $n = 1$). Following exposure to the ESI-based educational video, preparedness levels improved substantially. Most participants (97.1%, $n = 33$) achieved a high level of preparedness, while one participant (2.9%) reached the very high category. No participants remained in the

very low, low, or moderate preparedness categories after the intervention.

The Wilcoxon signed-rank test showed a statistically significant improvement in preparedness scores in the intervention group following the ESI-based triage educational video ($p < 0.001$), indicating that participants exhibited higher preparedness after the intervention than before receiving the educational video.

The Mann–Whitney U test revealed a statistically significant difference in post-intervention preparedness scores between the intervention and control groups ($p < 0.001$). The intervention group achieved a higher mean preparedness score (4.03 ± 0.17) than the control group (3.44 ± 0.50), indicating superior preparedness among students who received the ESI-based educational video.

Table 1. Participant Characteristics by Age, Sex, and Grade Point Average (n=34)

Characteristic	Intervention Group		Control Group	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Age (years)				
19 years	21	61.8	23	67.6
20 years	13	38.2	11	32.4
Sex				
Male	10	29.4	11	32.4
Female	24	70.6	23	67.6
Grade Point Average (GPA)				
GPA 2.76-3.50	6	17.6	7	20.6
GPA 3.51-4.00	28	82.4	27	79.4

Table 1 presents the demographic characteristics of participants in both the intervention and control groups. Each group consisted of 34 participants. In the intervention group, the majority of participants were 19 years old (61.8%), female (70.6%), and had a GPA between 3.51-4.00 (82.4%). Similarly, in the control

group, most participants were 19 years old (67.6%), female (67.6%), and had a GPA between 3.51-4.00 (79.4%). The distribution of characteristics was relatively comparable between the two groups, suggesting successful randomization.

Table 2. Preparedness Levels Before and After the Intervention in the Intervention Group (n = 34)

Preparedness Level	Pretest		Posttest		p-value
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)	
Very Low	1	2.9	0	0.0	< 0.001
Low	3	8.8	0	0.0	
Moderate	16	47.1	0	0.0	
High	14	41.2	33	97.1	
Very High	0	0.0	1	2.9	
Total	34	100.0	34	100.0	

Table 2 demonstrates the changes in preparedness levels among participants in the intervention group before and after the educational intervention. Prior to the intervention (pretest), the majority of participants had moderate (47.1%) and high (41.2%) preparedness levels, with 8.8% at low level and 2.9% at very low level. No participants were categorized at the very high level. Following the intervention (posttest), a significant shift was observed:

97.1% of participants achieved high preparedness level, and 2.9% reached very high level. No participants remained in the moderate, low, or very low categories. The Wilcoxon signed-rank test revealed a statistically significant improvement in preparedness levels after the intervention ($p < 0.001$), indicating that the educational intervention was highly effective in enhancing participants' preparedness.

Table 3. Comparison of Post-Intervention Preparedness Scores Between the Intervention and Control Groups

Group	n	Mean $\pm$ Standard Deviation	p-value
Intervention	34	4.03 $\pm$ 0.171	< 0.001
Control	34	3.44 $\pm$ 0.504	

3 presents the comparison of preparedness scores between the intervention and control groups following the intervention period. The intervention group demonstrated a higher mean preparedness score (4.03 $\pm$ 0.171) compared to the control group (3.44 $\pm$ 0.504). The independent samples t-test indicated that this difference was statistically significant ($p < 0.001$), suggesting that participants who received the educational intervention had significantly better preparedness outcomes than those in the control group. The smaller standard deviation in the intervention group (0.171) compared to the control group (0.504) also indicates more consistent preparedness levels among intervention participants.

4. DISCUSSION

The present study demonstrated that an Emergency Severity Index (ESI)-based triage educational video significantly improved the preparedness of undergraduate nurse anesthesiology students in managing traffic-related emergencies. Students who received the video intervention exhibited significantly higher preparedness scores than those in the control group, indicating that video-assisted learning effectively enhanced students' readiness to assess, prioritize, and respond to emergencies. These findings suggest that educational videos serve not only as a medium for knowledge transfer but also as an instructional strategy to strengthen clinical

preparedness by integrating theoretical knowledge with practical decision-making skills.

The improvement in preparedness may be explained by the characteristics of video-based learning, which simultaneously integrates visual and auditory information. Unlike conventional lecture-based instruction, educational videos enable students to observe realistic emergency scenarios, including patient assessment, triage categorization, care prioritization, and initial clinical decision-making. This learning approach facilitates the translation of theoretical concepts into practical understanding, allowing students to develop contextual knowledge that is more readily applicable in emergency settings. These findings support previous reports suggesting that innovative instructional media can increase learners' confidence and preparedness when responding to emergencies.

The findings are consistent with previous studies demonstrating the educational benefits of video-assisted triage training. Pranatio et al. (2025) reported significant improvements in ESI-related knowledge among nurse anesthesiology students following video-based instruction, while Pawilliyah et al. (2024) found similar improvements in emergency triage knowledge among

nursing students. Likewise, Amandus et al. (2021) demonstrated that video-based training enhanced healthcare professionals' ability to prioritize patients during traffic accidents. The present study extends this evidence by showing that the benefits of ESI-based educational videos extend beyond cognitive outcomes and also improve preparedness, encompassing knowledge, attitudes, decision-making, and readiness to respond effectively during emergencies.

The effectiveness of the intervention may also be attributed to the use of the Emergency Severity Index. This five-level triage system emphasizes rapid assessment of clinical acuity and anticipated resource requirements. Accurate prioritization is particularly important in traffic-related emergencies, where delayed or inappropriate triage may increase morbidity and mortality. Previous studies have demonstrated that the ESI is a valid and reliable triage system capable of improving prioritization accuracy, optimizing resource allocation, and predicting patient outcomes in emergency departments (ENA, 2023; Ariyani, 2020; Ganjali et al., 2020). Integrating this evidence-based triage framework into educational videos likely contributed to the observed improvement in students' preparedness.

From a disaster preparedness perspective, traffic accidents may escalate into mass-casualty incidents when the number of victims exceeds the capacity of available healthcare resources. Consequently, future healthcare professionals require competencies in rapid assessment, prioritization, and coordinated emergency response. Previous studies have demonstrated that disaster preparedness is strongly influenced by emergency training, practical experience, and institutional support (Winarti & Gracya, 2023; Lase et al., 2025). The present findings indicate that video-assisted ESI education represents an accessible educational strategy for strengthening preparedness, particularly among students with limited clinical experience.

An additional strength of this study is that participant characteristics were relatively homogeneous with respect to age, sex, and academic achievement, reducing the likelihood that these variables substantially influenced the observed differences between groups. Therefore, the improvement in preparedness is more likely attributable to the educational intervention rather than participant characteristics. These findings support previous evidence suggesting that digital learning environments are particularly

effective for contemporary nursing students and can facilitate clinical reasoning and independent decision-making.

The findings also have important implications for nursing education. Integrating ESI-based educational videos into emergency and disaster nursing courses may strengthen preparedness before students enter clinical placements. Because video-based instruction is inexpensive, standardized, and easily distributed, it may represent an effective complement to conventional classroom teaching and simulation-based learning. This approach also aligns with Indonesia's national initiatives to strengthen disaster preparedness and healthcare workforce capacity through technology-enhanced education.

This study has several limitations. First, preparedness was measured using a self-administered questionnaire, which may have introduced self-report bias. Second, participants were recruited from a single institution, potentially limiting the generalizability of the findings. Third, preparedness was evaluated immediately after the intervention; therefore, the long-term retention of knowledge and preparedness remains unknown. Future studies should include multiple institutions, larger sample sizes,

longitudinal follow-up, and objective performance assessments, such as simulation-based evaluations or direct observation of triage performance.

Overall, the present study demonstrates that ESI-based triage educational videos are an effective instructional strategy for improving preparedness among undergraduate nurse anesthesiology students in responding to traffic-related emergencies. Beyond enhancing knowledge, the intervention strengthened clinical reasoning, prioritization skills, and emergency decision-making. These findings support incorporating video-assisted ESI training into undergraduate emergency nursing curricula to better prepare future healthcare professionals for emergency and disaster response.

5. CONCLUSION

This study demonstrated that ESI-based triage educational videos significantly enhanced undergraduate nurse anesthesiology students' preparedness to manage traffic-related emergencies. The intervention improved students' preparedness levels and supported the development of clinical reasoning and emergency decision-making skills. Integrating video-assisted ESI training into undergraduate emergency

nursing curricula may provide an effective, accessible, and standardized approach to strengthening preparedness among future healthcare professionals. Further multicenter studies with longer follow-up periods are recommended to evaluate the long-term effectiveness and generalizability of this educational approach.

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AUTHOR CONTRIBUTIONS

All authors contributed to this study. PT, RZ, and HP were responsible for developing the concept and designing the study. PT was responsible for the data collection process and performed the statistical analysis. PT and RZ wrote the manuscript. All authors participated in the final revision of the manuscript and approved the final version for publication.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article

DATA AVAILABILITY STATEMENT

Data supporting the findings of this study are available from the corresponding author and can be accessed upon reasonable request.

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