Acta Anaesth. Bel., 2026, 77 (1): *23-33*

Original study

Measuring preoperative anxiety in older surgical patients: an international Delphi study

Yang K. L.[1] , Detroyer E.[1,2], Islam F.[3], Davis D.[4], Alvarez-Garcia[5], Boehm L. M.[6], Bouckaert F.[7], Dziadzko M.[8], Ely E. W.[9], Hardy A.[10], Klimek M.[11], Kowark A.[12], Lambrichts S.[13], Van Grootven B.[1,3], Rex S.[14,15], Milisen K.[1,2]

[1]Department of Public Health and Primary Care, Academic Center for Nursing and Midwifery, KU Leuven - University of Leuven, Leuven, Belgium; [2]Department of Geriatric Medicine, University Hospitals Leuven, Leuven, Belgium; [3]Institute for Nursing Science, University of Basel, Basel, Switzerland; [4]MRC Unit for Lifelong Health and Ageing Unit at UCL, London, United Kingdom; [5]Department of Nursing, University of Jaén, Jaén, Spain; [6]Critical illness, Brain Dysfunction, and Survivorship (CIBS) Center, School of Nursing, Vanderbilt University, Nashville, TN, USA; [7]Geriatric Psychiatry, University Psychiatric Center KU Leuven and Leuven Brain Institute, Department of Neurosciences, Neuropsychiatry, Leuven, Belgium; [8]Service d'Anesthésie, Hôpital de la Croix-Rousse, Hospices Civils de Lyon, RESHAPE INSERM U1290, Université Claude Bernard Lyon 1, Lyon, France; [9]Critical Illness, Brain Dysfunction, and Survivorship (CIBS) Center, Vanderbilt University Medical Center, Nashville, Tennessee, USA; [10]Clinique du Sport, Paris, France; [11]Department of Anaesthesiology, Erasmus University Medical Center, Rotterdam, The Netherlands; [12]Department of Anaesthesiology and Intensive Care Medicine, University Hospital Bonn, Bonn, Germany; [13]Department of Neurosciences, Research Group Psychiatry, KU Leuven, Leuven, Belgium; [14]Department of Anesthesiology, University Hospitals Leuven, Leuven, Belgium; [15]Department of Cardiovascular Sciences, KU Leuven - University of Leuven, Leuven, Belgium.

Corresponding author: K. Milisen, Department of Public Health and Primary Care, Academic Centre for Nursing and Midwifery, KU Leuven - University of Leuven, Kapucijnenvoer 7, B-3000 Leuven, Belgium. Tel: +32 16 37 79 79. E-mail: koen.milisen@kuleuven.be

Abstract

Background: **Preoperative anxiety is pervasive among surgical patients and associated with several complications, particularly in older patients. However, its assessment in older surgical patients remains challenging.**
Objectives: **To select the most appropriate instrument(s) for assessing preoperative anxiety in older surgical patients aged ≥65 years, assess their content validity, and reach consensus on a theoretical definition for preoperative anxiety.**
Design and Setting: **Three-round Delphi study.**
Method: **Experts in clinical management and/or research of (preoperative) anxiety, preoperative care, anaesthesiology, geriatrics, and psychiatry were included. Consensus required ≥70% agreement on instruments selection and their relevance, comprehensiveness and feasibility, and on definitions. The Content Validity Index (CVI) of each scale (S-CVI) and its items (I-CVI) were calculated for the selected instruments.**
Results: **Fourteen international experts participated in the study. The Surgical Anxiety Questionnaire (SAQ) was preferred for measuring preoperative anxiety in research settings, but not considered suitable for clinical practice. The Visual Analogue Scale-Anxiety (VAS-A) was preferred as the most appropriate instrument for measuring preoperative anxiety in clinical settings. The VAS-A had a higher S-CVI (0.92), while the SAQ had a lower S-CVI (0.74) with 10/17 items having I-CVI values below 0.78. Although the anxiety subscale of Amsterdam Preoperative Anxiety and Information Scale (APAIS-A) was highly recognized by the panel and had a high S-CVI score (0.91), it was not selected as the most appropriate for either research or clinical settings. Consensus was achieved regarding the theoretical definition of preoperative anxiety, emphasizing that preoperative anxiety is state anxiety.**

Ethics approval and consent to participate: The Social and Societal Ethics Committee (SMEC) of KU Leuven has approved this research (Address: Schapenstraat 34, 3000, Leuven, Belgium; Reference number G-2022-6007; Chair of the ethics committee: Prof. dr. Dieter Baeyens; Date of approval: 11/08/2023). Written informed consent was obtained from all of the participants.

Conclusions: **This study provides a reference for enhancing preoperative anxiety management in older patients. Preoperative anxiety was defined as state anxiety, with VAS-A identified as the most appropriate instrument for clinical use, and SAQ preferred in research, although SAQ is a relatively new instrument that requires further validation.**
Trial Registration: **Not applicable.**

Keywords: **Preoperative anxiety, older patients, Delphi study, content validation.**

Introduction

Preoperative anxiety, a pervasive issue in 16.7%-97% of surgical patients, has been associated with several complications, including hemodynamic instability, increased intraoperative requirements for anaesthetics, and increased risk of postoperative adverse outcomes[1–4]. In older surgical patients, these complications are compounded by age-related physiological and cognitive disturbances, increased frailty and the presence of multiple comorbidities, which heighten their medical, functional, and psychological vulnerabilities. Particularly, a high level of preoperative anxiety is an independently heightened risk for postoperative mortality or major morbidity in older patients undergoing cardiac surgery[5]. Therefore, identifying older patients with high preoperative anxiety is essential for optimizing their perioperative management and outcomes.

Although the impact of preoperative anxiety on patients' outcomes has been recognized, measuring this construct in older surgical patients remains challenging. Several instruments have been developed and adopted to assess preoperative anxiety; however, few were not specifically designed or validated for use in older populations[6–8]. As a result, substantial variability exists in the selection of instruments across clinical settings and research[9]. Moreover, whether preoperative anxiety in older surgical patients can be precisely detected and measured by these instruments is unclear, necessitating an investigation into their content validity, which is the degree to which an instrument adequately reflects the construct to be measured[10–12]. In addition, the theoretical definition of preoperative anxiety is not always clearly stated in the literature. When measuring anxiety related to a particular event (e.g., a surgical procedure), it is important to distinguish state anxiety from trait anxiety. State anxiety refers to a more transient intense emotional state that arises in response to an identifiable situation perceived as threatening or stressful, encompassing feelings of tension, fear, and apprehension, along with a temporary heightened sympathetic nervous system activity (i.e., being momentarily anxious given the context of a particular situation). Inversely, trait anxiety reflects a generalized and enduring predisposition to nervousness and anxiety as a personality feature (i.e., an inherently anxious person) rather than a situational reaction[13,14]. Individuals with high trait anxiety are more prone to experience elevated state anxiety when confronted with stress-inducing circumstances, such as an upcoming surgical procedure[15]. This heterogeneity and complexity have complicated efforts to compare findings, synthesize evidence, and establish standardized protocols for preoperative anxiety assessment.

Therefore, a consensus on the most appropriate instruments for measuring preoperative anxiety in older surgical patients is required. Various factors should be considered when choosing the appropriate instrument, including not only its reliability and accuracy, but also the aim of assessment, the age and clinical state of patients, as well as the type of surgery being planned. In addition, the clinical applicability and feasibility of the instrument must be accounted for. To address this issue, we used a Delphi method by engaging a panel of international experts to select the most appropriate instrument(s) for the assessment of preoperative state anxiety in older surgical patients (aged 65 years and older), and to reach a consensus on a theoretical definition of the construct.

Methods

This three-round Delphi study was conducted and reported according to the recommendations in Guidance on Conducting and REporting DElphi Studies (CREDES)[16,17]. This study received ethical approval from the Social and Societal Ethics Committee KU Leuven (Address: Schapenstraat 34, 3000, Leuven, Belgium; Reference number G-2022-6007; Chair of the ethics committee: Prof. dr. Dieter Baeyens; Date of approval: 11/08/2023). Written informed consent was obtained from all of the participants.

Eligibility criteria and expert panel recruitment

We included experts from relevant disciplines (such as medical doctors, psychiatrist, nurses, psychologists) involved in clinical management and/or research of (preoperative) anxiety,

preoperative care, anaesthesiology, geriatrics, and psychiatry[18,19].

We identified them as follows: 1) experts who are highly cited in international literature in the field of preoperative anxiety, preoperative care, and other fields mentioned above; 2) experts meeting the inclusion criteria were identified from the network of study team members; 3) experts from relevant scientific associations or societies. Experts willing to participate were also asked to suggest any peers who fit the eligibility criteria. Identified experts were contacted via email with an information sheet of the study. The panelists who agreed to participate signed the informed consent form, on which the volunteer participation and the freedom to withdraw from the study at any time were clearly stated. Assuming a drop-out rate of 40%, we recruited 14 experts to ensure at least 10 responses in the last round to better avoid chance agreement[10,20]. The developers of the included instruments were not considered in our panel of experts to avoid bias.

Procedures

All three rounds were held via online surveys, conducted by email and LimeSurvey (study flowchart is shown in Figure 1). All surveys were pilot tested for the clarity of instructions, wording, and rating criteria before being administered to panelists.

Round 1

Questionnaire for Round 1 consisted of three sections regarding Demographic information, Definition of preoperative anxiety, and Instruments for assessing preoperative anxiety (see Appendix 1 for full questionnaire). Lists of seven definitions and eight instruments were provided to panelists. Panelists were asked to choose the maximum of three definitions that they considered to be appropriate, and to give opinions on the most appropriate time frame for defining preoperative anxiety, including periods from the day the patient is informed of the surgery to a few hours before surgery. For the instruments, panelists were asked to assess each instrument as a whole in terms of their relevance, comprehensiveness, and the feasibility of using it for surgery. They may also oppose any instrument or suggest alternatives. The relevance was graded using a 4-point Likert scale (1= not relevant, 2= somewhat relevant, 3= quite relevant, and 4= highly relevant); comprehensiveness and feasibility were graded with Yes or No. After reviewing all instruments, panelists could select a maximum of three instruments as the most appropriate instruments for assessing preoperative anxiety in older surgical patients (aged 65 years and older). Definitions and instruments presented were obtained from our recently published systematic review about preoperative anxiety and postoperative delirium[9], as well as from the rapid search of systematic reviews and primary studies on preoperative anxiety.

Round 2

Questionnaire for Round 2 consisted of two sections regarding Definition of preoperative anxiety and Instruments for assessing preoperative anxiety (see Appendix 2 for full questionnaire). Panelists were requested 1) to select the most appropriate definition of preoperative anxiety from the top three choices identified in Round 1; 2) to select the most appropriate time frame to define preoperative anxiety in research and clinical settings,

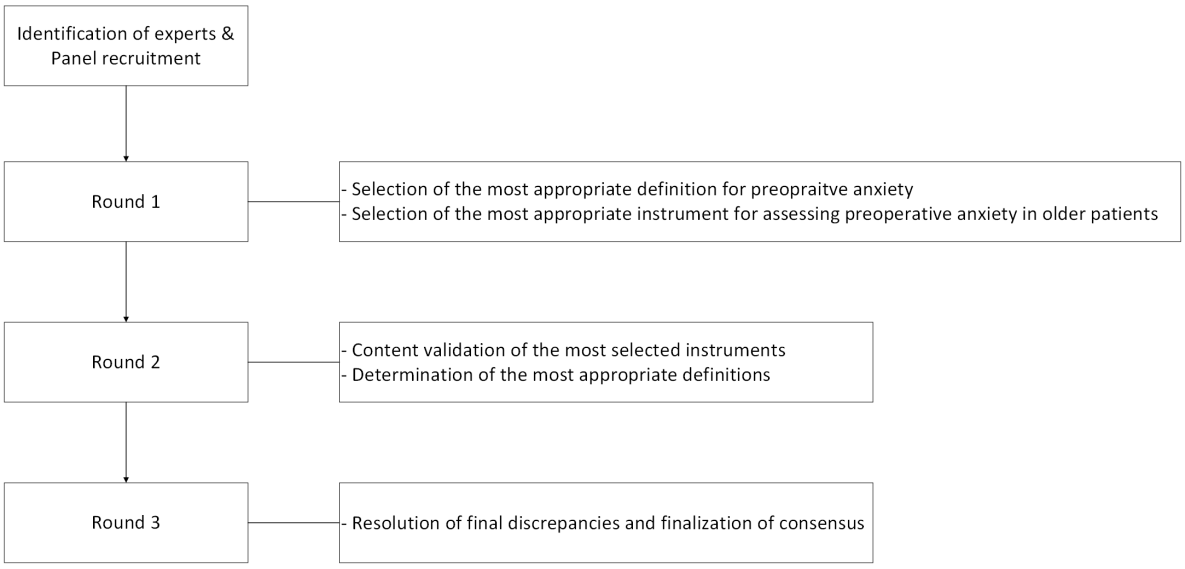

Fig. 1 — Flowchart of Delphi study procedure.

respectively; 3) to assess the content validity of each item in the top three selected instruments as well as the instruments for which consensus on the overall relevance was reached in Round 1, and to select the most appropriate instrument for research purpose and clinical purpose, respectively. Each single item was graded using a 4-point Likert scale (1= not relevant, 2= somewhat relevant, 3= quite relevant, and 4= highly relevant). The summary of the selection regarding the definitions and instruments in the first round was presented to the panelists for reference.

Round 3

In Round 3, panelists were also presented with a summary of Round 2 results, highlighting the unresolved issues. They were asked to review the refined definition and proposed time frame, indicate their agreement with these refinements, and could express their views on the remaining controversies (see Appendix 3 for full questionnaire).

Predefined criteria for consensus

As there is no universal standard for defining consensus, thresholds ranging from 70% to 80% are most commonly applied in Delphi studies[21,22]. In this study, consensus on the most appropriate definition and instrument was defined as a percentage of at least 70% of panelists. Consensus was achieved when at least 70% of the panelists agreed (highly/quite relevant or yes) or disagreed (somewhat/not relevant or no) regarding the relevance/comprehensiveness/feasibility of each instrument[23,24].

Data analysis

Expert panel demographics and ratings for each round are reported using descriptive analyses (i.e., frequencies and percentages). Data analyses was conducted using LimeSurvey and Microsoft Excel. To assess robustness, sensitivity analyses were performed by varying the predefined consensus threshold to 75% and 80%. To assess the interrater reliability levels in each round of instrument and definition selection, a Fleiss' kappa (K) statistic was computed in R program (version 4.3.1 Kappa values were interpreted as follows: < 0.00 = poor agreement; 0.00–0.20 = slight; 0.21–0.40 = fair; 0.41–0.60 = moderate; 0.61–0.80 = substantial; 0.81–1.00 = almost perfect agreement 25. A p-value < 0.05 was considered statistically significant.

For content validity assessment of the instruments evaluated in Round 2, we calculated the index of content validity (CVI) of each scale (S-CVI) and its items (I-CVI). I-CVI was calculated as the number of experts who rated an item of the instruments with a score of either 3 (quite relevant) or 4 (highly relevant), divided by the number of panelists10. I-CVI greater than 0.78 was considered as excellent agreement for relevance[20,26]. For the S-CVI, we calculated S-CVI/Ave (averaging approach), which is the average of the I-CVIs for all items, computed by summing up all I-CVIs and dividing them by the number of items 10,26. Instruments to be judged as having excellent overall content validity should have a S-CVI/Ave of 0.9 or higher[20,26].

Results

Expert panel

Fourteen panelists completed all three rounds of the study. The panel included six medical doctors, four researchers, two psychiatrists, one nurse, and one nurse consultant. The specialties involved were mostly anaesthesiology (n=5) and geriatrics (n=4). The panelists had an average of 18 years of experience in their specialty (range: 3-30 years) (Table I).

Most appropriate instruments for assessing preoperative anxiety

In Round 1, the top three appropriate instruments selected by the panelists for assessing preoperative anxiety in older surgical patients were APAIS-A (n=9, 64.3%), Surgical anxiety questionnaire (SAQ) (n=8, 57.1%), and Visual Analogue Scale-Anxiety (VAS-A) (n=8, 57.1%) (Table II). A Fleiss' Kappa of 0.115, $p = 0.002$ indicated slight agreement among the experts in Round 1.

For relevance, panelists reached consensus that SAQ, VAS-A, APAIS-A, and Anxiety Specific to Surgery Questionnaire (ASSQ) were highly/quite relevant for assessing preoperative anxiety in older surgical patients. For comprehensiveness, panelists reached the consensus that SAQ and ASSQ covered all the aspects relevant to measuring preoperative anxiety in older surgical patients, while State-Trait Anxiety Inventory-State subscale (STAI-S) and Six-item of STAI-State subscale (STAI-6) didn't. The common missing aspect pointed out by the panelists was that these two instruments lacked a surgical context, as these tools are primarily designed to assess anxiety in general rather than specific preoperative contexts. For the feasibility of use in clinical practice, panelists reached consensus that APAIS-A, VAS-A, HADS-A, and STAI-6 were feasible, especially in older patients undergoing emergency surgery. Sensitivity analyses using stricter consensus thresholds of 75% and 80% revealed different levels of stability

Table I. — Demographics of the Delphi panellists.

Characteristic		Number of panellists (N=14)
Female		5
Country of current employment		
	Belgium	6
	France	2
	US	2
	Germany	1
	Netherlands	1
	Spain	1
	Switzerland	1
Profession		
	medical doctor	6
	researcher	4
	psychiatrist	2
	nurse	1
	nurse consultant	1
Specialty		
	anaesthesiology	5
	geriatrics	4
	psychiatry	2
	surgery	1
	nursing	1
	critical care	1
Years of experience		
	< 10 years	4
	≥ 10 years and < 20 year	2
	≥20 years	8

in the results. When the threshold was increased to 75%, only one change was observed, with the relevance of APAIS-A no longer meeting the consensus criterion. However, when the threshold was further increased to 80%, five ratings failed to reach the consensus threshold. Further details are presented in Table II. In Round 2, panelists didn't reach consensus on which instrument was the most appropriate one for assessing preoperative anxiety in older surgical patients, but showed a distinct preference for instruments suitable for research and clinic settings, respectively (Table II). Six panelists (42.9%) selected SAQ as the most appropriate instrument in research settings, while none of the panelists considered it to be the most appropriate for clinical settings. Only one panelist (7.1%) selected VAS-A as the most appropriate instrument in research settings, while seven of the panelists (50.0%) considered it to be the most appropriate for clinical settings. In Round 2, Fleiss' Kappa was 0.106 ($p = 0.043$) for both research and clinical settings, indicating slight agreement among experts.

Content validation of the top selected instruments

The results of content validation in Round 2 are listed in Table III. VAS-A and APAIS-A had excellent overall content validity, with S-CVI/Ave value of 0.92 and 0.91, respectively. The I-CVI values of all four items in APAIS-A were more than 0.78 (range: 0.86-1.00). ASSQ obtained an S-CVI/Ave value of 0.85, with three out of ten items having I-CVI values below 0.78. The SAQ had a lower S-CVI/Ave value (0.74), with 10 out of 17 items having I-CVI values below 0.78.

Definition for preoperative anxiety

After the first two rounds, the panel did not reach a consensus on the definition of preoperative anxiety (Appendix 4). The primary difference among the top three most frequently selected definitions was whether preoperative anxiety should be conceptualized as state anxiety or as a combination of state and trait anxiety. In Round 3, all panelists confirmed that preoperative anxiety should be conceptualized as state anxiety. Furthermore, 100% consensus (n=14) was found on the refined definition that we proposed; i.e., "preoperative anxiety is defined as state anxiety, meaning a situational psychological and physiological state of apprehension, distress, or uneasiness, arising from concerns about a disease, hospitalization, anaesthesia, and surgery, or the unknown".

The time frame "From the day the patient is informed of the surgery" was identified as the most appropriate for defining preoperative anxiety

Table II. — Results of Round 1 and Round 2 regarding the instruments for assessing preoperative anxiety.

Instrument	Round 1				Round 2	
	Selection* n/N (%)	Relevance n/N (%)	Comprehensiveness n/N (%)	Feasibility n/N (%)	Selection# n/N (%)	
					In research setting	In clinical setting
APAIS-A	9/14 (64.3%)	Consensus: Highly and quite relevant 10/14 (71.4%)^^	No consensus: Not comprehensive 8/14 (57.1%)	Consensus: Feasible 13/13 (100%)	2/14 (14.3%)	4/14 (28.6%)
SAQ	8/14 (57.1%)	Consensus: Highly and quite relevant 10/13 (76.9%)^	Consensus: Comprehensive 12/13 (92.3%)	No consensus: Not feasible 7/13 (53.8%)	6/14 (42.9%)	0/14 (0.0%)
VAS-A	8/14 (57.1%)	Consensus: Highly and quite relevant 12/13 (92,3%)	No consensus: Not comprehensive 9/13 (69.2%)	Consensus: Feasible 13/13 (100%)	1/14 (7.1%)	7/14 (50.0%)
ASSQ	5/14 (35.7%)	Consensus: Highly and quite relevant 11/14 (78.6%)^	Consensus: Comprehensive 12/14 (85.7%)	No consensus: Not feasible 7/13 (53.8%)	5/14 (35.7%)	3/14 (21.4%)
BAI	4/14 (28.6%)	No consensus: Somewhat and not relevant 9/14 (64.3%)	No consensus: Not comprehensive 7/14 (50.0%)	No consensus: Not feasible 9/13 (69.2%)	NA	NA
HADS-A	3/14 (21.4%)	No consensus: Somewhat and not relevant 8/13 (61.5%)	No consensus: Not comprehensive 9/13 (69.2%)	Consensus: Feasible 11/13 (84.6%)	NA	NA
STAI-S	2/14 (14.3%)	No consensus: Somewhat and not relevant 8/13 (61.5%)	Consensus: Not comprehensive 10/13 (76.9%)^	No consensus: Not feasible 8/13 (61.5%)	NA	NA
STIA-6	1/14 (7.1%)	No consensus: Highly and quite relevant 7/13 (53.8%)	Consensus: Not comprehensive 10/13 (76.9%)^	Consensus: Feasible 11/13 (84.6%)	NA	NA

Note: Consensus was achieved when at least 70% of the panellists agreed (highly/quite relevant or yes) or disagreed (somewhat/not relevant or no) regarding the relevance/comprehensiveness/feasibility of each instrument as well as selected instrument; ^^ consensus status changed when stricter consensus thresholds of 75% and 80% were applied; ^ consensus status changed when stricter consensus threshold of 80% was applied. *In round 1, panellists selected a maximum of three instruments as the most appropriate for assessing preoperative anxiety in older surgical patients; #In round 2, panellists selected the most appropriate instrument in research settings and clinical settings, respectively. Highly and quite relevant: This instrument is highly/quite relevant for assessing preoperative anxiety in older surgical patients; Comprehensive: This instrument covers all the aspects you consider to be relevant to measure preoperative anxiety in older surgical patients; Not comprehensive: This instrument doesn't cover all the aspects you consider to be relevant to measure preoperative anxiety in older surgical patients; Feasible: This instrument is feasible to use to measure preoperative anxiety in older patients undergoing emergency surgery; Not feasible: This instrument is not feasible to use to measure preoperative anxiety in older patients undergoing emergency surgery. APAIS-A: Amsterdam Preoperative Anxiety and Information Scale-Anxiety subscale; SAQ: Surgical anxiety questionnaire; VAS-A: Visual Analogue Scale-Anxiety; ASSQ: Anxiety Specific to Surgery Questionnaire; BAI: Beck Anxiety Inventory; HADS-A: Hospital Anxiety and Depression Scale-Anxiety subscale; STAI-S: State-Trait Anxiety Inventory-State subscale; STAI-6: Six-item of STAI-State subscale. NA: Not Applicable, the instrument was not involved in the second round.

Instruments	Items	I-CVI
APAIS-A	Item 1: I am worried about the anaesthetic.	1.00
	Item 2: The anaesthetic is on my mind continually.	0.86
	Item 3: I am worried about the procedure.	0.93
	Item 4: The procedure is on my mind continually.	0.86
	S-CVI/Ave	0.91
ASSQ	Item 1: Thoughts of dying frequently come to my mind.	0.71
	Item 2: If something happens to me, my family and children will remain helpless.	0.64
	Item 3: I am afraid that I may not regain my consciousness after the operation.	1.00
	Item 4: I worry that I may die during the operation due to bleeding or other reasons.	0.93
	Item 5: I worry that I may not recover completely after the operation due to inflammation or other problems.	0.79
	Item 6: I am afraid that after the operation, I may not be able to walk again and/or I may not be able to care for myself as before.	0.93
	Item 7: I worry that I will have a lot of pain after the operation I will.	1.00
	Item 8: I believe that I will get rid of all my pains and problems after the operation.	0.57
	Item 9: I am afraid that I will be physically disabled by the operation.	0.93
	Item 10: I think I will feel pain during the operation.	1.00
	S-CVI/Ave	0.85
SAQ	Item 1: Not waking up from the anaesthetic.	1.00
	Item 2: Other health problems the doctors might find during my surgery.	0.57
	Item 3: The medical staff making a mistake during my surgery.	0.86
	Item 4: Contracting an infection or getting sick from the hospital environment.	0.64
	Item 5: Being discharged before I have recovered properly.	0.43
	Item 6: Feeling sick or vomiting after my surgery.	0.86
	Item 7: Costs associated with my surgery.	0.50
	Item 8: Not having enough social support after my surgery.	0.64
	Item 9: Having to take time off school or work.	0.71
	Item 10: My current health complicating my surgery or recovery.	0.71
	Item 11: Not having any control over my anaesthesia or surgery.	0.86
	Item 12: Having an injection or receiving an IV line (a drip).	0.64
	Item 13: An incision in my tissues.	0.64
	Item 14: Not knowing what is going to happen.	0.86
	Item 15: How long it will take to return to my normal daily activities or hobbies.	0.71
	Item 16: Being awake or conscious during my surgery.	0.93
	Item 17: Experiencing pain or discomfort after my surgery.	1.00
	S-CVI/Ave	0.74
VAS-A	One item	0.92
	S-CVI/Ave	0.92

Note: APAIS-A: Amsterdam Preoperative Anxiety and Information Scale-Anxiety subscale; SAQ: Surgical anxiety questionnaire; VAS-A: Visual Analogue Scale-Anxiety; ASSQ: Anxiety Specific to Surgery Questionnaire; I-CVI: item-level content validity index; S-CVI/Ave: instrument/scale-level content validity index/averaging approach. There were 13 experts rating VAS-A and 14 experts rating the rest instruments.

in both clinical and research settings. It received the highest number of selections in Round 1 (n=6) and Round 2 (n=7), and achieved full consensus in Round 3 (n=14).

Discussion

Preoperative anxiety is common in patients awaiting surgery, which may affect both the surgical outcomes of the patients and their overall experience. Multiple instruments have been utilized in both research and clinical settings to assess preoperative anxiety, with the selection often driven by convenience or practitioner preference. To enhance consistency in the assessment and management of preoperative anxiety in older surgical patients, this Delphi study provides a reference for selecting appropriate instruments for assessing preoperative anxiety, and a better understanding of the theoretical definition of preoperative anxiety.

Our findings underscore the complexities of measuring preoperative anxiety in older patients and highlight distinct considerations for clinical

and research settings. VAS-A was selected as the most appropriate instrument for use in clinical settings, although it did not achieve the prespecified consensus level. VAS-A has been recognized as an effective rapid screening tool for assessing preoperative anxiety across various clinical settings due to its simplicity and ease of use[27,28]. Patients can easily mark a point on a horizontal 10 cm line to indicate their preoperative anxiety levels, making it particularly beneficial in fast-paced clinical settings. However, in research investigating preoperative anxiety, its single-item and subjective nature may limit precision and fail to capture the multidimensional aspects of preoperative anxiety. Nevertheless, it is precisely because of its straightforward design that VAS-A allows older patients to express their anxiety levels without the need for complex verbal or written communication. After all, when research is embedded within clinical care, a time-efficient assessment tool is essential, as lengthy questionnaires may not be practical given patients' other priorities. While VAS-A has shown comparable performance to STAI-S, the gold standard measurement for state anxiety, these studies primarily involved younger adults or female patients[29–31]. A study involving 734 participants with a mean age of 52 years found that while VAS-A could detect patients with high anxiety, it didn't provide a high true positive rate with a low false positive rate[28]. However, for research evaluating the efficacy of anxiety-reduction interventions, a measure with higher specificity and a low false-positive rate is preferable. Conversely, SAQ was deemed inappropriate for clinical settings, as experts expressed significant concerns that completing SAQ could exacerbate anxiety because of the potential negative clinical scenarios being presented in multiple items of the instrument. Additionally, SAQ containing 17 items is excessively lengthy for patients to complete in busy clinical settings, particularly when anxiety may not be their utmost concern while awaiting surgery. However, SAQ was selected as the most appropriate instrument to be used in research settings. The SAQ captures a broader spectrum of preoperative anxiety, addressing not only anxiety about surgery itself but also broader concerns that may influence a patient's overall surgical experience, including concerns about general health status, surgical recovery process, and limited control and surgical procedures[32].

Although STAI-S and HADS-A are widely used and well-established instruments for assessing anxiety levels in various clinical settings, they were not preferred by the expert panel as they are not specific to surgical patients and do not explicitly relate to the preoperative context, which may limit their effectiveness in capturing the unique anxiety experiences associated with surgical procedures[6]. Additionally, with its 20 items, STAI-S is a complex and time-consuming scale, making it less suitable for older patients and busy clinical settings[33].

Beyond the choice between clinical and research applications, it is also important to consider the cultural and linguistic applicability of these instruments. Most of the instruments reviewed in this study were developed in Western contexts. Although some tools (e.g., HADS-A, APAIS) have been validated in non-Western languages, others (e.g., SAQ and ASSQ) remain less tested across cultures. Therefore, the findings and recommendations of this Delphi study should be applied with caution in populations where these instruments have not yet been validated, as their psychometric performance and feasibility may differ across cultural and patient groups.

Another focus of this study is to evaluate the content validity of the instruments, confirming that the instrument accurately captures preoperative anxiety as intended. The two most selected instruments, APAIS-A and SAQ, demonstrate vastly differing S-CVI/Ave scores. APAIS-A, with strong content validity, composes four items directly addressing anxiety about surgery and anaesthetic, while SAQ has a broader scope of preoperative anxiety, including some items that may be less relevant to preoperative anxiety assessment [7,32,34]. For example, the items within the 'concerns about recovery' subscale of SAQ received lower I-CVI scores (<0.78), with one item 'costs associated with my surgery' scoring only 0.33, likely because this item captures anticipatory concerns about the postoperative period rather than anxiety in the preoperative period[32]. Additionally, unlike APAIS, which has been validated across various countries and populations, SAQ is a relatively new instrument that requires further validation in diverse populations to ensure its applicability and accuracy in measuring preoperative anxiety across different population groups. The feasibility, acceptability, and psychometric properties (such as construct validity, reliability, and sensitivity to change) of the identified instruments should be further examined in older patients, whose responses may differ from expert expectations. In addition, all evaluated instruments measure the same underlying construct of preoperative anxiety, although they differ in scope, specificity, and level of detail. These variations may have influenced expert preferences during the Delphi process, as panellists had to balance comprehensiveness against feasibility, favouring concise instruments for use in time-sensitive clinical settings and more detailed measures for

research purposes. Such trade-offs reflect contextual priorities rather than methodological inconsistency.

The preoperative anxiety definition that reached the final consensus is comprehensive, clear, and practical, identifying specific situational triggers, and balancing psychological and physiological components, while remaining accessible for both clinical and research use. By conceptualizing preoperative anxiety as state anxiety, healthcare providers can gain more accurate insights into a patient's current emotional state and tailor the interventions to reduce preoperative anxiety levels. Acknowledging that state anxiety is context-dependent enables healthcare providers and caregivers to deliver appropriate emotional support at the optimal time. Individuals with high trait anxiety may be predisposed to heightened state anxiety in response to specific environmental triggers such as surgery[35]. However, the extent to which these two constructs are linked is still debatable[36,37]. Experts agreed that preoperative anxiety begins when patients are informed about surgery, marking the start of psychological preparation. While low to moderate levels of preoperative anxiety may facilitate effective coping with the expected surgery, excessive and prolonged high levels of preoperative anxiety can lead to negative consequences, which may contribute to worsened surgical outcomes and delayed recovery if it is left unrecognized at an early time[38,39]. Despite its clinical significance, anxiety in the early preoperative period is often overlooked in research and clinical practice. To capture expert perspectives on this issue, panellists were asked to indicate specific time points they considered most appropriate for measuring preoperative anxiety in both clinical and research settings. However, their responses were highly heterogeneous and were therefore not included in the final results. The dynamic nature of preoperative anxiety requires multiple assessments, so the timing of preoperative anxiety assessment should be strategically planned to include multiple touchpoints, such as the preoperative anaesthesia visits and preoperative education sessions, which would allow for early identification of excessive preoperative anxiety and timely anxiety-reduction interventions, ultimately leading to better patient care[40].

The study has some strengths and limitations that should be acknowledged. First, this study concentrated on several instruments for assessing preoperative anxiety, with a specific focus on their application in older surgical patients, a vulnerable population that requires special attention. A comprehensive recruitment process was conducted to engage eligible researchers and healthcare practitioners in this study, and the expert panel comprised professionals with extensive experience in the care of older adults, thereby enhancing the adequate consideration of the unique characteristics of this population group. However, the relatively small size and composition of the expert panel may limit its representativeness and because all participating experts were from Europe and the USA, the findings may be less applicable to non-Western contexts.

Besides, the findings from this Delphi study may have been influenced by the predefined consensus level, set at 70% agreement among panelists. While this consensus level is widely accepted and commonly used in Delphi studies, it remains somewhat arbitrary and could have influenced the results. As the selections of instruments and definitions did not reach the predefined consensus level, raising the threshold to 75% and 80% did not affect the overall conclusions, except for small changes in the ratings of relevance, comprehensiveness, and feasibility for the included instruments. Interrater reliability was slight across rounds, which is expected in a small, interdisciplinary Delphi panel, Therefore, the findings should be considered exploratory rather than definitive[41]. Since each instrument was developed for distinct purposes and suits different contexts, achieving consensus on the most appropriate tool is inherently challenging. Nevertheless, achieving the predefined consensus on the most appropriate instrument should not be the exclusive focus. It may be more informative for researchers and healthcare professionals to explore the detailed characteristics of each instrument in terms of its relevance, comprehensiveness, and feasibility.

Additionally, the instruments evaluated in this Delphi study for evaluation were selected based on existing literature, hence some emerging or less well-known measures might have been inadvertently excluded. Another limitation is that the views of experts who participated in this study may differ from those experts who declined participation. Although instrument developers were excluded to minimize potential conflicts of interest, the absence of certain key stakeholders (e.g., the instrument developers, surgeons and psychologists specializing in older patients) may have restricted the diversity of perspectives, so the findings from this study might not fully represent the general opinion among experts in the field of interest[42]. Although anonymity and iterative feedback were employed to minimize bias, the structured Delphi process may still have encouraged some degree of conformity, potentially suppressing minority opinions.

The findings from our Delphi study have implications for both research and clinical practice. A comprehensive understanding of the instruments

used to assess preoperative anxiety from multiple perspectives, along with consideration of their applicability to older patients, is essential for enhancing preoperative care within this population. Given the vulnerability of older patients, it is crucial to address the unique challenges associated with assessing preoperative anxiety in this population, including frailty, sensory impairments, cognitive decline and multiple comorbidities. Preoperative anxiety may vary substantially across surgical specialties (e.g., cardiac, ophthalmologic, and oncologic surgery) and between elective and emergency procedures. Future studies should explore these differences to determine whether specific assessment instruments are needed for different surgical contexts. In addition, preoperative anxiety is a dynamic construct, and future research should explore optimal timing and frequency of its assessment across different surgical specialties and care contexts. Each instruments discussed in this study has its unique aspects and strengths, but none of them were specifically developed for assessing preoperative anxiety in older surgical patients. Thus their validity in this population remains limited, which highlights the need for further research on the development and validation of a specific instrument for older patients, as well as on the refinement and adaptation of currently existing instruments to better fit the older patient population. Future studies involving a larger and more diverse panel of experts (including patients and caregivers) may also help establish a more structured framework for instrument selection in this field. The fact that there are few studies about the trajectory of preoperative anxiety in older patients highlights the need for further research. Assessing preoperative anxiety at the optimal time point(s) with the optimal tool will allow for a more comprehensive approach to managing preoperative anxiety and facilitating the implementation of targeted, timely interventions to reduce excessive preoperative anxiety levels. Integrating preoperative anxiety assessment into broader perioperative care frameworks (e.g., frailty assessment, delirium prevention, and cognitive optimization) may enhance holistic surgical preparation and recovery in older adults.

Conclusion

This study highlights the complexities and challenges of assessing preoperative anxiety in older surgical patients. Preoperative anxiety was defined as state anxiety, a key concept for selecting appropriate assessment tools and informing management strategies. Although formal consensus was not reached, VAS-A was identified as the most appropriate instrument for clinical use, especially in older surgical patients due to its simplicity and rapidity. Meanwhile, SAQ was preferred for research purposes, as it captures a broader range of preoperative anxiety-related factors. However, the findings should be interpreted with caution, as SAQ is a relatively new instrument and both tools require further validation in diverse cohorts of older surgical patients. The comprehensive understanding of preoperative anxiety, including the assessment instruments and its definition, lays an essential foundation for further research to enhance preoperative anxiety management in older patients.

Acknowledgements: Not applicable.

Conflicts of interest: None.

Funding: No funding has been received for this paper. Ke-Lu Yang is supported by China Scholarship Council (grant no. 202106180027).

Data sharing: The data of the study may be obtained from the corresponding author upon reasonable request.

References

1. Eberhart L, Aust H, Schuster M, et al. Preoperative anxiety in adults - a cross-sectional study on specific fears and risk factors. BMC Psychiatry. 2020;20:140.
2. Stamenkovic DM, Rancic NK, Latas MB, et al. Preoperative anxiety and implications on postoperative recovery: what can we do to change our history. Minerva Anestesiol. 2018;84:1307–17.
3. Kim W-S, Byeon G-J, Song B-J, Lee, HJ. Availability of preoperative anxiety scale as a predictive factor for hemodynamic changes during induction of anesthesia. Korean J Anesthesiol. 2010;58:328–33.
4. Abate SM, Chekol YA, Basu B. Global prevalence and determinants of preoperative anxiety among surgical patients: A systematic review and meta-analysis. Int J Surg Open. 2020;25:6–16.
5. Williams JB, Alexander KP, Morin J-F, et al. Preoperative anxiety as a predictor of mortality and major morbidity in patients aged >70 years undergoing cardiac surgery. Am J Cardiol. 2013;111:137–42.
6. Zemła AJ, Nowicka-Sauer K, Jarmoszewicz K, Wera K, Batkiewicz S, Pietrzykowska M. Measures of preoperative anxiety. Anaesthesiol Intensive Ther. 2019;51:64–9.
7. Sarah S., Lynn S. Is the Amsterdam Preoperative Anxiety and Information Scale (APAIS) a Valid Tool in Guiding the Management of Preoperative Anxiety in Adult Patients? A Literature Review. J Nurs Pract. 2019;3.
8. Gürler H., Yılmaz M., Türk KE. Preoperative Anxiety Levels in Surgical Patients: A Comparison of Three Different Scale Scores. J Perianesth Nurs. 2022;37:69–74.
9. Yang K-L, Detroyer E, Van Grootven B, et al. Association between preoperative anxiety and postoperative delirium in older patients: a systematic review and meta-analysis. BMC Geriatr. 2023;23:198.
10. Lynn MR. Determination and quantification of content validity. Nurs Res. 1986;35:382–5.
11. Yusoff MSB. ABC of Content Validation and Content Validity Index Calculation. EIMJ 2019;11:49–54.
12. Mokkink LB, Terwee CB, Patrick DL, et al. The COSMIN study reached international consensus on taxonomy,

terminology, and definitions of measurement properties for health-related patient-reported outcomes. J Clin Epidemiol. 2010;63:737–45.
13. Spielberger CD, Gonzalez-Reigosa F, Martinez-Urrutia A, Natalicio LFS, Natalicio DS. The state-trait anxiety inventory. Interam J Psychol. 1971;5:3–4.
14. Endler NS, Kocovski NL. State and trait anxiety revisited. J Anxiety Disord. 2001;15:231–45.
15. Oh J, Lee W, Ki S, Suh J, Hwang S, Lee J. Assessment of Preoperative Anxiety and Influencing Factors in Patients Undergoing Elective Surgery: An Observational Cross-Sectional Study. Medicina (Kaunas). 2024 Feb 27;60(3):403.
16. Jünger S, Payne SA, Brine J, Radbruch L, Brearley SG. Guidance on Conducting and REporting DElphi Studies (CREDES) in palliative care: Recommendations based on a methodological systematic review. Palliat Med. 2017;31:684–706.
17. Keeney S, Hasson F, McKenna H. The Delphi Technique in Nursing and Health Research. 1st edition. Wiley; 2011.
18. Baker J, Lovell K, Harris N. How expert are the experts? An exploration of the concept of 'expert' within Delphi panel techniques. Nurse Res. 2006;14:59–70.
19. McPherson S, Reese C, Wendler MC. Methodology Update: Delphi Studies Nurs Res. 2018;67:404–10.
20. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. Res Nurs Health. 2007;30:459–67.
21. Diamond IR, Grant RC, Feldman BM, et al. Defining consensus: a systematic review recommends methodologic criteria for reporting of Delphi studies. J Clin Epidemiol. 2014 Apr;67(4):401-9.
22. Schifano J, Niederberger M. How Delphi studies in the health sciences find consensus: a scoping review. Syst Rev. 2025 Jan 14;14(1):14.
23. Sumsion, T. The Delphi Technique: An Adaptive Research Tool. British Journal of Occupational Therapy 61, 153–156 (1998).
24. Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. J Adv Nurs. 2000;32:1008–15.
25. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977 Mar;33(1):159-74.
26. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Res Nurs Health. 2006;29:489–97.
27. Hornblow AR, Kidson MA. The Visual Analogue Scale for Anxiety: A Validation Study. Aust N Z J Psychiatry. 1976;10:339–41.
28. Kindler CH, Harms C, Amsler F, Ihde-Scholl T, Scheidegger D. The visual analog scale allows effective measurement of preoperative anxiety and detection of patients' anesthetic concerns. Anesth Analg. 2000;90:706–12.
29. Millar K, Jelicic M, Bonke B, Asbury AJ. Assessment of preoperative anxiety: comparison of measures in patients awaiting surgery for breast cancer. Br J Anaesth. 1995;74:180–3.
30. Vogelsang J. The Visual Analog Scale: an accurate and sensitive method for self-reporting preoperative anxiety. J Post Anesth Nurs. 1988;3:235–9.
31. Goebel S, Mehdorn HM. Assessment of preoperative anxiety in neurosurgical patients: Comparison of widely used measures and recommendations for clinic and research. Clin Neurol Neurosurg. 2018;172:62–8.
32. Burton D, King A, Bartley J, Petrie KJ, Broadbent E. The surgical anxiety questionnaire (SAQ): development and validation. Psychol Health. 2019;34:129–46.
33. Dennis, R. E., Boddington, S. J. A. & Funnell, N. J. Self-report measures of anxiety: Are they suitable for older adults? Aging & Mental Health 11, 668–677 (2007).
34. Moerman N, Van Dam FSAM, Muller MJ, Oosting H. The Amsterdam Preoperative Anxiety and Information Scale (APAIS). Anesth Analg. 1996;82:445–51.
35. Floros G, Kandarakis S, Glynatsis N, Glynatsis F, Mylona I. Significant Preoperative Anxiety Associated with Perceived Risk and Gender in Cataract Surgery. J Clin Med. 2024;13:5317.
36. Saviola F, Pappaianni E, Monti A, Grecucci A, Jovicich J, De Pisapia N. Trait and state anxiety are mapped differently in the human brain. Sci Rep. 2020;10:11112.
37. Wallace LM. Trait anxiety as a predictor of adjustment to and recovery from surgery. British J Clinic Psychol. 1987;26:73–4.
38. Matzner P, Sorski L, Haldar R, et al. Deleterious synergistic effects of distress and surgery on cancer metastasis: Abolishment through an integrated perioperative immune-stimulating stress-inflammatory-reducing intervention. Brain Behav Immun. 2019;80:170–8.
39. Hanalis-Miller T, Nudelman G, Ben-Eliyahu S, Jacoby R. The Effect of Pre-operative Psychological Interventions on Psychological, Physiological, and Immunological Indices in Oncology Patients: A Scoping Review. Front Psychol. 2022;13:839065.
40. Klopfenstein CE, Forster A, Van Gessel E. Anesthetic assessment in an outpatient consultation clinic reduces preoperative anxiety. Can J Anaesth. 2000;47:511–5.
41. Humphrey-Murto S, Varpio L, Gonsalves C, Wood TJ. Using consensus group methods such as Delphi and Nominal Group in medical education research. Med Teach. 2017;39:14–9.
42. Keeney S, Hasson F, McKenna H. Consulting the oracle: ten lessons from using the Delphi technique in nursing research. J Adv Nurs. 2006;53:205–12.

***Appendices** - scan code*

https://qrco.de/bgfdoK

doi.org/10.56126/77.1.04