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Knowledge, attitude, and practice of non-emergency surgical patients toward anesthesia

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This study aimed to investigate the knowledge, attitude, and practice (KAP) of non-emergency surgical patients toward anesthesia. This cross-sectional study was conducted between May and October 2023 at Zibo Central Hospital among non-emergency surgical patients. A total of 429 valid questionnaires were enrolled (mean age: 42.81 ± 13.17 years old; 227 (52.91%) females). The mean KAP scores were 7.79 ± 3.95 (possible range: 0–18), 32.35 ± 2.80 (possible range: 8–40), and 18.14 ± 3.96 (possible range: 6–24), respectively. Multivariate logistic regression analysis showed that knowledge (OR = 1.095, 95% CI 1.036–1.158, $P = 0.001$) and previous poor anesthesia experience (OR = 0.081, 95% CI 0.017–0.386, $P = 0.002$) were independently associated with practice. Non-emergency surgical patients had inadequate knowledge, positive attitude, and proactive practice towards anesthesia. It is crucial for healthcare professionals to implement targeted educational interventions to inform patients about the anesthesia process, potential risks, and benefits.

Keywords Knowledge, Attitude, Practice, Patients, Anesthesia, Cross-sectional study

Anesthesia is a fundamental component of medical procedures, enhancing patient safety and comfort by controlling pain and altering levels of consciousness during surgery¹. However, a significant issue in the field is the inadequate knowledge and understanding among many non-emergency surgical patients regarding anesthesia. This knowledge deficit often leads to heightened anxiety, particularly in clinical trials involving anesthesia^{2,3}. In such instances, the lack of a solid understanding of the anesthesia process can exacerbate patient apprehension. Severe anxiety can activate the sympathetic nervous system, resulting in elevated blood pressure and an increased incidence of tachycardia and arrhythmias during anesthesia induction, thereby necessitating higher levels of anesthetics^{4,5}. Hence, recognizing the importance of understanding the knowledge and attitudes of non-emergency surgical patients towards anesthesia and implementing appropriate interventions is imperative to address these concerns.

The Knowledge, Attitude, and Practices (KAP) survey serves as a diagnostic research tool, illuminating a group's comprehension, beliefs, and actions on a specific subject, particularly within the realm of health literacy. The KAP model is based on the premise that knowledge positively influences attitudes, which in turn shape behaviors^{6–8}. Given that non-emergency surgical patients undergo elective surgery, they often have more time to familiarize themselves with the surgical and anesthesia processes². Consequently, their knowledge, attitudes, and practices play a critical role in preparing for surgery and reducing preoperative anxiety. Adverse attitudes or inadequate knowledge can lead to heightened anxiety, increased surgical complications, and decreased anesthesia efficacy. Existing research in this domain has predominantly focused on healthcare professionals, with limited attention to non-emergency surgical patients^{9,10}. Currently, the participants consist of patients undergoing elective surgery. Education related to anesthesia will include content relevant to the subject, accessible through hospital and departmental public accounts for patient consultation and study. This research aims to delve deeper into patients' needs by exploring the KAP of non-emergency surgical patients concerning anesthesia.

Results

Initially, a total of 462 questionnaires were collected for the study, excluding 3 cases with disagreement on the informed consent; 26 cases with missing values, outliers, or ages less than 18 years old; 1 case with incomplete answers; 4 cases with logical errors in the answers to question 12; and 4 cases with all three KAP dimensions selecting "A". The remaining valid questionnaires were 429, with a validity rate of 92.86%. Among them, 227 (52.91%) were female, with mean age of 42.81 ± 13.17 years, 290 (67.60%) were residing in urban areas, 224

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(52.21%) were educated to a college or bachelor's degree and above. 279 (65.03%) were scheduled to use general anesthesia for this surgery, 223 (51.98%) had previous normal anesthesia experience and 162 (37.76%) had never received anesthesia (Table 1).

The mean KAP scores were 7.79 ± 3.95 (possible range: 0–18), 32.35 ± 2.80 (possible range: 8–40), and 18.14 ± 3.96 (possible range: 6–24), respectively. The knowledge score varied from patients with different marital status ($P=0.003$), education ($P<0.001$), medical insurance type ($P=0.008$), anesthesia method for their surgery ($P=0.011$), past anesthesia experience ($P<0.001$), whether they are a healthcare professional or medical student ($P<0.001$), and whether they have awareness of their medical condition ($P<0.001$). As for the attitude score, there were differences among patients with different marital status ($P=0.026$) and whether they have awareness of their medical condition ($P=0.016$). The differences of practice score were found among patients with different gender ($P=0.013$) and past anesthesia experience ($P<0.001$) (Table 1).

The distribution of knowledge dimensions revealed that the two questions with the highest number of participants choosing the “well known” option were “Are you aware of the contraindications (conditions that make anesthesia unsafe) for anesthesia?” (K5) with 57.34% and “Do you know the potential risks associated with different types of anesthesia?” (K6) with 38.46%. The two questions with the highest accuracy rates were “Anesthesiologists

Variables	N (%)	Knowledge		Attitude		Practice	
		Mean \pm SD	P	Mean \pm SD	P	Mean \pm SD	P
Total	429	7.79 ± 3.95		32.35 ± 2.80		18.14 ± 3.96	
Age	42.81 ± 13.17						
Gender			0.181		0.773		0.013
Male	202 (47.09)	7.52 ± 4.01		32.39 ± 2.84		18.64 ± 3.93	
Female	227 (52.91)	8.03 ± 3.89		32.31 ± 2.76		17.69 ± 3.95	
Marital status			0.003		0.026		0.318
Single/Divorced/Widowed	90 (20.98)	8.89 ± 3.74		32.93 ± 2.63		17.77 ± 4.32	
Married	339 (79.02)	7.50 ± 3.96		32.19 ± 2.82		18.24 ± 3.86	
Residence			0.160		0.616		0.531
Non-urban	139 (32.40)	7.40 ± 4.09		32.25 ± 2.62		17.96 ± 4.39	
Urban	290 (67.60)	7.98 ± 3.87		32.40 ± 2.88		18.22 ± 3.75	
Education			<0.001		0.689		0.802
Junior High School or below	106 (24.71)	6.53 ± 3.87		32.17 ± 2.82		17.92 ± 4.05	
High school/Technical school	99 (23.08)	7.33 ± 3.97		32.31 ± 2.90		18.21 ± 3.90	
College/Bachelor's or higher	224 (52.21)	8.59 ± 3.80		32.45 ± 2.75		18.21 ± 3.96	
Healthcare professional or medical student			<0.001		0.219		0.921
Yes	23 (5.36)	11.09 ± 3.57		31.65 ± 3.16		18.22 ± 3.64	
No	406 (94.64)	7.60 ± 3.89		32.39 ± 2.77		18.13 ± 3.98	
Medical insurance type			0.008		0.852		0.677
Only social medical insurance	314 (73.19)	7.48 ± 3.92		32.33 ± 2.75		18.09 ± 3.90	
Other	115 (26.81)	8.63 ± 3.93		32.39 ± 2.92		18.27 ± 4.15	
Anesthesia method for your surgery			0.011		0.271		0.449
General anesthesia	279 (65.03)	8.10 ± 3.84		32.51 ± 2.77		18.00 ± 4.13	
Spinal anesthesia	67 (15.62)	7.96 ± 4.11		32.01 ± 2.35		18.10 ± 3.57	
Other	83 (19.35)	6.63 ± 4.01		32.08 ± 3.17		18.63 ± 3.66	
Past anesthesia experience			<0.001		0.215		<0.001
No experience	194 (45.22)	6.78 ± 3.76		32.10 ± 2.92		17.90 ± 3.86	
Normal	223 (51.98)	8.61 ± 3.96		32.53 ± 2.68		18.61 ± 3.79	
Poor	12 (2.80)	8.75 ± 2.99		33.00 ± 2.66		13.33 ± 5.30	
Understanding of your medical condition?			<0.001		0.016		0.347
Yes	407 (94.87)	7.98 ± 3.89		32.43 ± 2.70		18.18 ± 4.00	
No	22 (5.13)	4.27 ± 3.31		30.95 ± 4.09		17.36 ± 3.06	
Types of anesthesia methods have you personally received in the past (Multiple choices)							
General anesthesia	97 (22.61)	9.02 ± 4.08		33.00 ± 2.64		18.95 ± 3.80	
Spinal anesthesia	65 (15.15)	8.98 ± 3.83		31.85 ± 2.56		17.89 ± 3.46	
Peripheral nerve block	15 (3.50)	7.73 ± 4.06		33.13 ± 2.42		18.27 ± 3.47	
Other local anesthesia methods	79 (18.41)	8.59 ± 3.85		32.05 ± 2.73		18.48 ± 4.14	
Received anesthesia but unsure of the type	52 (12.12)	7.02 ± 3.82		32.65 ± 2.74		18.54 ± 4.34	
Have not received anesthesia	162 (37.76)	6.62 ± 3.73		32.11 ± 3.03		17.73 ± 3.89	

Table 1. Baseline characteristics.

continuously monitor vital signs during general anesthesia to ensure patient safety.” (K11) with 83.22% and “Post-operative nausea and vomiting are among the most common adverse reactions to surgery and anesthesia.” (K13) with 71.33%. For the two questions “All patients undergoing anesthesia must undergo pre-anesthetic assessment by an anesthesiologist.” (K8) and “Local anesthetics do not cause toxic reactions in the body.” (K9), where the stem statements were incorrect, 83.92% and 29.14% respectively identified this error (Supplementary Table 1). When it comes to the sources of knowledge about anesthesia, the highest proportion was through anesthesiologists, internet, and relatives & friends, which were 81.59%, 27.51%, and 24.01%, respectively (Fig. 1).

Patient’s attitude towards anesthesia revealed that 84.62% strongly agreed that anesthesia was of significant importance throughout the surgical procedure (A1). Moreover, 62.70% strongly believed that the role of anesthesiologist in surgery is to relieve the patient’s pain and induce sleep (A2). Additionally, 39.39% and 40.56% were neutral about the dangers of anesthesia (A3) and its addiction (A4) respectively. Furthermore, 65.73% strongly believed that preoperative visits are helpful in providing relief from anxiety (A5). However, only 28.67% strongly agreed that general anesthesia is as easy as sleeping (A6). In addition, 76.69% fully agreed that preoperative fasting and hydration restrictions are important (A7). Interestingly, 83.45% were fully aware of the necessity of disclosing their history of food and medication allergies and other systemic diseases related to their own comorbidities for anesthesia (A8) (Supplementary Table 2).

When it comes to practicalities related to anaesthesia and surgery, 82.05% and 67.13% of patients reported that they were mostly not concerned or only a little concerned about anesthesia (P1) and surgery (P4), respectively. The same level of concern was reported by 77.16% and 68.76% respectively regarding thinking about anesthesia (P2) and surgery (P5). However, similarly, many patients (77.16% and 59.91%, respectively) also indicated about that they never or rarely sought information about anesthesia (P3) and surgery (P6). Additionally, 73.43% chose to use anesthetics even if it was not necessary (P7). Regarding anesthesia, 36.13% were concerned about intraoperative or postoperative pain, and 26.11% were concerned about safety (P8) (Supplementary Table 3).

Multivariate logistic regression showed that age (OR = 0.968, 95% CI: [0.943–0.994], $P = 0.015$), being a healthcare professional or medical student (OR = 3.875, 95% CI: [1.467–10.234], $P = 0.006$), and previous normal anesthesia experience (OR = 3.319, 95% CI: [1.614–6.825], $P = 0.001$) were independently associated with good knowledge (Table 2). No factors were independently associated with positive attitude (Table 3). Furthermore, knowledge (OR = 1.095, 95% CI: [1.036–1.158], $P = 0.001$) and previous poor anesthesia experience (OR = 0.081, 95% CI: [0.017–0.386], $P = 0.002$) were independently associated with proactive practice (Table 4).

Discussion

Non-emergency surgical patients had inadequate knowledge, positive attitude and proactive practice towards anesthesia. Multivariable logistic regression showed that age, being a healthcare professional or medical student, and previous normal anesthesia experience were independently associated with good knowledge. Knowledge and previous poor anesthesia experience were independently associated with proactive practice. The findings may offer valuable insights to guide healthcare professionals and administrators in developing more effective patient education programs.

The study results indicate significant gaps in KAP levels among non-emergency surgical patients toward anesthesia, underscoring the need for targeted interventions to address these deficiencies. These findings align with previous research on inadequate patient understanding and attitudes toward anesthesia¹¹. Demographic and clinical factors were found to be associated with KAP scores, emphasizing the importance of tailored educational approaches to bridge these gaps. Multivariable logistic regression identified factors independently associated with good knowledge, while a positive attitude remained resilient to specific factors. Proactive practice was linked to knowledge and previous poor anesthesia experiences, highlighting the crucial role of information and prior encounters in shaping patient actions¹². Furthermore, the lack of impact from previous encounters with anesthesia on patients’ attitudes could indeed be attributed to their trust and reliance on healthcare professionals. Patients often place a high degree of trust in their medical providers, including anesthesiologists and surgeons, believing in their expertise to manage anesthesia safely and effectively. This trust can overshadow personal experiences, leading patients to maintain a positive or at least neutral attitude towards anesthesia, regardless of past encounters. These findings offer valuable insights for improving patient readiness and cooperation in anesthesia-related procedures, with potential implications for enhancing clinical practice and patient safety¹³.

This study highlights substantial deficiencies in the knowledge dimension of non-emergency surgical patients toward anesthesia, as demonstrated by varying levels of awareness and misinformation. Notably, a significant portion of patients displayed incomplete or incorrect understanding of crucial aspects of anesthesia, such as the different methods of anesthesia, routes of administering anesthesia medications, the necessity of fasting before

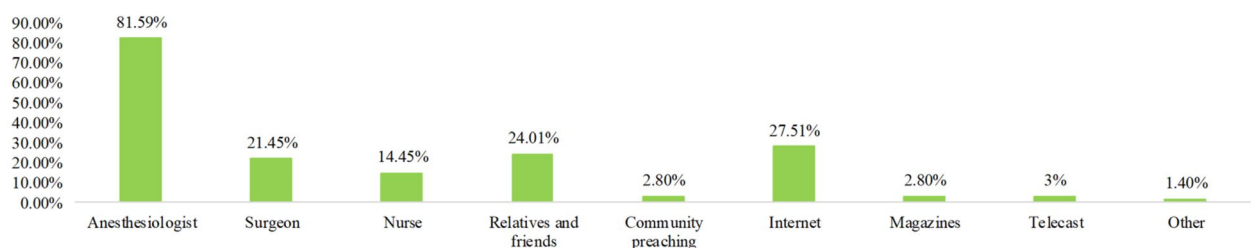


Figure 1. How do you acquire knowledge about anesthesia? (Multiple choices).

	Univariate analysis		Multivariate analysis	
	OR (95% CI)	P	OR (95% CI)	P
Age	0.966 (0.942 0.990)	< 0.006	0.968(0.943 0.994)	0.015
Gender				
Male	Ref			
Female	1.058 (0.579 1.933)	0.854		
Marital Status				
Single/Divorced/Widowed	Ref			
Married	0.682 (0.344 1.351)	0.273		
Residence				
Non-urban	Ref			
Urban	0.859 (0.458 1.612)	0.636		
Education				
Junior High School or below	Ref			
High school/Technical school	1.531 (0.589 3.980)	0.382		
College/bachelor's or higher	1.822 (0.803 4.134)	0.151		
Healthcare professional or medical student				
Yes	4.880 (1.949 12.221)	0.001	3.875(1.467 10.234)	0.006
No	Ref		Ref	
Medical insurance type				
Only social medical insurance	Ref			
Other	1.584 (0.840 2.987)	0.156		
Anesthesia method for your surgery				
General anesthesia	Ref			
Spinal anesthesia	0.841 (0.355 1.989)	0.693		
Other	0.664 (0.283 1.558)	0.346		
Past anesthesia experience				
No experience	Ref		Ref	
Normal	3.203 (1.582 6.484)	0.001	3.319(1.614 6.825)	0.001
Poor	1.512 (0.179 12.798)	0.704	2.123(0.245 18.365)	0.494

Table 2. Univariate and multivariate logistic regression analysis of knowledge dimension.

specific procedures, contraindications for anesthesia, potential risks associated with different anesthesia types, and the purposes of anesthesia clinics and pre-anesthesia assessments. Furthermore, several misconceptions were evident, including the belief that all patients undergoing anesthesia must undergo pre-anesthetic assessment by an anesthesiologist, and the misconception that local anesthetics do not cause toxic reactions in the body. These knowledge gaps and misconceptions pose a substantial challenge to patient safety and informed decision-making in clinical practice. To address these deficiencies, initiatives should be developed to enhance patient education on anesthesia, including pre-operative information sessions, written materials, and digital resources¹⁴. Collaboration between healthcare providers, including anesthesiologists and nursing staff, is essential in providing accurate and consistent information to patients^{15,16}. Additionally, healthcare institutions should invest in patient education programs to ensure that patients are well-informed about the anesthesia process, associated risks, and the importance of pre-anesthetic assessments, ultimately contributing to safer and more efficient clinical practice^{17,18}. Furthermore, the sources of knowledge identified in this study, primarily through anesthesiologists, the internet, and relatives and friends, offer valuable insights into where educational efforts should be concentrated. Collaboration with anesthesiologists and the development of reputable online resources can help ensure patients access accurate and evidence-based information, enhancing the informed decision-making process and patient safety in clinical practice^{19,20}.

This study reveals a range of attitudes held by non-emergency surgical patients towards anesthesia, emphasizing the need for comprehensive initiatives to improve clinical practice. While a majority of patients consider anesthesia to be crucial throughout the surgical procedure and view preoperative visits as important for alleviating anxiety, there are evident misconceptions and variations in attitude that warrant attention. For instance, a significant portion of patients believe that anesthesia is harmful to the human body or that anesthetic drugs can lead to addiction. Moreover, some patients regard general anesthesia as a simple and safe process, akin to sleeping. Addressing these misconceptions and fostering a more accurate understanding of anesthesia is crucial for patient safety and informed decision-making. Additionally, many patients acknowledge the importance of adhering to preoperative fasting and hydration restrictions and providing accurate information about allergies and systemic diseases to the anesthesiologist. To enhance clinical practice, it is imperative to develop initiatives that address and correct these varying attitudes, emphasizing the safety and complexity of anesthesia. These initiatives may include structured pre-operative education programs, informed consent processes, and open communication channels with patients to clarify misconceptions and ensure they are well-prepared for anesthesia^{21,22}.

	Univariate analysis		Multivariate analysis	
	OR (95% CI)	P	OR (95% CI)	P
Knowledge	1.156 (1.064 1.256)	0.001		
Age	0.993 (0.971 1.016)	0.562		
Gender				
Male	Ref			
Female	0.825 (0.452 1.503)	0.529		
Marital Status				
Single/Divorced/Widowed	Ref			
Married	0.709 (0.320 1.572)	0.397		
Residence				
Non-urban	Ref			
Urban	0.816 (0.424 1.572)	0.543		
Education				
Junior High School or below	Ref			
High school/Technical school	0.775 (0.340 1.769)	0.545		
College/Bachelor's or higher	1.116 (0.532 2.338)	0.772		
Healthcare professional or medical student				
Yes	0.592 (0.193 1.818)	0.360		
No	Ref			
Medical insurance type				
Only social medical insurance	Ref			
Other	0.905 (0.468 1.751)	0.767		
Anesthesia method for your surgery				
General anesthesia	Ref			
Spinal anesthesia	1.550 (0.579 4.149)	0.383		
Other	0.673 (0.334 1.355)	0.268		
Past anesthesia experience				
No experience	Ref			
Normal	1.555 (0.848 2.851)	0.153		
Poor	1.778 (0.221 14.337)	0.589		

Table 3. Univariate and multivariate logistic regression analysis of attitude dimension.

Collaborative efforts among healthcare providers, including anesthesiologists and nursing staff, are essential in implementing these initiatives and fostering a positive and informed attitude towards anesthesia.

The results highlight varying dimensions of the practice-related aspects of non-emergency surgical patients, offering valuable insights into their attitudes and behaviors concerning anesthesia. A significant proportion of patients express concerns and worries related to anesthesia, and their thoughts and behaviors reflect an active interest in gathering information about the procedure and the surgery itself. It is evident that patients are motivated to learn as much as possible about anesthesia and the surgical process, potentially driven by a desire to alleviate their anxiety and make informed decisions. However, a considerable number of patients also express concerns about anesthesia's safety and its potential impact on physical health, which might be attributed to misconceptions or a lack of information. To improve clinical practice, initiatives should focus on addressing these concerns and empowering patients with accurate and reliable information. Structured pre-operative education programs, informed consent processes, and open communication channels with patients can help alleviate concerns and ensure that patients make informed choices²³. Furthermore, addressing patient concerns about the professionalism of the anesthesiologist is critical, highlighting the importance of fostering trust and confidence in healthcare providers through improved communication and transparency. These initiatives align with previous research emphasizing the role of patient education and communication in enhancing patient satisfaction and clinical outcomes²⁴. By addressing patient concerns and promoting proactive engagement, clinical practice can be improved, patient experiences enhanced, and patient safety assured.

This study has several limitations that should be considered when interpreting the results. It was conducted at a single center with a limited geographic scope, potentially limiting the generalizability of findings to a broader patient population. The cross-sectional design prevents the establishment of causal relationships, and reliance on self-administered questionnaires may introduce response bias. Sampling bias and potential selection bias due to non-participation may affect the representativeness of the sample.

Non-emergency surgical patients had inadequate knowledge, positive attitude and proactive practice towards anesthesia. Healthcare professionals providing anesthesia during surgery should consider implementing educational programs designed to enhance patient awareness and understanding of anesthesia procedures. These programs could focus on addressing the specific knowledge gaps identified in the study and aim to alleviate

	Univariate analysis		Multivariate analysis	
	OR (95% CI)	P	OR (95% CI)	P
Knowledge	1.089 (1.032 1.148)	0.002	1.095(1.036 1.158)	0.001
Attitude	1.049 (0.977 1.127)	0.186		
Age	0.998 (0.983 1.013)	0.800		
Gender				
Male	Ref			
Female	0.572 (0.379 0.864)	0.008		
Marital status				
Single/Divorced/Widowed	Ref			
Married	1.180 (0.724 1.923)	0.506		
Residence				
Non-urban	Ref			
Urban	1.191 (0.777 1.825)	0.424		
Education				
Junior High School or below	Ref			
High school/Technical school	1.029 (0.576 1.837)	0.924		
College/Bachelor's or higher	1.108 (0.678 1.810)	0.681		
Healthcare professional or medical student				
Yes	0.741 (0.313 1.756)	0.496		
No	Ref			
Medical insurance type				
Only social medical insurance	Ref			
Other	0.975 (0.619 1.536)	0.913		
Anesthesia method for your surgery				
General anesthesia	Ref			
Spinal anesthesia	1.669 (0.914 3.047)	0.095		
Other	1.573 (0.912 2.714)	0.103		
Past anesthesia experience				
No experience	Ref		Ref	
Normal	1.225 (0.809 1.885)	0.338	1.044 (0.679 1.606)	0.845
Poor	0.101 (0.0.21 0.473)	0.004	0.081 (0.017 0.386)	0.002

Table 4. Univariate and multivariate logistic regression analysis of practice dimension.

anxiety among patients. Moreover, healthcare providers should prioritize effective communication to foster a positive attitude in patients and encourage proactive engagement in their anesthesia care.

In conclusion, non-emergency surgical patients had inadequate knowledge, positive attitude and proactive practice towards anesthesia. Healthcare professionals providing anesthesia during surgery should consider implementing educational programs designed to enhance patient awareness and understanding of anesthesia procedures. These programs could focus on addressing the specific knowledge gaps identified in the study and aim to alleviate anxiety among patients.

Methods

Study design and participants

This cross-sectional study was conducted between May and October 2023 at Zibo Central Hospital among non-emergency surgical patients. Inclusion criteria encompassed: (1) Eligibility for elective surgical procedures; (2) age of 18 years or above. Exclusion criteria were exclusively limited to individuals who declined to provide their consent for participation. The study obtained ethical approval from the Medical Ethics Expert Committee of Zibo Central Hospital (Approval No. 2023040), and informed consent was obtained from the study participants.

Questionnaire introduction

The development of the questionnaire adhered to pertinent guidelines and existing literatures^{25–27}. Following this, it underwent refinements in response to feedback received from three senior anesthesiologists at Zibo Central Hospital and was subsequently subjected to a pilot test involving a small sample (comprising 32 responses), yielding a Cronbach's α coefficient of 0.795.

The final questionnaire, written in Chinese, comprised four distinct sections: demographic information (encompassing variables such as age, gender, marital status, residence, education, occupation, medical insurance type, anesthesia method, prior anesthesia experiences, awareness of their own medical condition, and history of anesthesia), the knowledge dimension, attitude dimension, and practice dimension. The knowledge dimension consisted of 13 questions, with questions 1 and 3–7 scored as 2 for “well-known,” 1 for “partly known,” and 0

for “unclear,” while questions 8–9 were scored as 1 for option “b” and 0 for other choices, and questions 10–13 were scored inversely. The total score for this dimension ranged from 0 to 18. The attitude dimension included 8 questions assessed using a five-point Likert scale, ranging from “strongly agree” (5 points) to “strongly disagree” (1 point), yielding a total score ranging from 8 to 40. The practice dimension consisted of 8 questions, where questions 1–6 were scored as 1 for option “a” and 4 for option “d,” while questions 7 and 8 were open-ended and not scored, resulting in a total score ranging from 6 to 24. Adequate knowledge, positive attitude, and proactive practice were defined as total scores exceeding 70% for each respective dimension²⁸.

Questionnaire distribution and quality control

Participants Patients undergoing elective surgery. Anesthesia-related education will have relevant content in hospitals and department public accounts, which can be consulted and studied by patients. The main way is preoperative visit. Generally, the anesthesiologist who performs anesthesia for the patient the next day visits the afternoon of the day before surgery. For very special patients, they may go to the anesthesia clinic a few days in advance. We issued a questionnaire, which was also issued after the preoperative visit. Non-emergency surgery patients were recruited through convenience sampling, utilizing a combination of WeChat groups and face-to-face interactions in diverse hospital departments. The online questionnaire was disseminated via Questionnaire Star (<https://www.wjx.cn/>), affording participants the option to access and complete the questionnaire either by scanning a QR code through WeChat or following a provided web link. A research team, consisting of three doctors trained as research assistants responsible for questionnaire promotion and distribution, diligently assessed all submissions for completeness, internal consistency, and logical coherence. Submissions exhibiting logical errors, incomplete answers, or uniform responses across all items were categorized as invalid.

Statistical analysis

The sample size for this study was calculated to be 5–10 times the number of questionnaire items²⁹, given that there were 29 independent variables in this case. Accordingly, the minimum required sample size was determined to be 145 participants. To accommodate a potential 10% rate of invalid or incomplete responses among survey questionnaires, a minimum of 182 participants were sought to ensure the attainment of a sufficient number of valid and complete responses.

Data analysis was conducted using SPSS 22.0 (IBM, Armonk, NY, USA). Continuous data are presented as means and standard deviations (SD), while categorical data are expressed as n (%). Continuous variables underwent a normality test, with the t-test for normally distributed data and the Mann–Whitney U test for non-normally distributed data when comparing two groups. For three or more groups with normally distributed continuous variables and uniform variance, ANOVA was used for comparisons, while the Kruskal–Wallis H test was employed for non-normally distributed data. In multivariate analysis, 70% score distribution of the total score was used as the cut-off value. Univariate variables with $P < 0.05$ were enrolled in multivariate regression. A two-sided P-value less than 0.05 was considered statistically significant.

Ethics approval and consent to participate

The study was approved by the Medical Ethics Expert Committee of Zibo Central Hospital (Approval No. 2023040), and informed consent was obtained from all participants.

Data availability

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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Author contributions

Xue Wu and Yan Yang carried out the studies, participated in collecting data, and drafted the manuscript. Xiaomin Li and Hui Li performed the statistical analysis and participated in its design. Xue Wu and Hui Li participated in acquisition, analysis, or interpretation of data and draft the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare no competing interests.

Additional information

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