JERN Journal of Education and Research in Nursing

Original Article

DOI: 10.14744/jern.2025.07448
J Educ Res Nurs. 2026;23(1):47-53

The Relationship Between Nursing Students' Medical Error Tendencies and Their Evidence-based Nursing Competencies: An Analytical Cross-sectional Study

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Abstract

Background: Medical errors are a common problem in healthcare services and represent a risk that nursing students may encounter during their training. Evidence-based nursing may contribute to the prevention or reduction of medical errors by supporting clinical decisions based on the best available evidence.

Aim: The purpose of this study was to examine the relationship between nursing students' evidence-based practices and medical error tendencies.

Methods: This analytical cross-sectional study was conducted with 290 nursing students. Data were collected between February and April 2025 using the Sociodemographic Characteristics Form, the Medical Error Scale, and the Knowledge, Attitudes, and Behaviors Scale on Evidence-Based Nursing. Pearson correlation and multiple linear regression tests were used for data analysis.

Results: Most of the nursing students were female, in their fourth year, and had a GPA (Grade Point Average) between 3.00 and 3.50. The mean total Medical Error Scale score was 157.76±17.83. The mean scores for evidence-based nursing knowledge, attitude, future use, and practice were 24.60±3.65, 22.06±6.66, 39.99±5.28, and 14.73±5.10, respectively. Higher evidence-based practice scores (β=0.24, p<0.001), second-year student status (β=0.29, p=0.029), and having internship experience in surgical clinics (β=0.12, p=0.039) significantly predicted greater medical error awareness.

Conclusion: Nursing students were cautious about medical errors, and their knowledge, attitude, and future use levels regarding evidence-based nursing were good. Nursing students with higher evidence-based practice competencies, those in their second year of study, and those with internship experience in surgical clinics demonstrated greater awareness of medical errors.

Keywords: Evidence-based practice, medical errors, nursing education, nursing

Introduction

"Primum non nocere – first, do no harm" is the basis of all healthcare services. However, today, one in ten patients receiving healthcare is harmed for various reasons, and more than three million people die annually due to unsafe care practices.[1] The main types of medical errors include medication errors, surgical errors, diagnostic and treatment errors, falls, and nosocomial infections.[2] Nursing students, who will be responsible for patient care in the future, provide care to patients during their clinical practice. This responsibility carries the potential for nursing students to commit medical errors, which poses a significant risk to patient safety. The prevalence of medication errors made by nursing students during clinical practice ranges from 6% to 1.1%.[3]

With the vision of a world in which nobody is harmed in healthcare and every patient receives safe and respectful care at any time and in any place, the World Health Organization (WHO) aims to achieve the greatest possible reduction in preventable harm worldwide. However, WHO reports highlight many barriers to ensuring that patient safety is a key component of education and training programs.[4] These barriers include an inadequate curriculum, insufficient stakeholder involvement, weaknesses in educational coordination and planning, and limited leadership interest. The report also indicates that insufficient senior medical and nursing "champions" are among the barriers to preventing medical errors.[4] It is important that nursing students are equipped with nursing practices aimed at preventing medical errors. In this context, students are expected to demonstrate evidence-based nursing skills.[5] The literature indicates that nursing students' knowledge, attitudes, application, and future use of evidence-based nursing practices vary, ranging from good to low.[6–10]

In the literature, studies examining both nursing students' tendencies toward medical errors and their evidence-based nursing (EBN) competencies are quite limited. In a study conducted by Xu et al.,[11] it was determined that nursing students with a high level of competence in patient safety showed greater participation in evidence-based nursing education. Similarly, in a root cause analysis of maternal deaths conducted by Madzimbamuto et al.,[12] it was found that 67% of deaths were related to a lack of knowledge and 53% to failure to implement recommended practices. In light of these findings, it is emphasized that education for

Cite this article as: Aydoğan S, Erdem Önder H, Şahbudak G, Ince M. The Relationship Between Nursing Students' Medical Error Tendencies and Their Evidence-based Nursing Competencies: An Analytical Cross-sectional Study. J Educ Res Nurs. 2026;23(1):47-53.

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Received: October 20, 2025
Accepted: December 15, 2025
Publication Date: March 01, 2026

undergraduate and postgraduate medical, midwifery, and nursing students should be strengthened, and that compliance with evidence-based practices and clinical protocols should be prioritized.

In this context, it is important to examine the relationship between nursing students' knowledge of, attitudes toward, and behaviors regarding evidence-based practices and their potential to commit medical errors in order to identify areas of risk in terms of patient safety. Determining the relationship between nursing students' medical errors and their knowledge, attitudes, and behaviors regarding evidence-based nursing can reveal educational needs and risky areas, thereby reducing students' susceptibility to medical errors and improving patient safety and the provision of quality care. At the same time, this may contribute to the development of strategies to reduce the risk of medical errors through the adoption of evidence-based practices. Understanding this relationship may emphasize the importance of evidence-based practices in nursing education and improve students' ability to provide safe care. Therefore, this study aimed to determine the relationship between nursing students' evidence-based practice competencies and their medical error tendencies.

Study Questions

1. What are nursing students' tendencies to make medical errors?
2. What are the levels of nursing students' knowledge, attitudes, and behaviors regarding evidence-based nursing?
3. What factors predict nursing students' tendencies to make medical errors?

Materials and Methods

Design and Setting

The present study employed an analytical cross-sectional study design. The study was reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.[13] Data were collected from second-, third-, and fourth-year nursing students enrolled in the Faculty of Health Sciences at a state university.

Population and Sample

The study population consisted of 452 students. Using a sampling method for a known population, a minimum sample size of 208 was determined with a 95% confidence interval. The study was completed with 290 participants, representing 64.16% of the total population. The inclusion criteria were: (1) being second-, third-, and fourth-year nursing students and (2) willingness to participate voluntarily. First-year students were excluded from the study because they do not yet have any clinical practice experience.

Data Collection Tools

The Sociodemographic Characteristics Form, the Medical Error Scale, and the Scale of Knowledge, Attitudes, and Behaviors in Evidence-Based Nursing were used to collect the research data.

Sociodemographic Characteristics Form

This form was prepared by the researchers in accordance with the relevant literature.[14–16] The form includes 13 questions related to students' gender, age, class, academic average, medical error encounter status, and experiences related to evidence-based practices.

Medical Error Scale

The scale was developed by Kahriman and Ozturk[17] to determine whether student nurses perform patient care safely during clinical practice, whether they commit malpractice or medical errors, and whether they exercise caution regarding medical errors. The scale consists of 36 items and seven subscales: Falls, Blood and Blood Transfusion, Patient Transfer, Drug Administration, Communication, Infections, and Care Practices. The scale is a 5-point Likert-type scale, rated as always (5), usually (4), sometimes (3), rarely (2), and never (1). The total score range of the scale is 36–180. Scores closer to 180 than to 108 indicate that student nurses are controlled or cautious regarding medical errors, while scores closer to 36 than to 108 indicate that student nurses may not be controlled regarding medical errors. The total Cronbach's alpha value of the scale was 0.94, and Cronbach's alpha values for the subscales ranged between 0.71 and 0.91. In this study, the total Cronbach's alpha value was 0.94, and Cronbach's alpha values for the subscales ranged between 0.77 and 0.92.

Knowledge, Attitudes, and Behaviors in Evidence-based Nursing

This scale was developed by Johnston et al.[18] to determine the knowledge, attitudes, and behaviors of medical students at the University of Hong Kong regarding evidence-based practice. In the USA, Brown et al.[19] adapted the scale for nursing students. The reliability and validity study of the scale in our country was conducted by Karayağız Muslu et al.[16] The Likert-type scale consists of 26 items and four subdimensions: "knowledge," "attitude," "future use," and "practice." The "knowledge" and "attitude" sub-dimensions are scored on a six-point Likert scale ranging from Strongly Agree (6) to Strongly Disagree (1). The "practice" sub-dimension is scored on a five-point Likert scale ranging from never (1) to every day (5). Cronbach's alpha values of the "knowledge," "attitude," "future use," and "practice" sub-dimensions of the scale were found to be 0.70, 0.60, 0.80, and 0.77, respectively. In this study, Cronbach's alpha values for the "knowledge," "attitude," "future use," and "practice" sub-dimensions were 0.84, 0.82, 0.76, and 0.86, respectively.

Data Collection

Data were collected between February and April 2025 by the researchers through face-to-face interactions with participants who met the inclusion criteria. The researchers first visited classrooms to provide information about the study. Questionnaire forms were distributed to students who consented to participate, and the completed forms were subsequently collected from the students. Data collection from one participant took approximately 15–20 minutes.

Data Analysis

The data were analyzed using SPSS 22.0 (IBM Corp., Armonk, New York, USA). Descriptive statistics, including number, percentage, mean, and standard deviation, were calculated. Relationships between scale scores were evaluated using Pearson correlation analysis. Multiple linear regression analysis was employed to explore associations between independent and dependent variables. Assessment of multicollinearity among independent variables revealed variance inflation factor (VIF) values ranging from 1.05 to 5.41, indicating the absence of multicollinearity. A significance level of $p<0.05$ was considered statistically significant.

Ethical Consideration

Before starting the study, ethical approval was obtained from the Burdur Mehmet Akif Ersoy University Non-interventional Clinical Research Ethics Committee (Approval Number: GO 2025/992, Date: 08.01.2025). Institutional permission was obtained from the university where the research was conducted. Consent was obtained from students who agreed to participate in the study. The study was conducted in full compliance with the ethical principles set forth in the Declaration of Helsinki.

Results

The mean age of the nursing students was 21.46 years (standard deviation [SD]=2.09). Most were female (73.4%), in their fourth year (35.5%), and had a GPA (Grade Point Average) between 3.00 and 3.50 (46.6%). When asked about medical error encounters, 68.6% of the nursing students reported no experience, while 31.4% had encountered at least one medical error. The most commonly encountered medical error types were communication (14.8%), medication (14.5%), and infection-related errors (11.7%). Among the nursing students, 45.5% stated that they had received EBN training, and 72.8% believed that EBN could reduce medical errors. In terms of educational resources, lecture notes (82.1%), textbooks (66.2%), and research articles (55.2%) were the most frequently used. Interestingly, 52.8% of the nursing students reported using artificial intelligence as a resource, followed by internet resources (44.5%) and social media (38.3%). Scientific databases such as PubMed (12.4%) and Cochrane (1.0%) were less commonly used. The primary purposes for using evidence were patient care (74.8%), research (62.8%), and assignments (55.9%) (Table 1).

The mean Medical Error Scale (MES) total score of the nursing students was 157.76±17.83 (min-max: 106–180). The mean scores for Care Practices, Medication Administration, Blood and Blood Product Transfusion, Patient Transfer, Falls, Infection, and Communication were 13.89±1.54, 20.69±3.57, 27.66±3.92, 20.79±4.13,

Table 1. Characteristics of nursing students (n=290)

Variables	n	%	Variables	n	%
Age, years (mean±SD)	21.46±2.09		Surgery	8	2.8
Gender			Transfer	6	2.1
Female	213	73.4	Falls	6	2.1
Male	77	26.6	Transfusion	5	1.7
Academic year			Other interventions**	4	1.4
Second	90	31.0	Received training on evidence-based nursing		
Third	97	33.5	Yes	132	45.5
Fourth	103	35.5	No	158	54.5
Grade point average			Do you think evidence-based nursing can reduce medical errors?		
<3.00	88	30.3	Yes	211	72.8
3.00–3.50	135	46.6	No	6	2.1
≥3.50	67	23.1	Unsure	73	25.1
Clinic where internship was completed			Resources used in nursing education*		
Internal medicine	230	79.3	Lecture notes	238	82.1
Surgery	240	82.8	Textbooks	192	66.2
Pediatrics	122	42.1	Research articles	160	55.2
Operating room	77	26.6	Artificial intelligence	153	52.8
Intensive care unit	147	50.7	Internet resources	129	44.5
Emergency department	150	51.7	Social media	111	38.3
Number of medical error encounters			PubMed	36	12.4
0	199	68.6	Cochrane	3	1.0
1	28	9.7	Difficulty accessing evidence		
2	29	10.0	Yes	37	12.8
3	34	11.7	No	253	87.2
Type of medical error encountered*			Purpose of using evidence*		
Communication	43	14.8	Patient care	217	74.8
Medication	42	14.5	Research	182	62.8
Infection	34	11.7	Assignments	162	55.9
Documentation	10	3.4			

*: Percentages were calculated based on the total sample (n). Participants were allowed to provide multiple responses; therefore, the total percentage does not necessarily sum to 100%, **: Laryngoscope use, electrocardiogram (ECG) measurement, and invasive procedures. SD: Standard deviation.

34.05±5.24, 18.54±2.20, 22.14±3.55, and 157.76±17.83, respectively. In addition, the mean scores for EBN Knowledge, Attitude, Future Use, and Practice were 24.60±3.65, 22.06±6.66, 39.99±5.28, and 14.73±5.10, respectively (Table 2).

Upon examining the correlation between EBN and MES scores, a positive correlation was found between EBN Knowledge (r=0.20, p=0.001) and EBN Future Use (r=0.21, p<0.001) and MES total scores (Table 3).

A multiple linear regression analysis was conducted to identify predictors of nursing students' tendency to make medical errors. The model was statistically significant (F=2.36, p=0.002) and explained 13% of the variance. The results indicated that being a second-year student (β=0.32, p=0.029), having an internship in a surgical clinic (β=0.12, p=0.046), and having a higher level of evidence-based knowledge (β=0.14, p=0.047) were positive predictors of awareness of medical errors. As nursing students progress to the second year of their education, their awareness of medical errors increases considerably compared to those in the third and fourth years. Having experience in surgical clinics and higher levels of evidence-based nursing knowledge are also associated with a significant positive increase in awareness of medical errors (Table 4).

Discussion

Medical errors are a critical issue in healthcare services, as they can compromise patient safety and have serious consequences. It is crucial to understand the circumstances in which nursing students encounter these errors in order to develop effective prevention and education strategies. In this study, nearly one-third of nursing students

Table 2. Mean scores of the evidence-based nursing scale and medical error scale (n=290)

	Min	Max	Available min-max	Mean±SD
Medical error scale				
Care practices	8	15	3-15	13.89±1.54
Medication administration	8	25	5–25	20.69±3.57
Blood and blood product transfusion	6	30	6–30	27.66±3.92
Patient transfer	5	25	5–25	20.79±4.13
Falls	14	40	8–40	34.05±5.24
Infection	8	20	4–20	18.54±2.20
Communication	7	25	5–25	22.14±3.55
Total	106	180	36–180	157.76±17.83
Evidence-based nursing scale				
Knowledge	10	30	5–30	24.60±3.65
Attitude	6	36	6–36	22.06±6.66
Future use	24	54	9–54	39.99±5.28
Practice	4	30	6–30	14.73±5.10

Min: Minimum, Max: Maximum, SD: Standard deviation

Table 3. Correlations between total and subscale scores of the evidence-based nursing scale and medical error scale (n=290)

	EBN knowledge	EBN attitude	EBN future use	EBN practice	MES care practices	MES medication administration	MES blood and blood product transfusion	MES patient transfer	MES falls	MES infection	MES communication	MES total
EBN knowledge	–											
EBN attitude	r=-0.03	–										
	p=0.654											
EBN future use	**r=0.56**	r=-0.09	–									
	p<0.001	p=0.109										
EBN practice	r=0.01	**r=-0.40**	**r=0.17**	–								
	p=0.852	**p<0.001**	**p=0.004**									
MES care practices	**r=0.23**	r=0.05	**r=0.23**	r=0.05	–							
	p<0.001	p=0.419	**p<0.001**	p=0.420								
MES medication administration	r=0.10	r=-0.06	**r=0.14**	**r=0.19**	**r=0.53**	–						
	p=0.095	p=0.287	**p=0.020**	**p=0.001**	**p<0.001**							
MES blood and blood product transfusion	**r=0.19**	r=0.03	**r=0.13**	r=0.00	**r=0.47**	**r=0.43**	–					
	p=0.001	p=0.594	**p=0.034**	p=0.949	**p<0.001**	**p<0.001**						
MES patient transfer	**r=0.16**	r=-0.05	**r=0.14**	**r=0.17**	**r=0.43**	**r=0.49**	**r=0.42**	–				
	p=0.006	p=0.397	**p=0.020**	**p=0.003**	**p<0.001**	**p<0.001**	**p<0.001**					
MES falls	r=0.09	r=-0.07	**r=0.17**	**r=0.13**	**r=0.42**	**r=0.51**	**r=0.38**	**r=0.53**	–			
	p=0.141	p=0.234	**p=0.004**	**p=0.031**	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**				
MES infection	**r=0.18**	**r=0.17**	**r=0.20**	r=-0.08	**r=0.43**	**r=0.42**	**r=0.48**	**r=0.28**	**r=0.46**	–		
	p=0.002	**p=0.004**	**p=0.001**	p=0.161	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**			
MES communication	**r=0.18**	r=0.08	**r=0.15**	r=0.02	**r=0.45**	**r=0.39**	**r=0.49**	**r=0.52**	**r=0.56**	**r=0.42**	–	
	p=0.003	p=0.156	**p=0.013**	p=0.715	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**		
MES total	**r=0.20**	r=0.00	**r=0.21**	r=0.12	**r=0.66**	**r=0.74**	**r=0.71**	**r=0.75**	**r=0.81**	**r=0.63**	**r=0.76**	–
	p=0.001	p=0.948	**p<0.001**	p=0.050	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**	**p<0.001**	

r: Pearson correlation coefficient, MES: Medical error scale, EBN: Evidence-based nursing scale.

Table 4. Multiple linear regression analysis results for the medical error scale (n=290)

Variables	B	SE	β	t	p	VIF
Constant	82.550	18.931		4.361	0.000	
Age, years	0.353	0.541	0.041	0.653	0.514	1.258
Grade point average	1.030	2.457	0.026	0.419	0.675	1.186
EBN scale						
Knowledge	0.700	0.350	0.143	1.999	**0.047**	1.604
Attitude	0.107	0.171	0.040	0.628	0.531	1.274
Future use	0.460	0.242	0.136	1.902	0.058	1.600
Practice	0.422	0.229	0.120	1.840	0.067	1.333
Gender						
Female	4.690	2.485	0.116	1.887	0.060	1.190
Academic year						
Second year	12.305	5.110	0.319	2.408	**0.017**	5.489
Third year	7.113	4.219	0.189	1.686	0.093	3.916
Internship in internal medicine clinic						
Yes	3.484	2.805	0.079	1.242	0.215	1.277
Internship in surgical clinic						
Yes	5.592	2.790	0.120	2.004	**0.046**	1.116
Internship in pediatrics						
Yes	5.637	3.274	0.156	1.722	0.086	2.579
Internship in operating room						
Yes	-4.420	3.246	-0.110	-1.362	0.174	2.032
Internship in intensive care unit						
Yes	-1.779	2.534	-0.050	-0.702	0.483	1.583
Internship in emergency department						
Yes	4.116	2.942	0.116	1.399	0.163	2.132
Encountered a medical error						
Yes	-2.211	2.260	-0.058	-0.978	0.329	1.087
Received training on evidence-based nursing						
Yes	2.806	2.115	0.079	1.327	0.186	1.095
Difficulty accessing evidence						
Yes	0.774	3.072	0.015	0.252	0.801	1.039

B: Unstandardized beta coefficients, SE: Standard error, β: Standardized beta coefficients, R^2=0.13, Adjusted R^2=0.08, F=2.365, p=0.002, Durbin-Watson test=1.601.

reported encountering medical errors. The most frequently encountered medical errors were communication, medication administration, and infection-related errors. In Türkiye, the rate of medical errors encountered by nursing students during clinical practice ranges from 33.3% to 63.6%.[20–25] The most common types of medical errors encountered during clinical practice were nosocomial infections, medication administration, communication errors, and needle-stick injuries.[20–24] These findings indicate that nursing students are at high risk of encountering medical errors during clinical practice, and that preventive education and supervision should be strengthened, particularly in the areas of communication, medication administration, and infection control.

This study found that nursing students were cautious about medical errors. Similarly, other studies in the literature have reported that nursing students generally have a low tendency to commit medical errors.[23,25–27] In contrast, Sakallı,[21] found that nursing students had low levels of attention to medical errors and were more prone to making mistakes. In this context, the findings of our study are largely consistent with the existing literature. Our results suggest that the students in our sample have a high level of awareness regarding patient safety.

In the present study, being a second-year student was found to be a significant predictor of higher awareness of medical errors. Although Yeşilyurt et al.'s study[23] showed that fourth-year nursing students were more attentive, the majority of studies in the literature indicate that second-year nursing students are more aware of medical errors.[28–30] This supports our findings. This can be explained by the fact that, in the early stages of clinical practice, second-year nursing students approach patient safety issues with greater care and sensitivity. However, as nursing students progress to the third and fourth years, their clinical training intensifies and they begin to specialize in their chosen fields, spending more time in healthcare settings. During this period, nursing students interact closely with clinical nurses and become increasingly influenced by the norms and routines of clinical practice. Indeed, it has been reported that nursing students perceive clinical nurses as stronger role models than academic nurses.[31,32] A study conducted in Türkiye showed that nurses have low levels of patient safety culture.[33] Therefore, as nursing students begin to adopt the attitudes and behaviors of their professional role models in clinical settings, their perceptions of medical errors may change over time. During this transition period, sensitivity to potential errors may decrease, or risky practices observed in routine care may become normalized. Consequently, these findings emphasize the importance of continuously reinforcing patient safety and medical error awareness education in the later stages of nursing education.

Another important predictor of higher awareness of medical errors is nursing students' placement in surgical clinics. The high-risk and fast-paced nature of these environments, where mistakes can lead to immediate and serious consequences, helps explain this finding.[34] Nursing students in surgical settings face complex procedures, multidisciplinary teamwork, and strict aseptic techniques, which increase their sensitivity to patient safety issues.[35] Surgical clinics also emphasize precision, communication, and responsibility, further strengthening nursing students' awareness of potential errors.[34] Therefore, internship experiences in surgical clinics may help nursing students better understand safe care principles and reinforce the importance of preventing medical errors.

This study revealed that higher levels of evidence-based knowledge were also significant predictors of greater awareness of medical errors. Additionally, nursing students who received education on evidence-based nursing demonstrated significantly higher awareness of medical errors. A positive correlation was also found between students' overall EBN knowledge and future use scores and their total Medical Error Scale score. Evidence-based practice aims to use the most current and strong evidence carefully in patient care.[36] Similarly, Azami et al.[37] reported a positive relationship between evidence-based nursing and nurses' knowledge and attitudes toward medical errors; however, since their study was conducted with practicing nurses rather than students, the findings may differ slightly from those of the present study. These results highlight the importance of strengthening nursing students' evidence-based practice competencies to help minimize the occurrence of medical errors.

In the current study, students' knowledge, attitude, and future use of EBN were found to be at a good level on average, while EBN practice was at a moderate level. Previous studies have similarly reported that nursing students' knowledge and future use scores for EBN were high,[6,10,38] attitude scores were medium to high,[6,10,38] and practice scores were medium to low.[6,10,38] While our findings are generally consistent with the literature, they also suggest that although nursing students have sufficient knowledge and positive attitudes toward EBN, they face difficulties in translating this knowledge into practice. In addition, Taş Arslan et al.[39] reported that most undergraduate nursing curricula do not include EBN courses. This finding is concerning, especially since the Nursing Regulation states that nursing care should be planned, implemented, evaluated, and supervised based on evidence.[40] Therefore, to ensure patient safety and deliver quality care, it is essential to implement evidence-based practices in clinical settings and to structure nursing education programs that incorporate evidence-based approaches.

Strengthens and Limitations

The data in this study were collected using validated and reliable instruments. The analytical cross-sectional design enabled the identification of relationships between key factors associated with students' tendencies toward medical errors. Despite these strengths, several limitations should be considered. First, the use of self-reported questionnaires may have introduced response bias, as students might have over- or underreported their medical error tendencies and evidence-based nursing competencies. Second, the study was conducted in a single nursing department, which may limit the generalizability of the findings to other nursing schools or regions.

Conclusion

The findings of this study indicate that nursing students generally exhibit controlled and cautious behaviors regarding medical errors. Although students demonstrated good levels of EBN knowledge, attitude, and future use, their practice levels remained moderate. Higher evidence-based practice knowledge, being a second-year student, and having internship experience in surgical settings significantly predicted greater awareness of medical errors. Therefore, it is essential to strengthen the integration of evidence-based practices within nursing education, particularly by enhancing educational strategies that foster the translation of evidence into clinical decision-making and practice.

Ethics Committee Approval: The study was approved by the Burdur Mehmet Akif Ersoy University Non-interventional Clinical Research Ethics Committee (Approval Number: 2025/992, Date: 08.01.2025).

Informed Consent: Participants were informed about the study's purpose, and verbal consent was obtained.

Conflict of Interest: The authors have no conflicts of interest to declare.

Funding: The authors declared that this study received no financial support.

Use of AI for Writing Assistance: Artificial intelligence (AI)-assisted technologies, such as ChatGPT and DeepL, were used to improve the clarity and language of the manuscript. The content is original and was created by the authors, who reviewed and approved all sections of the final version.

Author Contributions: Concept – S.A., H.E.Ö., G.Ş., M.İ.; Design – S.A., H.E.Ö., G.Ş., M.İ.; Materials – S.A.; Data Collection and/or Processing - S.A., H.E.Ö., G.Ş., M.İ.; Analysis and/or Interpretation - S.A.; Literature Review – S.A.; Writing – S.A.; Critical Review – S.A., H.E.Ö., G.Ş., M.İ.

Acknowledgments: The authors would like to express their sincere gratitude to all the participants for their contributions and cooperation throughout the study.

Peer-review: Externally peer-reviewed.

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