ORIGINAL RESEARCH

# Knowledge, Attitudes, and Practices of Patients from the Anesthesia Clinic in Jinshan District, Shanghai, Regarding Visiting the Anesthesia Clinic

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**Background:** Anesthesia assessment outpatient clinics (AAOCs) can help personalize the anesthesia experience, alleviate anesthesia-related anxiety, and offer health management advice. This study investigated the knowledge, attitude, and practice (KAP) of patients from the anesthesia clinic in Jinshan District, Shanghai, China, regarding AAOCs.

**Methods:** This cross-sectional study was conducted from July 10, 2023, to October 15, 2023, at Jinshan Hospital affiliated to Fudan University. The final version of the questionnaire included four dimensions: demographic information, knowledge dimension (seven items, scores 0–7), attitude dimension (six items, scores 6–30), and practice dimension (six items, scores 6–30). The Cronbach's α was 0.935. The risk factors for the practice dimension were examined through univariable and multivariable logistic regression. The relationships among the KAP dimensions were explored using a structural equation model (SEM).

**Results:** A total of 531 questionnaires were included for analysis. The mean knowledge score was 5.5±1.9 (/7 points, 79.0%). The mean attitude score was 26.3±3.7 (/30, 87.8%). The mean practice score was 25.5±3.4 (/30, 85.0%). However, still over 10% of participants did not recognize AAOCs' ability to alleviate anesthesia-related fears and did not believe AAOCs affect future health management. The knowledge scores correlated to the attitude (r=0.401, P<0.001) and practice (r=0.379, P<0.001) scores, while the attitude scores correlated to the practice scores (r=0.742, P<0.001). The SEM showed that knowledge influenced attitude (β=2.409, P<0.001), while attitude influenced practice (β=0.721, P<0.001). The attitude scores (OR=2.055, 95% CI: 1.756–2.404, P<0.001) and personal/relative/friend experience with AAOCs (OR=2.771, 95% CI: 1.002–7.664, P=0.050) were independently associated with the practice scores.

**Conclusion:** Patients in Jinshan District had a good KAP toward AAOCs. Improving knowledge of AAOCs should improve attitudes and the use of AAOCs to improve the patient experience and outcomes of anesthesia.

**Keywords:** anesthesiologist, patient, knowledge, attitude, practice, cross-sectional study

## Background

Anesthesia is required for surgery, but it is also associated with an increased risk of morbidity and mortality,[1] and patients who are older and/or with comorbidities are at further increased risk.[2] Hospitals often deal with patients who have to undergo extensive surgeries or interventions and who have complicated comorbidity issues.[3,4] Hence, a precise and comprehensive assessment of a patient's condition is crucial to optimize patient safety.[2] Such assessments significantly decreased anesthesia-related mortality, especially in developed countries.[1,5] On the other hand, the preoperative assessment for patients with non-operating room anesthesia remains limited, significantly impacting patient outcomes.[6] Organizational factors also play roles in risk factors for anesthesia,[7] as well as patient age <1 or >65 years, American Society of Anesthesiology (ASA) status, emergency surgery, and surgery starting after 6:00 pm.[8]

Anesthesia assessment outpatient clinics (AAOCs) support hospitals by evaluating the patients and the complexity of their surgery.[9] AAOCs differ among the departments, hospitals, and local policies, but they all share the same principle of offering services to the patients, surgeons, and anesthesia team.[10] In AAOCs, the patients are evaluated by

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anesthesiologists, nurses, or both,[2] and they are essential to improve patient outcomes, prepare the patients psychologically and medically, and ensure the most optimal sets of conditions for optimal surgical outcomes.[11–13] AAOCs also optimize communication among patients, surgeons, anesthesiologists, and postoperative healthcare providers.[14,15] Proper use of AAOCs leads to significant declines in surgical cancellations, length of hospital stay, and mortality.[8,16,17] Most importantly, AAOCs help manage the patient's anxiety regarding anesthesia and surgery, offer health management services, and can translate into better patient experience and outcomes after anesthesia.[18–20] Still, the patients must be aware of the existence of AAOCs and of the various services AAOCs can offer to receive the optimal benefits from AAOCs.

Knowledge, attitude, and practice (KAP) is a structured survey method widely used in sociology and psychology. Recently, KAP surveys have been increasingly used in the medical field. KAP surveys show the current status of a population's KAP towards a particular subject. KAP surveys help explore the underlying issues (eg, gaps in knowledge, misconceptions, and misunderstandings) in the status of a specific medical point, providing a basis for optimizing health education and disease management strategies.[21,22] Knowledge is what the participants know about the subject. Attitudes are what the participants believe about the subject. Practice is what the participants do in relation to the subject.[21,22] There are no KAP studies specifically on AAOCs. Still, a study in Ethiopia showed that most patients perceive anesthesia as "putting patients to sleep and waking them up after surgery", with a poor knowledge of the role of anesthesia healthcare providers outside the operating room[23] and a poor global knowledge of the roles of anesthesiologists.[24] Patients in developing countries show poor knowledge of anesthesia.[25] The KAP methodology has been applied in various fields in anesthesiology, but to the best of the authors' knowledge, the authors were not able to find previous literature on KAP specifically on AAOCs.

Therefore, this study aimed to investigate the KAP of patients in Jinshan District, Shanghai, China, regarding AAOCs. The results could help optimize the publicity for the use of AAOCs and the services offered by AAOCs.

## Methods

### Study Design and Participants

This cross-sectional study was conducted from July 10, 2023, to October 15, 2023, at Jinshan Hospital affiliated to Fudan University. The study included patients of Jinshan District, Shanghai, who visited the AAOC of Jinshan Hospital affiliated to Fudan University. At the authors' hospital, a visit to the AAOC is not mandatory before surgery. The AAOC is available, and the patients are free to visit it or not. The participants completed the questionnaire before they were evaluated in the AAOC. This study was approved by the ethics committee of the author's Hospital. Written informed consent was obtained from all study participants through the electronic questionnaires before data collection (ie, only those who provided informed consent were allowed to complete the questionnaire).

The inclusion criteria were 1) Shanghai Jinshan District patients from the anesthesia clinic, 2) those aged 18–85, and 3) those with the capacity for independent decision-making. The exclusion criteria were 1) unable to communicate due to deafness, 2) mental illnesses, 3) without the capacity for independent decision-making, or 4) refusal to participate in this study.

The questionnaire was distributed to the study participants using the WeChat QR code via Questionnaire Star. The criteria for invalid questionnaires were 1) participants who do not agree to continue the study after filling out the questionnaire (ie, withdrawing consent), 2) response time of <50 seconds (based on the number of questions), 3) logic errors (eg, impossible age), or 4) selected "not sure" for all questions in the knowledge section.

### Questionnaire

The questionnaire was designed based on relevant guidelines and literature. After creating the initial draft, a pilot study was conducted with 30 participants, and the overall Cronbach's α coefficient was 0.896. The questionnaire was adjusted based on the pilot study results, resulting in the final version (Supplementary Figure 1), which included four dimensions: demographic information (age, gender, education level, occupation, residence location, history of anesthesia, and having heard of anesthesia clinics), knowledge dimension, attitude dimension, and practice dimension. The knowledge

dimension consisted of two aspects with a total of seven questions. Each correct answer was scored 1 point, while incorrect or "not sure" answers received 0 points, with a score range of 0–7 points. The attitude dimension included six questions and used a 5-point Likert scale, ranging from very positive (5 points) to very negative (1 point), with a score range of 6–30 points. The practice dimension also contained six questions, using a 5-point Likert scale, ranging from always (5 points) to never (1 point), with a score range of 6–30 points. The Cronbach's α coefficient for the formal experiment was 0.935. The KMO was 0.933.

## Sample Size
The formula

$$n = \left( \frac{Z_{1-\alpha/2}}{\delta} \right)^2 \times p \times (1-p)$$

can be used to calculate the sample size of cross-sectional surveys. In the formula, $n$ represents the sample size for each group, $\alpha$ represents the type I error (which is typically set at 0.05), $Z_{1-\alpha/2}$=1.96, $\delta$ represents the allowable error (typically set at 0.05), and $p$ is set at 0.5 (as setting it at 0.5 maximizes the value and ensures a sufficiently large sample size). Hence, the calculated sample size was 384. Considering an estimated questionnaire response rate of 80%, a minimum of 480 valid questionnaires were needed.

## Statistical Analysis
Descriptive analyses were used to gather the demographic data and KAP scores of the participants. The continuous variables were presented as means ± standard deviations and analyzed using the Mann–Whitney $U$-test or the Kruskal–Wallis H-test. The categorical variables were shown as n (%) and analyzed using the chi-squared test. The correlation analyses of the KAP dimension scores were performed using Spearman analysis. The risk factors for the practice dimension were examined through univariable and multivariable logistic regression analyses. The relationships among the KAP dimensions were explored using a structural equation model (SEM). The SEM was based on the hypotheses that H1) knowledge directly influenced attitudes, H2) knowledge directly influenced practice, H3) attitudes directly influenced practice, and H4) knowledge indirectly influenced practice through attitudes. A mediation analysis has been added to explore the mediating mechanisms between knowledge, attitudes, and practices. All analyses were performed using SPSS 23 (IBM, Armonk, NY, USA). Two-sided P-values <0.05 were considered statistically significant.

# Results
## Characteristics of the Participants
A total of 592 questionnaires were collected. After excluding invalid ones, 531 questionnaires were included for analysis. The majority of the participants were 35–65 years old (55.9%), female (59.7%), had high school education or lower (47.3%), were non-healthcare workers (87.2%), and were residing in urban areas (71.0%). About two-thirds of the participants had previous anesthesia experiences (66.7%), and 65.5% of the participants themselves or their friends and family had experience with AAOCs (Table 1).

## Knowledge, Attitude, and Practice
The mean knowledge score was 5.5±1.9 (/7 points, 79.0%). Higher scores were observed with higher education (P=0.017), healthcare workers (P<0.001), urban patients (P<0.001), prior anesthesia experience (P=0.046), and personal/relative/friend experience with AAOCs (P<0.001) (Table 1). The knowledge item with the highest score was K4 (89.1%; Anesthesia outpatient clinics are run by specialized anesthesiologists who conduct pre-anesthesia assessments of patients, provide professional conclusions, develop the best anesthesia plans for patients, and engage in pre-anesthetic education tasks. Is the statement above correct?). The lowest score was for K1 (48.6%; "Do you have knowledge about anesthesia outpatient clinics?") (Table 2).

**Table 1** Basic Information About the Participants and KAP Score

|  | n (%) | Knowledge | P | Attitude | P | Practice | P |
|---|---|---|---|---|---|---|---|
| **n=531** |  |  |  |  |  |  |  |
| **Overall score** |  | 5.5±1.9 |  | 26.3±3.7 |  | 25.5±3.4 |  |
| **Age (years)** |  |  | 0.859 |  | 0.090 |  | 0.044 |
| 18–35 | 189 (35.6) | 5.5±2.0 |  | 26.5±3.6 |  | 25.9±3.6 |  |
| 35–65 | 297 (55.9) | 5.6±1.9 |  | 26.1±3.7 |  | 25.2±3.2 |  |
| >65 | 45 (8.5) | 5.6±1.7 |  | 27.2±3.9 |  | 26.1±3.8 |  |
| **Gender** |  |  | 0.548 |  | 0.811 |  | 0.781 |
| Male | 214 (40.3) | 5.6±1.9 |  | 26.3±3.6 |  | 25.5±3.3 |  |
| Female | 317 (59.7) | 5.5±1.9 |  | 26.4±3.7 |  | 25.5±3.5 |  |
| **Education level** |  |  | 0.017 |  | <0.001 |  | <0.001 |
| High school or below | 251 (47.3) | 5.3±2.1 |  | 25.5±3.7 |  | 24.8±3.4 |  |
| College | 122 (23.0) | 5.7±1.7 |  | 26.3±3.9 |  | 25.6±3.4 |  |
| Bachelor's | 130 (24.5) | 5.7±1.7 |  | 27.6±3.0 |  | 26.5±3.4 |  |
| Master's and above | 28 (5.3) | 6.1±1.2 |  | 28.3±2.8 |  | 26.8±3.0 |  |
| **Occupation** |  |  | <0.001 |  | 0.012 |  | 0.117 |
| Student | 15 (2.8) | 4.2±3.0 |  | 25.1±4.0 |  | 25.5±3.7 |  |
| Healthcare worker | 53 (10.0) | 6.3±1.3 |  | 27.6±2.8 |  | 26.4±3.4 |  |
| Non-healthcare worker | 463 (87.2) | 5.5±1.9 |  | 26.2±3.7 |  | 25.4±3.4 |  |
| **Residence** |  |  | <0.001 |  | <0.001 |  | 0.001 |
| Urban | 377 (71.0) | 5.7±1.6 |  | 26.7±3.6 |  | 25.8±3.4 |  |
| Rural | 154 (29.0) | 5.0±2.3 |  | 25.4±3.8 |  | 24.7±3.4 |  |
| **Prior anesthesia experience** |  |  | 0.046 |  | 0.571 |  | 0.538 |
| Yes | 354 (66.7) | 5.6±1.8 |  | 26.4±3.8 |  | 25.6±3.5 |  |
| No | 177 (33.3) | 5.3±2.0 |  | 26.2±3.5 |  | 25.4±3.3 |  |
| **Awareness of anesthesia outpatient clinics** |  |  | <0.001 |  | <0.001 |  | <0.001 |
| Yes, and I or my friends and family have visited | 348 (65.5) | 5.9±1.7 |  | 26.7±3.5 |  | 25.8±3.4 |  |
| Yes, only heard about it | 126 (23.7) | 5.2±1.8 |  | 26.1±3.6 |  | 25.4±3.4 |  |
| No | 57 (10.7) | 4.2±2.4 |  | 24.6±4.3 |  | 23.7±3.4 |  |

**Table 2** Knowledge Dimension of the Participants

|  | Correct rate, n (%) |
|---|---|
| 1. Do you have knowledge about anesthesia outpatient clinics? | 258 (48.6) |
| 2. Anesthesia outpatient clinics are short for pre-anesthesia assessment outpatient clinics, which are clinical outpatient facilities that combine disease consultation and diagnosis. Is the statement above correct? | 404 (76.1) |
| 3. Establishing anesthesia outpatient clinics is aimed at effectively assessing anesthesia risks, preparing for anesthesia, improving anesthesia safety, and enhancing communication efficiency between patients and doctors. It serves as an important platform for exchanging information between both parties. Is the statement above correct? | 469 (88.3) |
| 4. Anesthesia outpatient clinics are run by specialized anesthesiologists who conduct pre-anesthesia assessments of patients, provide professional conclusions, develop the best anesthesia plans for patients, and engage in pre-anesthetic education tasks. Is the statement above correct? | 473 (89.1) |
| 5. The primary task of anesthesia outpatient clinics is to conduct pre-anesthesia assessments for patients undergoing comfortable medical examinations and procedures, such as painless gastroscopy, painless gynecological outpatient surgery, assisted reproduction, and painless bronchoscopy. Is the statement above correct? | 452 (85.1) |
| 6. Anesthesia outpatient clinics can reduce the anxiety levels of patients who are planning to undergo surgical interventions. Is the statement above correct? | 442 (83.2) |
| 7. Anesthesia outpatient clinics can also provide necessary diagnosis and treatment for chronic pain patients and cancer patients regarding pain management and medication. Is the statement above correct? | 438 (82.5) |

The mean attitude score was 26.3±3.7 (/30, 87.8%). Higher scores were observed with higher education (P<0.001), healthcare workers (P=0.012), urban patients (P<0.001), and personal/relative/friend experience with AAOCs (P<0.001) (Table 1). The majority of the participants had positive attitudes toward the significance of AAOCs, the benefits of such clinics, the acquisition of better knowledge about anesthesia, and following the recommendations for subsequent treatments. Still, >10% of the participants did not recognize that AAOCs can help alleviate the fears and concerns toward anesthesia and did not agree that attending AAOCs will impact future health management (Table 3).

The mean practice score was 25.5±3.4 (/30, 85.0%). Higher scores were observed in the >65 age group (P=0.044), higher education (P<0.001), urban patients (P=0.001), and personal/relative/friend experience with AAOCs (P<0.001) (Table 1). The participants had proactive practice toward consulting an AAOC, following the physician's recommendations, and adjusting future health management based on the physician's advice. On the other hand, >10% of the participants were not willing to gain knowledge from the AAOC, to educate friends and family about the significance of AAOCs, and to accept the judgment of the physicians regarding tolerance to anesthesia (Table 3).

## Correlations

As shown in Table 4, the knowledge scores correlated to the attitude (r=0.401, P<0.001) and practice (r=0.379, P<0.001) scores, while the attitude scores correlated to the practice scores (r=0.742, P<0.001).

**Table 3** Attitude and Practice Dimension of the Participants

| | n (%) | | | | |
|---|---|---|---|---|---|
| | **Strongly Agree** | **Agree** | **Neutral** | **Disagree** | **Strongly Disagree** |
| 1. Do you agree that the existence of anesthesia outpatient clinics has clinical significance? | 313 (59.0) | 178 (33.5) | 35 (6.6) | 4 (0.8) | 1 (0.2) |
| 2. Do you agree that anesthesia outpatient clinics are beneficial for patients? | 298 (56.1) | 188 (35.4) | 39 (7.3) | 5 (0.9) | 1 (0.2) |
| 3. Do you believe that anesthesia outpatient clinics can alleviate patients' fears or concerns about anesthesia? | 286 (53.9) | 186 (35.0) | 55 (10.4) | 2 (0.4) | 2 (0.4) |
| 4. Do you agree that anesthesia outpatient clinics help you better understand anesthesia risks? | 291 (54.8) | 191 (36.0) | 45 (8.5) | 3 (0.6) | 1 (0.2) |
| 5. Do you agree that visiting an anesthesia outpatient clinic will impact your future health management? | 229 (43.1) | 150 (28.3) | 116 (21.9) | 32 (6.0) | 4 (0.8) |
| 6. Do you acknowledge the results of anesthesia outpatient clinic doctors and will follow their recommendations for subsequent treatment? | 277 (52.2) | 213 (40.1) | 37 (7.0) | 2 (0.4) | 2 (0.4) |
| | n (%) | | | | |
| | **Strongly willing to** | **Willing to** | **Neutral** | **Unwilling to** | **Strongly unwilling to** |
| 1. Are you willing to seek consultation at an anesthesia outpatient clinic before a procedure? | 196 (36.9) | 295 (55.6) | 37 (7.0) | 3 (0.6) | / |
| 2. Are you willing to consider anesthesia based on the recommendations provided by the anesthesia outpatient clinic? | 201 (37.9) | 292 (55.0) | 36 (6.8) | 2 (0.4) | / |
| 3. Are you willing to adjust your future health management based on the test results provided by the anesthesia outpatient clinic? For example, focusing more on potential heart disease risks indicated by an electrocardiogram, quitting smoking, reducing alcohol intake, or losing weight. | 203 (38.2) | 290 (54.6) | 34 (6.4) | 4 (0.8) | / |
| 4. Are you willing to actively learn or receive background information from the anesthesia outpatient clinic? | 174 (32.8) | 298 (56.1) | 52 (9.8) | 7 (1.3) | / |
| 5. Are you willing to educate your family and friends about the clinical significance of anesthesia outpatient clinics? | 165 (31.1) | 304 (57.3) | 58 (10.9) | 4 (0.8) | / |
| 6. During the medical process, are you willing to accept the judgment of anesthesia outpatient clinic doctors regarding your tolerance for anesthesia (even if your anesthesia assessment does not pass, leading to a refusal of anesthesia)? | 173 (32.6) | 304 (57.3) | 46 (8.7) | 7 (1.3) | 1 (0.2) |

**Table 4** Correlation Analysis of KAP Scores

|  | Knowledge | Attitude | Practice |
|---|---|---|---|
| Knowledge | 1 |  |  |
| Attitude | 0.401 (P<0.001) | 1 |  |
| Practice | 0.379 (P<0.001) | 0.742 (P<0.001) | 1 |

## Multivariable Analysis of Factors Associated with Practice

The univariable analyses showed that the knowledge scores (P<0.001), attitude scores (P<0.001), age 35–65 (P=0.011), bachelor's degree (P<0.001), master's degree or above (P=0.012), urban residence (P=0.003), and with personal/relative/friend experience with AAOCs (P=0.003) were associated with the practice scores (Table 5). The attitude scores (OR=2.055, 95% CI: 1.756–2.404, P<0.001) and personal/relative/friend experience with AAOCs (OR=2.771, 95% CI: 1.002–7.664, P=0.050) were independently associated with the practice scores (Table 5).
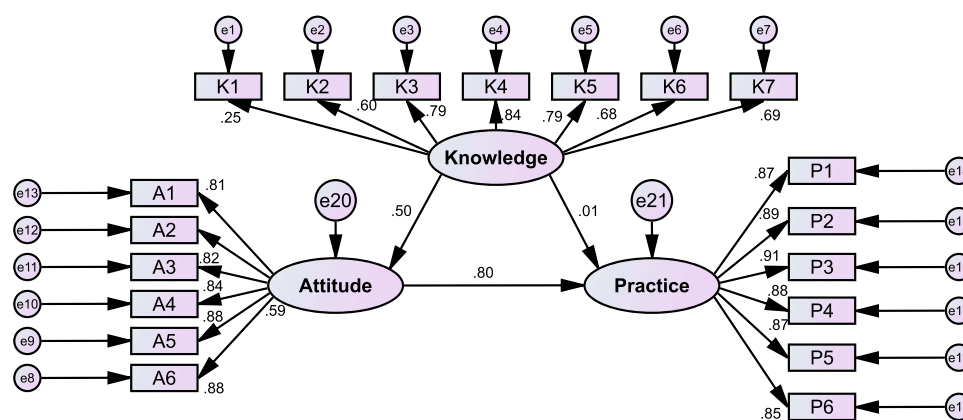
## Structural Equation Model

As shown in Table S1, the SEM (Figure 1) had a good fit based on the incremental fit index (IFI) (0.922, >0.8 is good), Tucker-Lewis index (TLI) (0.910, >0.8 is good), and comparative fit index (CFI) (0.922, >0.8 is good). In addition, the P-values of the loaded factors are all <0.05, suggesting that the model has a good measurement relationship. Knowledge

**Table 5** Univariable and Multivariable Logistic Regression

| Practice (cutoff=28) | Univariable Logistic Regression | | Multivariable Logistic Regression | |
|---|---|---|---|---|
|  | OR (95% CI) | P | OR (95% CI) | P |
| **Knowledge Score** | 1.532 (1.309–1.791) | <0.001 | 1.030 (0.827–1.283) | 0.793 |
| **Attitude Score** | 2.067 (1.782–2.398) | <0.001 | 2.055 (1.756–2.404) | <0.001 |
| **Age** |  |  |  |  |
| 18–35 years | 0.752 (0.387–1.457) | 0.398 | 0.828 (0.305–2.249) | 0.712 |
| 35–65 years | 0.430 (0.225–0.823) | 0.011 | 0.450 (0.181–1.119) | 0.086 |
| >65 years | Ref |  | Ref |  |
| **Gender** |  |  |  |  |
| Male | 0.953 (0.651–1.395) | 0.805 |  |  |
| Female | Ref |  |  |  |
| **Education level** |  |  |  |  |
| High school or below | Ref |  | Ref |  |
| College | 1.626 (0.995–2.657) | 0.052 | 1.071 (0.522–2.196) | 0.852 |
| Bachelor's | 2.740 (1.727–4.346) | <0.001 | 1.309 (0.640–2.676) | 0.460 |
| Master's and above | 2.802 (1.250–6.283) | 0.012 | 0.785 (0.275–2.241) | 0.651 |
| **Occupation** |  |  |  |  |
| Student | 0.762 (0.228–2.546) | 0.659 |  |  |
| Healthcare worker | Ref |  |  |  |
| Non-healthcare worker | 0.601 (0.334–1.081) | 0.089 |  |  |
| **Residence** |  |  |  |  |
| Urban | 1.992 (1.272–3.118) | 0.003 | 1.401 (0.732–2.684) | 0.309 |
| Rural | Ref |  | Ref |  |
| **Prior anesthesia experience** |  |  |  |  |
| Yes | 1.196 (0.801–1.785) | 0.382 |  |  |
| No | Ref |  |  |  |
| **Awareness of anesthesia outpatient clinics** |  |  |  |  |
| Yes, and I or my friends and family have visited | 3.525 (1.550–8.020) | 0.003 | 2.771 (1.002–7.664) | 0.050 |
| Yes, only heard about it | 2.747 (1.137–6.635) | 0.025 | 2.575 (0.860–7.708) | 0.091 |
| No, but I know some of it | Ref |  |  |  |

**Figure I** Structural equation model. The coefficients for the loaded items are standardized coefficients, while those in Table S1 are unstandardized coefficients.

influenced attitude (β=2.409, P<0.001), while attitude influenced practice (β=0.721, P<0.001) (Table S1). The mediation analysis showed that knowledge directly influenced attitude (β=0.505, P=0.007), attitude directly influenced practice (β=0.797, P=0.006), and knowledge indirectly influenced practice through attitude (β=0.402, P=0.006). Knowledge had no direct influence on practice (P=0.934) (Supplementary Table S2).

## Discussion

To the best of the authors' knowledge, the authors were not able to find previous literature on KAP specifically on AAOCs. Therefore, this cross-sectional study investigated the KAP of patients in Jinshan District, Shanghai, China, regarding AAOCs. The results suggested that patients in Jinshan District had a good KAP toward AAOCs. Improving knowledge of AAOCs should improve attitudes and the use of AAOCs to improve the patient experience and outcomes of anesthesia.

Although there are no KAP studies specifically on AAOCs, some data are available regarding anesthesia. Indeed, most patients in Ethiopia perceive anesthesia as simply making the patient sleep and waking them up, which is not false but rather a very simplistic view of the roles of the anesthesia team.[23] That view was shared by patients in Hong Kong.[26] Another study from Ethiopia reported a poor global knowledge of the roles of anesthesiologists.[24] Similar results were observed in developing countries.[25] On the other hand, the present study showed a good KAP toward AAOCs in Jinshan District, Shanghai, China. The results showed that a personal or social circle experience with AAOC was independently associated with the practice toward AAOC, suggesting that the experience with AAOCs was positive for most patients or their social circle. Indeed, the social circle plays an important role in healthcare in terms of sharing experiences.[27] Although socioeconomic factors were not independently associated with the practice, the univariable analyses showed that the socioeconomic factors were associated with the KAP toward AAOCs. It is supported by the general relationship between socioeconomic status and health literacy[28] and about anesthesiologists.[29]

The attitudes of the participants toward AAOCs were high, but some items had lower scores, particularly A3 ("Do you believe that anesthesia outpatient clinics can alleviate patients' fears or concerns about anesthesia?") and A5 ("Do you agree that visiting an anesthesia outpatient clinic will impact your future health management?"). Even though patients receive anesthesia to prevent feeling pain during procedures, many patients have fears and concerns toward anesthesia, including the risks of complications and allergies and the possibility of "not waking up". In addition, anxiety toward anesthesia can negatively impact patient satisfaction.[30] Although the patient attended an AAOC, >10% thought that AAOCs could not alleviate the patient's fears and concerns toward anesthesia. Furthermore, >20% of the patients believed that visiting the AAOC would not change their practice in the future. The issue can arise from the teaching content of the AAOC or the professionals' approach to the patient, particularly those showing signs of anxiety. Still, AAOC consultation has been shown to reduce preoperative anxiety[31–33] and reduce the cancellation rate on the day of surgery.[34] Efforts should be taken to consider the patients' feedback and improve the content and patient approach at the AAOC. Furthermore, 10–12% of the patients had little willingness to gain anesthesia-related information, promote

AAOCs to friends and families, and accept the physician's assessment of anesthesia tolerance. The majority of the participants seemed satisfied with the AAOCs. Nevertheless, these results suggest that steps must be taken to enhance the education of the patients and the general population about the importance and role of AAOCs to improve their recognition and participation in AAOCs. In addition, the results suggest a need for optimizing doctor-patient communication. Indeed, healthcare providers in anesthesia clinics should pay special attention to alleviating anesthesia-related fears and providing health management advice to improve patient trust, satisfaction, experience, and outcomes after anesthesia.

The present study showed that the KAP dimensions were correlated to each other, but only attitude scores were independently associated with the practice scores. In addition, the SEM analysis showed that knowledge influenced attitudes and that attitudes influenced practice. Nevertheless, the mediation analysis showed that knowledge directly influenced attitude and that attitude directly influenced practice, but knowledge did not directly influence practice. Hence, improving knowledge should also directly improve attitudes and indirectly improve practices toward AAOCs. The results suggest that hospitals and relevant institutions should widely promote the services and importance of AAOCs through various channels to enhance public recognition and participation in AAOCs. Considering that some patients may have concerns about anesthesia, the healthcare providers at AAOC should pay special attention to any signs of anxiety during consultations. They should communicate in a friendly and easily understandable manner, explaining safety measures and personalized plans during the anesthesia process to reduce patient anxiety. In addition, AAOC should not only be a place for preoperative assessment but also a platform where patients can receive long-term health management advice. Healthcare providers can take this opportunity to offer postoperative recovery guidance and other health maintenance suggestions, thereby enhancing patients' trust and satisfaction with medical services. Furthermore, public health interventions should be designed to popularize the important roles of AAOCs in the healthcare system. Such interventions could take the form of pamphlets in waiting rooms, posters, websites, video capsules on the internet or TV shows, or formal nurse education at the preoperative clinic. Future studies should aim to design and test such interventions.

The present study had limitations. It was performed at a single center, resulting in a relatively small sample size and limiting the generalizability of the conclusions to a single geographical area. The study was performed on patients who consulted an AAOC, possibly biasing the results toward higher KAP. Because of the cross-sectional nature of the study, the results represent a single point in time, and no dynamic assessment of the KAP in time was performed. Nevertheless, the present study could serve as a historical baseline to evaluate the impact of an education intervention on AAOCs. In addition, the cross-sectional design prevents the analysis of causality. Although SEM analyses can provide some trends about causality, they are statistical inferences that have to be validated in real life. The questionnaire was designed by the investigators according to the local practices and policies and might not be exportable to other provinces or countries. Finally, all KAP studies are at risk of the social desirability bias, in which the participants can answer what they know they should do instead of what they are really doing.[35,36]

In conclusion, patients from the anesthesia clinic in Jinshan District had a good KAP toward AAOCs. Improving knowledge of AAOCs should improve attitudes, which should improve practice. The social circle also plays a significant role in the KAP toward AAOCs. The results could help improve the services offered by AAOCs in Jinshan District. Future studies should examine methods to improve the KAP toward AAOCs. The exact patient experience and anesthesia outcomes after the use of AAOCsa should also be examined before and after interventions to improve the KAP toward AAOCs.

## Data Declaration

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

## Ethical Statement

All procedures were performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. This study was approved by the ethics committee of Jinshan Hospital, affiliated to Fudan University [approval JIEC 2023-S53]. Written informed consent was obtained from all study participants through the electronic questionnaires before data collection. All methods were carried out in accordance with relevant guidelines and regulations.

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

## Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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