Construction of an ICU Pre-experience Pattern for Patients Undergoing Lung Cancer Surgery and Their Family Members: A Delphi Study

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AIM: This study aims to construct an intensive care unit (ICU) pre-experience pattern for patients undergoing lung cancer surgery and their family members, to provide a novel mechanism of communication between healthcare professionals and patients that may improve treatment adherence and satisfaction with hospitalisation.

METHODS: Initially, an item pool was created for pre-experienced ICUs through a comprehensive literature review, prior qualitative research, and expert panel discussions, resulting in 146 items. Inputs from experts were sought through Delphi surveys to construct an ICU pre-experience pattern for patients undergoing lung cancer surgery and their family members. The Delphi study included 22 multidisciplinary experts from intensive care, nursing management, clinical medicine, and social psychology. Subsequent rounds of consultation were guided by consistency in the findings of the consultation. Two rounds of consultations were performed using 5-point Likert scales to assess importance and feasibility. Consensus criteria included a mean score of $\geq$3.5 and a coefficient of variation (CV) of $\leq$0.25.

RESULTS: A total of 146 items, including 5 primary, 29 secondary, and 112 tertiary items, were incorporated in the final pattern. These included items structured around 5 critical time phases: '24 hours preceding ICU admission', 'Postoperative ICU admission before anaesthesia emergence', 'Postoperative ICU admission after anaesthesia emergence', 'First postoperative day/transfer day', and 'Following ICU discharge'. Key dimensions include the objectives of ICU admission, description of ICU personnel and environment, psychological preparation, clinical procedures, and post-ICU care. Two rounds of expert consultations yielded a 100% recovery rate (RR). An acceptable level of consensus was achieved, with mean importance and feasibility scores ranging from 4.41 to 5.00 in Round 2, and a CV below 0.25 for all items. The high authority coefficients (Cr) (0.84 and 0.83) confirm a trend toward higher expert consensus on the clinical relevance and practical applicability of the developed pattern.

CONCLUSIONS: This study developed an ICU pre-experience pattern for patients undergoing lung cancer surgery and their family members. This pattern provides a theoretical framework and a potential approach that may help alleviate anxiety and enhance treatment adherence.

Keywords: Delphi method; ICU; pre-experience; lung cancer surgery; psychological distress; information gaps

Introduction

The intensive care unit (ICU) is an unfamiliar and oppressive setting for patients and their families, characterized by significant uncertainties that can adversely affect physiological, psychological, and cognitive well-being [1]. This challenge is particularly pronounced in patients undergoing lung cancer surgery, who must simultaneously face the impact of major thoracic surgery and the possibility of postoperative ICU admission.

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Lung cancer remains a major global public health concern, with more than 2.21 million new cases and 1.80 million deaths reported worldwide in 2020, and projections estimating an annual incidence of 3.8 million new cases by 2050 [2–5]. In China, both incidence and mortality rates are among the highest globally [6,7]. Surgical resection is the preferred option and most effective treatment approach for lung cancer; however, postoperative ICU monitoring is often required to manage respiratory and other associated complications [4,8]. Compared with patients' general wards, ICUs are highly specialized and operate under strict infection-control protocols and more rigid procedural frameworks [9]. Limited public awareness and understanding of ICU frameworks, routine procedures, and financial complications lead to significant knowledge gaps for patients and their families [10]. Consequently, many patients experience substantial psychological distress; for example, approximately one-third of relatives of ICU patients report

anxiety or depressive symptoms, and some develop post-traumatic stress disorder (PTSD) [11,12]. Evidence shows that providing comprehensive preoperative education can reduce anxiety and improve patient satisfaction [13–16].

In general, patients and their family members consistently seek clear and detailed information about the ICU setting, including expectations of life-support treatments, possible risks, treatment timeline, and explicit benchmarks for ICU admission and transfer [13]. Studies have shown that pre-ICU educational interventions, such as unit tours or video-assisted orientations, can effectively reduce anxiety and enhance adherence to treatment plans [17,18]. However, current clinical practice predominantly relies on traditional approaches of preoperative education, particularly verbal counselling by healthcare providers. These conventional approaches often lack comprehensiveness or standardisation, resulting in an inconsistent and fragmented understanding of ICU-based care [19]. As a result, such knowledge gaps may paradoxically increase, rather than alleviate, preoperative anxiety [20].

To address these challenges, we developed a novel, well-structured pattern that can provide healthcare professionals with a standardized communication pathway that enhances patient understanding, offers an explicit theoretical framework, and supports approaches to alleviate anxiety and improve treatment adherence. For the development of this pattern, we employed the Delphi method, which is a widely recognized approach for transforming multidisciplinary expert opinions into a validated framework, particularly valuable when empirical data are limited but clinical experience is rich [21].

Methods

Developing the Delphi Questionnaire

The initial item pool for the ICU pre-experience pattern was developed through a two-step process. First, a comprehensive literature review and previous qualitative studies were conducted to identify key informational needs and educational components relevant to ICU patients. Second, panel discussions were held within the research team (comprising ICU clinicians, senior nurses, and nursing managers) to refine these components and confirm their clinical relevance and appropriateness for patients undergoing lung cancer surgery.

The process yielded an item pool of 146 items, systematically organised into 3 hierarchical levels: temporal framework (primary items), core domains (secondary items), and operationalised content (tertiary items).

Expert Selection Process and Panel Composition

A definitive sample size (number of experts in this case) is not required in a Delphi study, and previous research suggests that a panel of 15–30 experts is sufficient for a relatively homogeneous group [22,23]. Expert selection process adhered to established Delphi methodological guidelines with the following inclusion criteria [24]: (1) at least ten years of professional experience in tertiary hospitals; (2) an intermediate or higher professional title; (3) a bachelor's degree or higher; and (4) willingness to participate in this study, and agree to complete all expert consultation round.

Using purposive sampling, consistent with the study objectives, we organized a national Delphi panel of 22 multidisciplinary experts. They were identified and invited through professional networks and recommendations from relevant academic societies to ensure the inclusion of leading specialists in their respective fields. The panel included: (1) broad geographic diversity across East, Central, South, North, Southeast, Northwest, and Northeast regions of China; and (2) diverse professional domains, such as Intensive Care Medicine, Critical Care, Nursing Management, Evidence-based Medicine, Clinical Medicine, and Social Psychology. All included experts provided written informed consent, and the study protocol was approved by the Medical Ethics Committee of West China Hospital (Ethics Number: 2021-352).

Expert Consultation: A Two-round Process

The questionnaires were distributed electronically between 12 May and 9 August 2022. Active follow-up was maintained through WeChat, email, and telephone calls to ensure timely distribution and completion of the questionnaire. The questionnaire included three standardised components: a cover letter, a demographic information section, and the core assessment. The experts rated each item using a 5-point Likert scale for importance (1 = not at all important to 5 = extremely important) and feasibility (1 = not at all feasible to 5 = highly feasible). To enhance expert comprehension during scoring, explanatory notes were supplemented for specific items.

Furthermore, the Delphi questionnaire included structured response options for each item, enabling experts to (1) recommend removal, (2) suggest modifications and revisions, or (3) propose additional components. An open-ended comment section was also provided for rational documentation to ensure comprehensive feedback. Moreover, consensus to retain an item was predefined as meeting both of the following criteria: a mean importance score $\geq$3.5 and a coefficient of variation (CV) $\leq$0.25. The stability of responses across the two Delphi rounds was assessed by examining the changes in the mean scores and CVs for all items. A significant decrease in CV from Round 1 to Round 2, coupled with consistently high mean scores, was interpreted as evidence of strong consensus and response stability, supporting the decision to conclude the Delphi process in Round 2.

Data Analysis

Data management and statistical analysis were conducted using SPSS version 26.0 (IBM SPSS). Expert participation was assessed using the questionnaire recovery rate (RR),

with RR >70% considered the cut-off for a valid consultation round [23,25]. The authority coefficient (Cr) was calculated to evaluate the credibility of expert input. The expert judgement coefficient (Ca) was divided into four components: practical experience, theoretical analysis, consultation of domestic and international literature, and intuitive perception. Each component was classified into high, medium, or low influence on expert judgment, with corresponding assigned values as follows: practical experience (0.5, 0.4, 0.3), theoretical analysis (0.3, 0.2, 0.1), consultation of domestic and international literature (0.1, 0.1, 0.1), and intuitive perception (0.1, 0.1, 0.1). However, the familiarity coefficient (Cs) was graded on a 5-level scale: very familiar (0.9), relatively familiar (0.7), generally familiar (0.5), unfamiliar (0.3), and very unfamiliar (0.1). The Cr was then calculated using the following formula: Cr = (Ca + Cs)/2, with Cr ≥0.70 indicating an acceptable level of expert authority [25].

Descriptive statistics, including frequency, percentage, mean, standard deviation (SD), and CV, were used to summarise the data. Kendall's coefficient of concordance (W) was employed to track changes in expert consensus: while conventional benchmarks (0.1–0.3 weak, 0.3–0.5 moderate, >0.5 strong) are reported for orientation, the main inference rests on the statistically significant increase in W between rounds, which we interpret as evidence of improved consensus rather than an absolute shift from "weak" to "strong" agreement. The screening criteria for rating indicators (mean importance score ≥3.5 and CV ≤0.25) were derived from established Delphi methodology [26], ensuring that the selected items indicated both clinical relevance and expert consensus. A *p*-value of <0.05 was applied as the threshold for statistical significance.

Table 1. Demographic characteristics of the experts.

Baseline characteristics	Two rounds of consulting	
	n = 22	%
Gender		
Males	7	31.8
Females	15	68.2
Age (years)		
30–39	1	4.5
40–49	12	54.5
≥50	9	40.9
Years of professional life (years)*		
10–19	6	27.3
≥20	16	72.7
Areas		
East China	1	4.5
Central China	1	4.5
South China	1	4.5
North China	1	4.5
Southeast	16	72.7
Northwest	1	4.5
Northeast	1	4.5
Highest level of education		
Bachelor's degree	7	31.8
Master's degree	9	40.9
Doctor's degree	6	27.3
Title		
Associate senior	9	40.9
Senior	13	59.1
Professional field		
Nursing	15	68.2
Clinical medicine	4	18.2
Social psychology	1	4.5
Medical technology	1	4.5
Management	1	4.5

*: All experts met the inclusion criterion of >10 years' experience in tertiary hospitals.

Results

Baseline Characteristics of Experts

We invited 22 experts to participate and complete both rounds of the study. The expert panel demonstrated representativeness across three key dimensions, including professional experience, multidisciplinary composition, and expertise in intensive care medicine. This data collection therefore meets the requirements of extensiveness and diversity that are fundamental to the Delphi protocol (Table 1).

Consultation Round 1

In the first round, all 22 distributed questionnaires were completed and returned, yielding a 100% valid RR. Fifteen experts submitted constructive feedback, corresponding to a feedback rate of 68.2%, indicating a high level of participation in the Delphi round. In this round, the Ca, Cs, and Cr were 0.91, 0.76, and 0.84, respectively (Table 2). The first round consultation revealed that the mean score of importance for all items ranged from 4.14 to 5, with CV values between 0 and 0.27 (**Supplementary Table 1**). The mean feasibility score for all items ranged from 4.68 to 5, with CV values between 0 and 0.19 (**Supplementary Table 2**). Kendall's W for importance was 0.118 for all items, 0.062 for primary items, 0.111 for secondary items, and 0.127 for tertiary items (Table 3). In contrast, Kendall's W for feasibility was 0.061 for all items, 0.063 for primary items, 0.087 for secondary items, and 0.049 for tertiary items (Table 4).

Table 2. Authority coefficients of the experts.

Consultation Round	Ca	Cs	Cr
Round 1	0.91	0.76	0.84
Round 2	0.91	0.75	0.83

Abbreviations: Cr, authority coefficient; Ca, expert judgement coefficient; Cs, familiarity coefficient.

Following the first Delphi round, items were revised, added, or deleted based on the predefined screening criteria and expert feedback. After the panel discussion and analysis, four

Table 3. Expert consensus and significance testing of two rounds (importance).

Indicator	Total items		Primary items		Secondary items		Tertiary items	
	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2
Kendall's W	0.118	0.135	0.062	0.154	0.111	0.167	0.127	0.129
χ^2	375.06	430.08	6.85	13.51	70.97	102.78	304.73	315.11
df	145	145	5	4	29	28	109	111
p	<0.01	<0.01	0.23	<0.01	<0.01	<0.01	<0.01	<0.01

Abbreviations: df, degrees of freedom.

Table 4. Expert consensus and significance testing of two rounds (feasibility).

Indicator	Total items		Primary items		Secondary items		Tertiary items	
	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2
Kendall's W	0.061	0.135	0.063	0.154	0.087	0.163	0.049	0.129
χ^2	194.47	430.08	6.93	13.51	55.70	104.18	118.55	315.11
df	145	145	5	4	29	29	109	111
p	<0.01	<0.01	0.226	<0.01	<0.01	<0.01	0.25	<0.01

Abbreviations: df, degrees of freedom.

tertiary items that did not meet the inclusion criteria were deleted. Thereafter, one new secondary item 'Purpose of restraints' and seven tertiary items were added, as follows: 'All aforementioned medical devices are equipped with alarm systems that activate when abnormal monitoring parameters or infusion irregularities are detected, prompting immediate intervention by healthcare professionals'; 'Protect patients from self-harm behaviours (e.g., self-injury, falls from bed, accidental tube removal) associated with impaired consciousness, cognition, or attention, as well as behaviours that threaten the safety of others or disrupt medical care'; 'Ensure uninterrupted and effective delivery of therapeutic interventions and nursing care'; 'Central venous catheterisation: performed as clinically indicated for vasoactive drug infusion, fluid resuscitation, and central venous pressure monitoring'; 'Indwelling gastric tubes: used for gastric decompression in abdominal distension or for enteral nutritional support, as determined by postoperative clinical assessment'; 'Drainage tube: maintain unobstructed drainage while the tube is in place; do not pull, bend, or remove the tube'; and 'Venous thrombosis prophylaxis: performed in-bed venous thrombosis prophylaxis exercises based on the patient's clinical tolerance'. Additionally, one primary item was reclassified as a secondary item to improve conceptual clarity and hierarchy. Overall, comprehensive revisions were systematically implemented to optimise one primary, five secondary, and nine tertiary items.

A qualitative analysis of the 15 experts' open-ended feedback in Round 1 identified several key themes: (1) Clarity and precision: multiple tertiary items (e.g., 'purpose of restraints') were suggested for rephrasing to improve clinical accuracy. (2) Comprehensiveness: gaps in patient education were identified, leading to the addition of 7 new tertiary items addressing issues such as device functions and venous thrombosis prophylaxis. (3) Structural reorganization: one primary item was reclassified as a secondary item to improve the logical flow of the pattern. (4) Feasibility: feedback on resource demands led to refinements of the items related to family involvement and staff availability.

These comments were systematically reviewed by the research team and directly informed the modifications outlined above, ensuring the final pattern was both comprehensive and practically applicable.

Consultation Round 2

Items that did not meet the predefined consensus criteria were revised or deleted based on expert feedback and then re-evaluated in the second round. In the second Delphi round, all 22 questionnaires were completed and returned, yielding a 100% RR. Nine experts provided constructive suggestions, corresponding to a feedback rate of 40.9%. The Ca, Cs, and Cr values in Round 2 were 0.91, 0.75, and 0.83, respectively (Table 2). The second round revealed that the mean scores for the importance and feasibility of all items ranged from 4.41 to 5, with CVs between 0 and 0.23 (**Supplementary Table 3**). In Round 1, 15 experts provided feedback; in Round 2, 9 experts responded. This reduction is consistent with typical Delphi dynamics, where participation commonly declines in later rounds as consensus stabilises and fewer items require comment.

Comparative analysis indicated that expert consensus improved in the second round, as evidenced by a reduction in CVs for both importance and feasibility scores to below 0.25. The finding demonstrated greater consistency in expert ratings than in Round 1. In Round 2, Kendall's W for item importance was 0.135 for all items, 0.154 for primary items, 0.167 for secondary items, and 0.129 for tertiary items (Table 3). For feasibility, Kendall's W was 0.135 for all items, 0.154 for primary items, 0.163 for secondary items, and 0.129 for tertiary items (Table 4). The Round 2 questionnaire was distributed, incorporating the aforemen-

tioned revisions. After analysis of Round 2 data, all items achieved the predefined consensus thresholds (mean score ≥4.41 for both importance and feasibility; CV ≤0.25 for all items).

The significant improvement in consensus from Round 1 to Round 2, evidenced by reduced CV values and higher Kendall's W coefficients, indicated that expert opinions had stabilized and reached sufficiently aligned agreement. Consequently, no further revisions were required after Round 2, and the Delphi process was formally concluded. The finalised pattern comprised 5 primary items ('24 hours preceding ICU admission', 'Postoperative ICU admission before anaesthesia emergence', 'Postoperative ICU admission after anaesthesia emergence', 'First postoperative day/transfer day', and 'Following ICU discharge'), 29 secondary items (Table 5), and 112 tertiary items (**Supplementary Table 3**). The tertiary items are detailed in **Supplementary Table 3**.

Discussion

This study successfully established a comprehensive ICU pre-experience pattern for patients undergoing lung cancer surgery and their family members using a rigorous Delphi consensus process. The high Cr (Cr = 0.84 in Round 1 and 0.83 in Round 2) reveals the strong credibility of the expert panel but validates the methodological robustness of our study, as both values exceed the generally accepted threshold of 0.70 for authoritative consensus in Delphi studies.

The 100% RR across both consultation rounds, coupled with substantive feedback from 15 experts in Round 1 and 9 experts in Round 2, demonstrates a remarkable panel engagement and commitment to improving the study. Moreover, the consistently low CV values (CV <0.25) across both rounds indicate increasing consistency among expert ratings, suggesting that the consensus achieved was both statistically significant and indicative of genuine agreement among a multidisciplinary group of specialists.

The improvement in Kendall's W coefficients from Round 1 to Round 2 underscores the strength of the iterative consensus-building process. For instance, Kendall's W for primary items' importance increased from 0.062 to 0.154 ($p < 0.01$), and for secondary items from 0.111 to 0.167 ($p < 0.01$). This progressive enhancement in concordance coefficients confirms the effectiveness of the Delphi methodology in aligning expert perspectives, particularly for the structural framework of our proposed pattern.

Our study established an ICU pre-experience pattern organized across 5 key temporal phases, with the final consensus comprising 5 primary, 29 secondary, and 112 tertiary items. In Round 2, the high mean values for both importance (4.41–5.00) and feasibility (4.41–5.00) indicate that the experts considered the content as both clinically relevant and practically applicable. Notably, several critical components, including psychological preparation, the purpose of physical restraints, and specific postoperative care procedures, received a maximum mean value (mean value = 5.00, CV = 0.00), highlighting unanimous agreement on their crucial role in effective ICU preparation.

The item optimization process showed valuable insights into clinical priorities. The addition of seven new tertiary items in Round 2, such as explanations of medical device alarm systems and venous thrombosis prophylaxis, reflects expert emphasis on patient safety and the prevention of complications. Similarly, the reclassification of one primary item to the secondary level shows how expert feedback was used to iteratively refine the conceptual organization and internal logic of the pattern.

Variation in consensus levels across various items offers valuable information. Primary items, which represent broad temporal phases (e.g., '24 hours preceding ICU admission'), achieved higher consensus more readily, as reflected by their lower CV values (0.06–0.22) and the significant rise in Kendall's W for importance from 0.062 to 0.154. This suggests that experts found the overarching structure largely non-controversial. In contrast, tertiary items, which specify detailed, operational content, exhibited slightly lower, though still acceptable concordance (Kendall's W for importance: 0.129). This is understandable, as experts from diverse professional backgrounds may differ in how they prioritize or perceive the feasibility of particular clinical or educational items. Through the iterative Delphi process, these granular items were progressively revised and retained only when they met the predefined consensus criteria, ensuring that their inclusion in the final pattern was well justified.

During ICU admission, patients are exposed to multifaceted physiological and psychological stressors that can induce or aggravate mental health concerns. Our findings align with previous studies demonstrating that structured preoperative education can significantly alleviate anxiety and improve recovery outcomes [27]. However, the comprehensive nature of our ICU pre-experience pattern, which integrates temporal, procedural, psychological, and informational dimensions, represents a significant advancement over conventional preoperative education models that often focus primarily on procedures. The persistent information asymmetry between healthcare professional teams and patients remains a major challenge in critical care settings. The strong expert consensus on the significance of addressing specific informational needs, including ICU costs, functions of monitoring and support devices, and communication protocols (mean importance values 4.41–5.00), highlights the potential of this pattern to systematically decrease this gap. Evidence from a Chinese study revealed that patients undergoing lung cancer surgery have substantial information needs, but they receive limited and variable health education [28], a gap that our standardized and comprehensive pattern is designed to address. The high feasibility scores (4.41–5.00) across all components further suggest strong expert confidence in its clinical practicality, addressing a common limitation of theoretically sound but practi-

Table 5. Primary and secondary items in Round 2 (importance and feasibility).

Content of items	Mean value	SD	CV
Primary items			
A 24 h preceding ICU admission	4.91	0.29	0.06
B Postoperative ICU admission before anaesthesia emergence	4.45	0.96	0.22
C Postoperative ICU admission after anaesthesia emergence	4.91	0.29	0.06
D First postoperative day/transfer day	4.91	0.29	0.06
E Following ICU discharge	4.50	0.86	0.19
Secondary items			
A1 Objectives of ICU admission	4.91	0.29	0.06
A2 Description of ICU personnel	4.86	0.47	0.10
A3 Description of ICU medical devices	4.55	0.80	0.18
A4 ICU hospitalisation fees	4.95	0.21	0.04
A5 Supply preparation	4.95	0.21	0.04
A6 Psychological preparation	5.00	0.00	0.00
B1 ICU admission handover procedure	4.95	0.21	0.04
B2 ICU admission handover content	4.82	0.40	0.08
B3 Purpose of physical restraints	5.00	0.00	0.00
C1 Clinical condition at postoperative ICU admission	5.00	0.00	0.00
C2 How to express needs before tracheal extubation	5.00	0.00	0.00
C3 How to cooperate during tracheal extubation	5.00	0.00	0.00
C4 How to cooperate after tracheal extubation	5.00	0.00	0.00
C5 Precautions in the ICU on the night of the surgery	5.00	0.00	0.00
C6 Common medications administered in the ICU	4.73	0.55	0.12
D1 Morning nebulisation therapy	4.68	0.89	0.19
D2 Deep breathing and coughing exercises	5.00	0.00	0.00
D3 Maintaining fasting after 06:30	4.77	0.43	0.09
D4 Obtain arterial and venous blood samples for diagnostic testing	4.64	0.73	0.16
D5 Replace the drainage container	4.64	0.73	0.16
D6 The medical and nursing grand rounds	4.86	0.35	0.07
D7 Wound dressing	4.77	0.43	0.09
D8 Perform bedside radiography or transport for CT	4.68	0.48	0.10
D9 Notify family prior to interdepartmental transfer	4.95	0.21	0.04
D10 Precautions for non-transferred patients	4.82	0.66	0.14
D11 Precautions for family members of patients transferred to the ICU	5.00	0.00	0.00
E1 Adherence to ward treatment protocols	4.55	0.80	0.18
E2 Methods for providing feedback or suggestions	4.50	0.74	0.16
E3 Relevant prevention knowledge	4.50	0.86	0.19

Abbreviations: SD, standard deviation; CV, coefficient of variation; ICU, intensive care unit; CT, computed tomography.

cally challenging. This emphasis on a practical orientation is crucial because the real impact of the pattern relies on its smooth integration into routine clinical workflows.

In summary, the rigorous methodological approach, the satisfactory level of expert consensus, and consistently high ratings for both importance and feasibility provide compelling evidence for the scientific validity and clinical applicability of this pattern. It provides a comprehensive theoretical framework designed to reduce anxiety and enhance treatment adherence; however, its clinical feasibility, effectiveness, and overall impact on patient and family outcomes should be rigorously evaluated and validated through future prospective studies.

Limitations

Despite presenting a valuable framework, we acknowledge several limitations to this study that should be considered when interpreting these findings. First, the expert panel was regionally skewed towards Southeast China, with 72.7% of experts from that region, which may have affected the consensus. To mitigate potential bias, we ensured significant diversity across professional domains (e.g., Nursing, Clinical Medicine, Social Psychology), thereby basing the framework on multidisciplinary expertise. Furthermore, the developed pattern focuses on standard clinical procedures and common human responses in the ICU setting, which are less likely to be influenced by regional customs. Future studies should aim for geographically balanced expert representation.

Second, the relatively low Kendall's W values indicate only modest expert consensus. However, methodological studies suggest that even low Kendall's W values can reflect meaningful consensus when the expert includes >10 participants [29]. The effectiveness and applicability of this pattern require further prospective clinical validation, including potential optimization based on real-world outcomes in lung cancer patients and their family members.

Third, the inherent anonymity of the Delphi method may promote convergence towards majority opinion, resulting in artificially high agreement rates while overlooking divergent perspectives. Finally, the substantial number of questionnaire items may have contributed to response fatigue, potentially affecting the accuracy and depth of expert feedback. Meanwhile, this study is mainly based on expert consensus; the practical feasibility and effectiveness of the ICU pre-experience pattern must be further evaluated through comprehensive clinical validation.

Conclusions

This study developed a comprehensive ICU pre-experience pattern for patients undergoing lung cancer surgery and their family members using a rigorous Delphi consensus strategy. The final framework comprising 5 primary, 29 secondary, and 112 tertiary items, demonstrated high Cr (0.83), strong engagement (100% RR), and acceptable consensus levels (Kendall's W = 0.129–0.167, $p < 0.01$). The key innovation of this study lies in integrating temporal, psychological, procedural, and informational dimensions into a structured preoperative preparation framework, directly targeting longstanding challenges such as information asymmetry and psychological distress associated with ICU admission. In clinical practice, this pattern provides a standardized yet flexible reference to guide clinical implementation, with the potential to facilitate patient and family preparedness and more efficient perioperative communication. However, these potential benefits necessitate confirmation through future interventional studies. Future studies should focus on clinical validation to evaluate the pattern's feasibility and effectiveness in improving ICU care experiences and associated psychological outcomes.

Availability of Data and Materials

All data included in this study can be obtained by contacting the corresponding author if needed.

Author Contributions

DHC conceptualized and designed the study, conducted the research, analyzed the data, and drafted the initial manuscript. HL, XQL, CMW, and YL contributed to study design, methodology development, and manuscript revision. YMT supervised the study design, conducted statistical analysis, interpreted clinical data, and provided expert clinical guidance throughout the entire research process. All authors contributed to the critical revision of the manuscript for important intellectual content. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The study adhered to the Declaration of Helsinki and was approved by the Medical Ethics Committee of West China Hospital (Ethics Number: 2021-352). Participation in the study was voluntary. All experts received comprehensive study documentation that outlined the research objectives, methodology, and significance, and written informed consent for participation was obtained from each expert.

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Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.62713/aic.4380.

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