Am J Cancer Res 2025;15(12):5334-5348
www.ajcr.us /ISSN:2156-6976/ajcr0169068

Original Article

Mitigating uncertainty and improving nursing quality: information needs for patients and their families regarding intensive care unit (ICU) tours for lung cancer surgery

Dihong Chen[1], Li Diao[2], Qianxue Yang[3], Xiaoqian Lan[1], Tingting Peng[2], Yaxu Fan[2], Lei Yuan[2], Yan Liu[2], Yongming Tian[2], Li Tang[4]

[1]Department of Anesthesiology, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu 610041, Sichuan, China; [2]Department of Critical Care Medicine, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu 610041, Sichuan, China; [3]Department of Public Services Development, People's Hospital of Mianzhu, Mianzhu 618200, Sichuan, China; [4]Department of Operating Room, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu 610041, Sichuan, China

Received September 28, 2025; Accepted December 19, 2025; Epub December 25, 2025; Published December 30, 2025

Abstract: Background: Information asymmetry between healthcare providers and patients undergoing lung cancer surgery can result in reduced treatment engagement, lower admission satisfaction, and a greater risk of medical disputes, particularly regarding the transition to the intensive care unit (ICU). This study aims to map the ICU pre-experience pattern by first identifying, along a timeline of key ICU stages, the specific information that patients awaiting lung-cancer surgery and their families require during the peri-ICU period. Methods: A qualitative study was conducted by purposive sampling at the Lung Cancer Center of West China Hospital, Sichuan University. Semistructured interviews were held with 36 participants (17 patients and 19 families). The interview transcripts were analyzed by content analysis with NVivo 12.0 software. Results: The analysis identified a structured hierarchy of information needs, comprising 2 first-level themes, 4 second-level themes, and 13 third-level themes. The core finding was that patients' information needs were greater than those of their families. Patients were predominantly concerned about postoperative care and their physical perceptions. In contrast, families focused more on process-oriented information, such as the ICU transfer process and required signatures before admission, as well as the patient's surgical outcomes and treatment process after admission. Conclusion: Patients and their families have comprehensive yet distinct information needs prior to ICU admission. Healthcare providers are their primary information source, underscoring the necessity for a structured, proactive, and patient-centered approach to information delivery. These findings provide a foundational framework for developing an "ICU pre-experience" pattern to mitigate uncertainty and improve nursing quality.

Keywords: ICU pre-experience, information needs, lung cancer surgery, nursing quality

Introduction

According to 2020 global cancer statistics, lung cancer ranks as the second most common cancer worldwide and remains the leading cause of cancer-related deaths, accounting for 18.0% of total cancer mortality [1]. In China, it is the malignancy with the highest recorded morbidity and mortality [2]. Despite advancements in treatment modalities such as chemotherapy, radiotherapy, targeted therapy, and immunotherapy, surgical resection continues to be the cornerstone of lung cancer management. Owing to the complexity of surgical procedures, patients who undergo lung cancer surgery are routinely transferred to the intensive care unit (ICU) postoperatively [3, 4]. The ICU environment is highly controlled due to strict infection prevention protocols, which limits access to information for patients and their

https://doi.org/10.62347/QWGS8971

families. This often fails to address their core needs regarding the ICU environment, treatments, care, and associated costs. For patients admitted directly to the ICU after surgery, a lack of understanding of their condition and planned interventions can lead to adverse events. Studies indicate that unmet information needs are correlated with lower treatment engagement, poorer adherence, and reduced satisfaction with care [5, 6]. Moreover, families waiting outside the ICU face considerable psychological pressures, including separation from the patient, financial burdens, prolonged waiting times, and persistent fear of potential loss. These stressors often manifest as anxiety and tension, in turn, which may contribute to medical disputes [7-9]. Therefore, providing effective and timely information about postoperative ICU transitions is critical for enhancing patient compliance, reducing complications, improving patient' satisfaction, and mitigating conflicts.

Currently, preoperative ICU education - delivered through approaches such as verbal explanations [10], multimedia [11], or artificial intelligence (AI)-based simulations - serves as the primary approach for information delivery [12]. However, existing approaches face several challenges. The content is often based predominantly on the judgment of the clinical experience of healthcare providers, with limited input from patients and their families, resulting in information and suboptimal educational outcomes. Some healthcare providers may emphasize successful surgical results without adequately preparing patients for potential challenges, creating a discrepancy between expectations and the actual recovery experience and resulting in disappointment [13, 14]. Thus, there is a clear need to increase the quality of pre-ICU education by developing standardized, patient-centered content that accurately addresses the information needs of patients and their families.

This study aims to introduce a new concept: he ICU pre-experience pattern. This pattern is a structured preoperative education framework, designed around the specific information needs of patients and families during the peri-ICU period and organized along a timeline reflecting key stages of ICU care.

Materials and methods

Ethical considerations

The study adhered to the Declaration of Helsinki and was approved by the Medical Ethics Committee of West China Hospital, Sichuan University (ethics number 2021-352 granted by the Medical Ethics Committee). Written informed consent was obtained from all participants prior to their participation.

Study setting

This study was conducted at the Lung Cancer Center of West China Hospital, Sichuan University. As the largest facility of its kind in Western China, the center adopts a multidisciplinary model, integrating senior experts from thoracic surgery, oncology, radiotherapy, respiratory medicine, pathology, medical imaging, and radiation physics to provide comprehensive care for lung cancer patients. It attracts a substantial number of patients nationally and internationally.

Study participants

A phenomenological approach was employed. Using purposive sampling, we recruited patients who underwent lung cancer surgery at the Lung Cancer Center of West China Hospital, Sichuan University, between October and December 2021, along with their families. To ensure maximum-variation representation, we sequentially approached patients differing by age, education, and surgical procedure until thematic saturation. The inclusion criteria were as follows: (1) a confirmed diagnosis of lung cancer treated surgically; (2) direct admission to the ICU postoperatively; (3) age 18 years or older; (4) hemodynamic and emotional stability, with the capacity to comprehend and communicate effectively; and (5) independent behavioral capacity and willingness to provide informed consent. Patients were excluded if they had a mental illness, impaired consciousness, language barriers, or hearing impairment. The sample size was set by information saturation, operationalised as the point at which three consecutive interviews, coded immediately and independently by two researchers, added no new themes, sub-themes, or meaningful varia-

tion to the existing thematic framework; recruitment was then terminated [15].

Data collection

The interview outlines for patients and their families, administered before and after the ICU tour, were developed on the basis of a comprehensive review of the literature [16-20]. The post-operative patient interview protocol consisted of 5 core questions and 18 supplementary questions. The interview protocol for pre-operative patients and their families (both pre- and post-operative) each contained 3 core questions with some supplementary questions. Furthermore, a preliminary interview was conducted with 3 pre-operative patients and 3 post-operative patients, along with their families. On the basis of this pilot, questions that were repetitive, off-topic, minimally relevant to the research objectives, ambiguous, or difficult to comprehend were either removed or revised. All the formal interviews were guided by this finalized interview protocol, which is provided in detail in the Appendix. A semistructured in-depth interview methodology was employed in this study. Guided by the pre-defined interview protocol, experienced research nurses conducted interviews with a total of 36 participants: 9 pre-operative patients (2-18 h before surgery, after the surgical and nursing pre-operative interview/informed-consent session had been completed but before any pre-operative sedative or skin preparation), 8 post-operative patients (24-48 h after extubation, when they were fully alert [Richmond Agitation-Sedation Scale ≥ 0] and had been transferred to the general ward), 10 pre-operative families (same day as the patient's pre-operative interview, immediately after they had accompanied the patient through the nursing pre-operative teaching session), and 9 post-operative families (24-48 h after surgery, after the surgeon had delivered the first routine post-operative update and when no acute crisis was present). The interviews were scheduled at times convenient for the participants, specifically when patients were conscious, were mentally alert, not undergoing treatments or meals, and when families were emotionally available and free from distress. Each interview lasted 10-20 minutes and was held in a quiet, private setting to minimize distractions. Before each session, the researchers explained the study's purpose, assured confidentiality, and obtained written informed consent. The entire interview was audio-recorded. The interviewers also paid close attention to participants' nonverbal behaviors, including facial expressions, emotional shifts, and body postures, and noted these observations. Following the interviews, the audio recordings were transcribed verbatim within 4 hours by 2 independent researchers to ensure accuracy. The resulting text files were named sequentially via letters (a-j'), resulting in 36 Microsoft Word documents. All transcripts were returned to the participants for member checking to confirm their accuracy. To ensure confidentiality, all participants were anonymized and assigned unique codes: pre-operative patients (Ppre 1-9), post-operative patients (Ppost 1-8), pre-operative families (Fpre 1-10), and post-operative families (Fpost 1-9).

Quality control

To ensure the rigor and trustworthiness of the study, several measures were implemented. First, all the researchers involved in the data collection and analysis received formal training in qualitative methodology. Second, data triangulation was achieved through a collaborative process: 2 research members independently transcribed the interviews, and these transcripts were then cross-checked by other members to increase accuracy. Third, the research team engaged in continual reflective discussions throughout the study to identify and mitigate potential biases. Finally, to validate the findings, the researchers revisited the original audio recordings after preliminary data analysis, and the final interpreted results were returned to a subset of participants for member checking, thereby confirming the authenticity and representativeness of the analyzed content.

Data analysis

The data were analyzed by Nvivo 12.0. The analytical process was as follows: First, a new project was created in Nvivo 12.0, and source files containing the interview transcripts in Microsoft Word documents were imported. Second, the data were coded through a meticulous process of reading, deconstructing, and conceptualizing the text. Significant statements were assigned themes, which were then grouped into themes on the basis of shared meaning. As coding pro-

Table 1. Characteristics of the survey subjects (N=36)

Characteristics	N (%)/mean (range)
Identity	
Patient	17 (47.2)
Families	19 (52.8)
Gender	
Male	18 (50.0)
Female	18 (50.0)
Age (years)	
Average	46.4
Range	22-65
Education level	
Elementary school and below	1 (2.8)
Junior high school	10 (27.8)
High school	5 (13.9)
Bachelor's degree or higher	20 (55.6)
Occupation	
Government employee	4 (11.1)
Corporate employee	10 (27.8)
Farmer	2 (5.6)
Other	11 (30.6)
Retired	9 (25.0)

gressed, new data were either assigned to existing themes or used to create new themes. Data saturation was assessed systematically. After coding interviews with the ninth pre-operative patient, eighth posto-perative patient, tenth pre-operative families, and ninth post-operative families, no new theme emerged. To confirm information saturation, 3 additional interviews were conducted and analyzed, which yielded no new thematic content, confirming that saturation had been achieved. To ensure coding consistency and accuracy, 2 researchers independently coded 2 transcripts. Discrepancies in theme assignment were reviewed and resolved through team discussions, resulting in a coding framework that best reflected the study's thematic focus.

Results

Participant demographics

This study included a total of 36 participants, comprising 17 patients and 19 families. This study include 18 males and 18 females, with a average age of 46.4 years. The participants who held a bachelor's degree or higher constituted 55.6% of the sample. The detailed demographic characteristics are presented in **Table 1**.

Overall information needs

The interview transcripts were analyzed following a systematic thematic analysis process. This involved 3 stages: first, open coding was performed to generate initial codes from the data; second, these codes were grouped into broader categories through associative coding; and finally, selective coding was used to integrate and refine the categories into a coherent thematic framework. This process resulted in the identification of a hierarchical structure of themes, comprising 2 first-level themes, 4 second-level themes, and 13 third-level themes. By integrating all the coded themes into the pattern, we developed a comprehensive framework depicting the information needs of lung cancer surgery patients and their families regarding the ICU pre-experience, as presented in **Figure 1**.

From the perspective of overall information needs, the most salient theme was the transfer process, consent-related procedures, and admission process; these topics were followed by topics such as tracheal intubation/extubation, pain management, and sputum suction, as shown in the word cloud (**Figure 2**). In NVivo, semantically similar content was coded into the same theme, and the relative prominence of these themes was analyzed. NVivo software's built-in hierarchy diagram function was used. The built-in hierarchical diagram item function of a diagram was generated, where the area of each theme corresponds to its frequency of mention, thus directly reflecting the proportion difference across all information needs. The overall hierarchy diagram is presented in **Figure 3**. The analysis revealed that patients demonstrated a greater overall need for information than their families did. Furthermore, patients were more concerned about information related to the period post-ICU admission, whereas families' needs were more focused on the entire ICU period.

Patient-related information needs

Patient-related information needs were more heavily focused on the period post-ICU admission than before it, as indicated by the larger

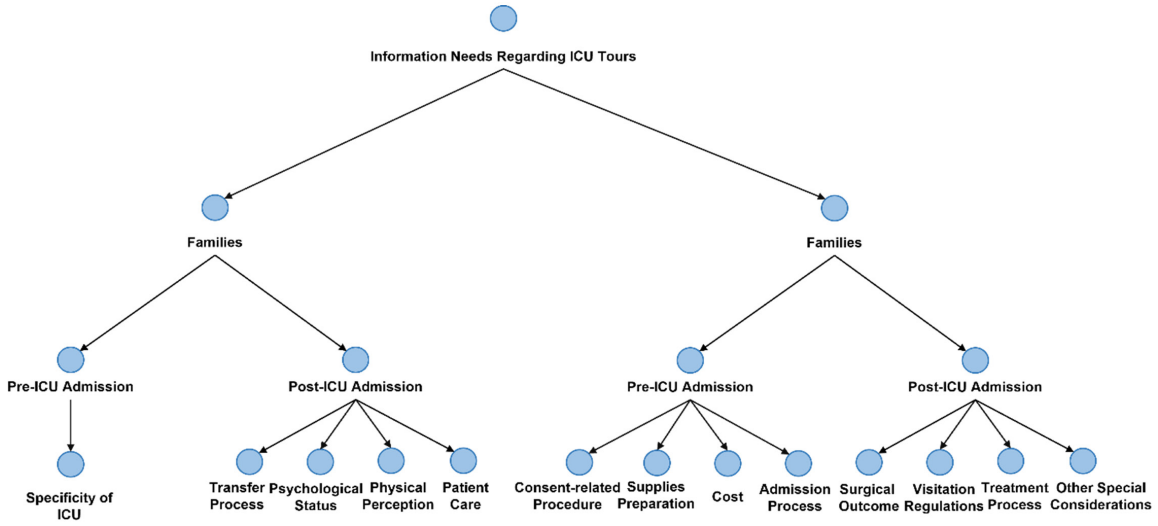

Figure 1. Information needs for patients and their families regarding ICU tours. Abbreviation: ICU, Intensive Care Unit.

Figure 2. Word cloud map of ICU pre-experience information needs of lung cancer patients and their families. Abbreviation: ICU, Intensive Care Unit.

area occupied by post-ICU admission themes in the hierarchical diagram (**Figure 4**). This suggests that patients were more concerned about what to expect following their transfer to the ICU. The pre-admission information needs arose primarily from a general lack of public familiarity with the ICU environment due to its closed management. Therefore, these needs focus on the specificity of the ICU, including its fundamental attributes (e.g., definition, target patient population), environment (e.g., noise and light), and common equipment (e.g., treat-

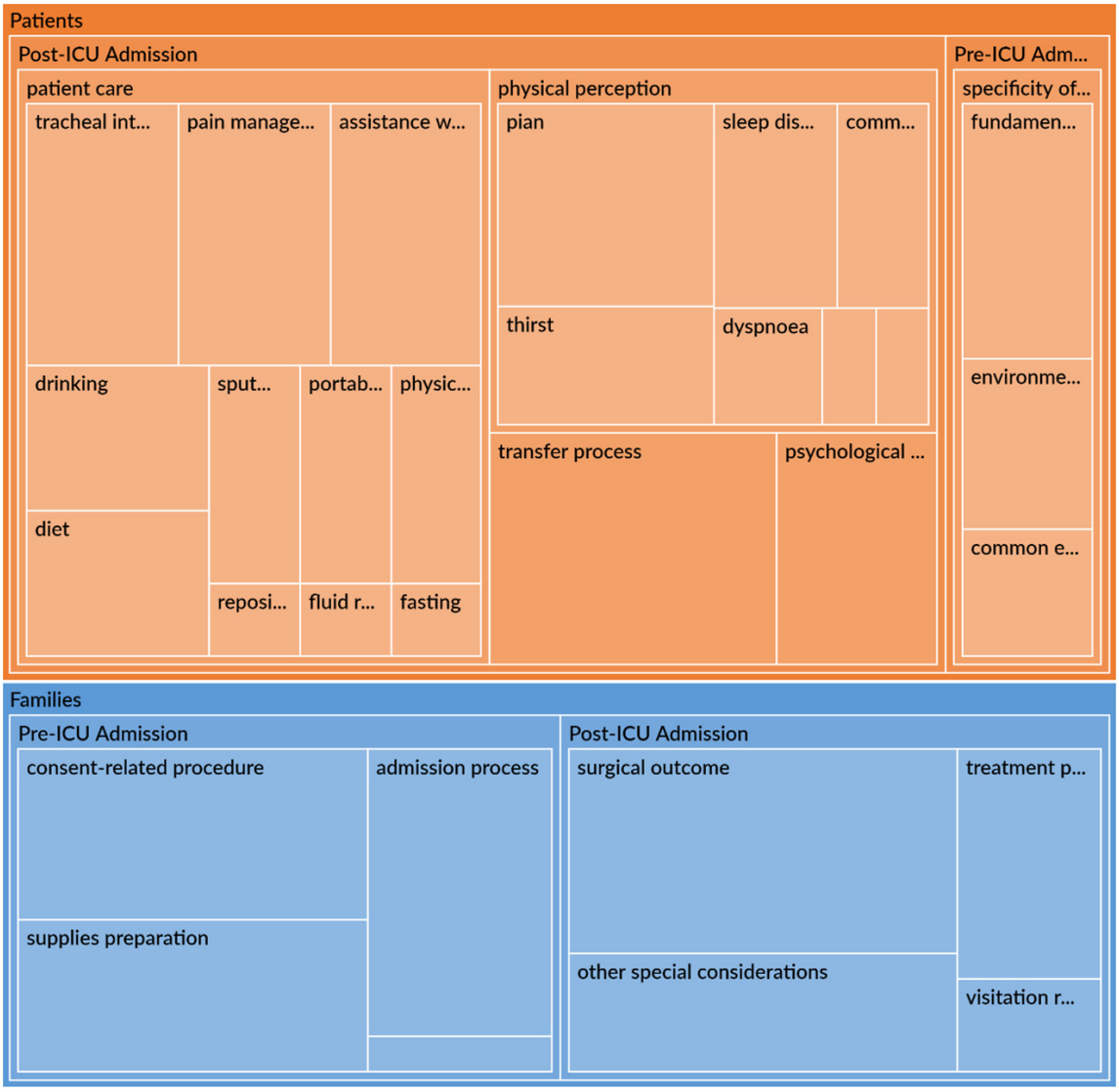

Figure 3. Hierarchy of ICU pre-experience information needs of lung cancer patients and their families. Abbreviation: ICU, Intensive Care Unit.

ment beds, monitoring and emergency devices, etc.). For example, some patients perceived the ICU as "a department for critically ill patients in need of resuscitation". Interviewees also highlighted that the constant operation of equipment and persistent alarm sounds were perceived as actors likely to compromise sleep quality. With respect to information needs after ICU admission, patients expressed concerns across 4 dimensions, including patient care, physical perception, the transfer process, and the psychological status. The interviewees mentioned a series of nursing measures, including tracheal intubation and extubation, dietary management, pain management, assistance with coughing and expectoration, and the use of physical restraints. Endotracheal intubation and extubation refer to the insertion of a special endotracheal tube through the mouth or nose into the trachea to maintain ventilation during general anesthesia or respiratory insufficiency, and its subsequent removal after the patient regains spontaneous breathing. Dietary management received considerable attention, as patients fasted for 8 hours before lung cancer surgery, leading to questions about what and when they could eat after entering the ICU. Pain management involves measures to control post-operative pain, such as administering appropriate analgesics and guiding patients in

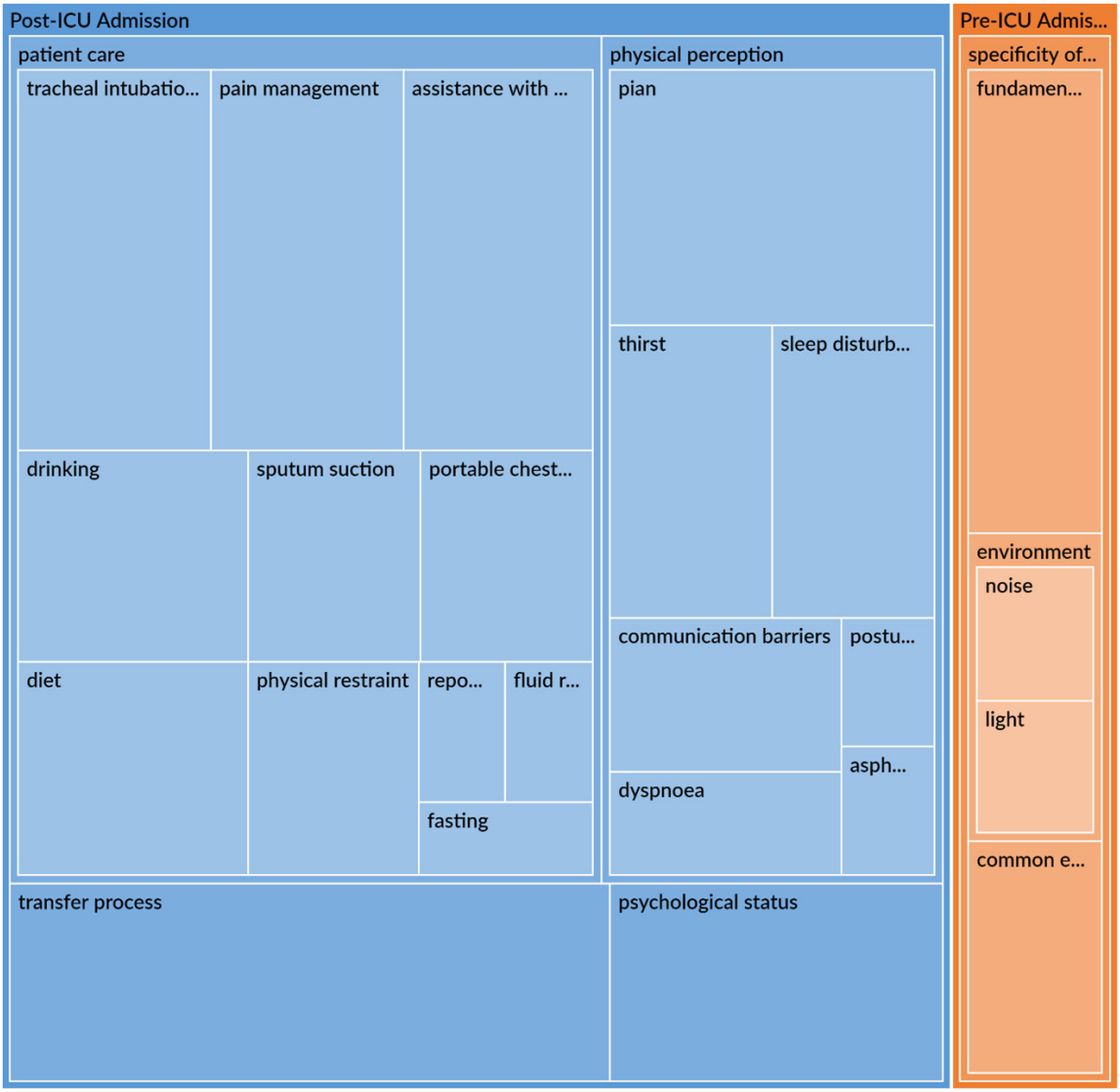

Figure 4. Hierarchy of the information needs of lung cancer patients. Abbreviation: ICU, Intensive Care Unit.

the proper use of analgesia pumps. Assistance with cough and expectoration encouraged patients to cough and expel phlegm for 3-5 days after lung cancer surgery, aiming to clear the respiratory tract, facilitate breathing, and reduce complications such as pneumonia and atelectasis. Physical restraint was a measure that most patients and their families reported not fully understanding or accepting, and its main purpose was to prevent accidents such as falling from bed. The dimension of physical perception mainly encompasses sensations experienced during ICU treatment, such as pain, sleep disturbance, or other discomfort. The transfer process out of the ICU, including the timing of transfer and the waiting location for families, has also attracted significant attention. The dimension of psychological state referred to feelings and emotions reported by patients during the ICU, such as nervousness and anxiety. A summary of the analysis of patient information needs is presented in **Table 2**.

Families-related information needs

A hierarchical diagram of the information needs of families is presented in **Figure 5**. The analysis indicated that the families' information needs pre-ICU admission involve 4 primary aspects: the admission process, consent-related procedures, supplies preparation, and cost.

Table 2. Summary of the data analysis results of patients and their families pre-ICU admission

Theme	Number of Themes	List of Material Sources	Number of Coding Reference Points	Examples of Reference Points
Specificity of ICU (A1-1-1)	13	nz, a'	17	P: In other words, it may be an emergency treatment, which may be important for the maintenance of some nursing care, or for emergency treatment, which may be the case in the ICU.
Light (A1-1-2)	2	a, r	2	P: Oh, I didn't sleep well that night. I was nervous, and then the light was on.
Noise (A1-1-3)	3	a, e, r	3	P: There was still a slight impact. When I was sleeping, I did not know what the instrument was. The sound was relatively loud, and I did not know whether it was a ventilator.
Common Equipment (A1-1-4)	1	b	1	P: I felt that the bed was also very comfortable to sleep in. N: Did you know why? It was because the bed underneath you was an air bed.
Physical Restraint (B1-1-1)	8	a, b, d, e, h, oq	10	P: Now, could you please explain why you want to tie it up? Is it uncontrollable?
Sputum Suction (B1-1-2)	4	a, b, d, s	5	P: What if I still do not cough? N: Then, we would consider sputum suction by bronchoscopy, which was a problem of sputum suction.
Pain Management (B1-1-3)	12	a, d, f, j, l, n, ps, y	13	P: What if some people were sensitive to pain? I saw the patient who came back from the same ward yesterday. I was watching with pain and sweating.
Tracheal Intubation and Extubation (B1-1-4)	10	af, j, q, r, s	17	P: I thought it was necessary to tell me in advance that I was out of surgery and there was a tube in my throat.
Fluid Restriction (B1-1-5)	2	b, f	2	P: My mouth was dry, so I really wanted to drink water.
Fasting (B1-1-6)	4	c, l, s, y	4	P: After the surgery, I could not eat, right?
Diet (B1-1-7)	5	e, k, m, o, s	8	P: Then, I wanted to know when I could drink water.
Drinking (B1-1-8)	14	c, d, f, h, jn, p, s, v, y, a'	16	F: I wanted to know that she was in the ICU, and we could not go in. What would she eat?
Breathe (B1-1-9)	1	e	1	P: You could also teach us how to breathe.
Assistance with Coughing and Expectoration (B1-1-10)	7	a, c, e, f, n, r, s	11	P: The nurse said that I was coughing sputum in the wrong way, but I also did not know how to cough correctly.
Portable Chest X-Ray (B1-1-11)	5	b, c, d, h, j	5	P: What was the chest X-ray?
Passive Reposition (B1-1-12)	1	e	1	P: You told me to slightly move my position, like lifting my butt.
Asphyxian (B1-2-1)	1	e	1	P: Yes, there was a sense of suffocation, so you can talk about it in advance to let patients be psychologically prepared.
Communication Barriers (B1-2-2)	3	a, b, e	3	P: I had been knocking on the table and could not speak.
Postural Discomfort (B1-2-3)	3	b, e, q	3	P: The feeling that I wanted to move but could not.
Pain (B1-2-4)	4	a, c, d, f	6	P: After the nurse changed my medicine, I was in so much pain. The pain pump did not work. I was sweating in pain and did not dare to move.
Sleep Disturbance (B1-2-5)	5	a, c, e, p, r	5	P: I was also very anxious. I was afraid that I would not be able to sleep.
Thirst (B1-2-6)	3	bd	3	P: I was thirsty, and my mouth was very dry.
Dyspnoea (B1-2-7)	1	e	3	P: I always felt very uncomfortable. It was very difficult to breathe as the supply was very fast. There was no way to breathe spontaneously.
Transfer Process (B1-3)	15	c, g, j, mo, r, st, vz, a'	20	P: I just wanted to ask about the time of transferring to the public ward, and would you tell my family members to come in advance?
Psychological Status (B1-4)	3	a, b, e	5	P: Oh, no wonder, I was so nervous at that time.

Abbreviation: ICU, Intensive Care Unit; P, Patient; N, Nurse; F, Family.

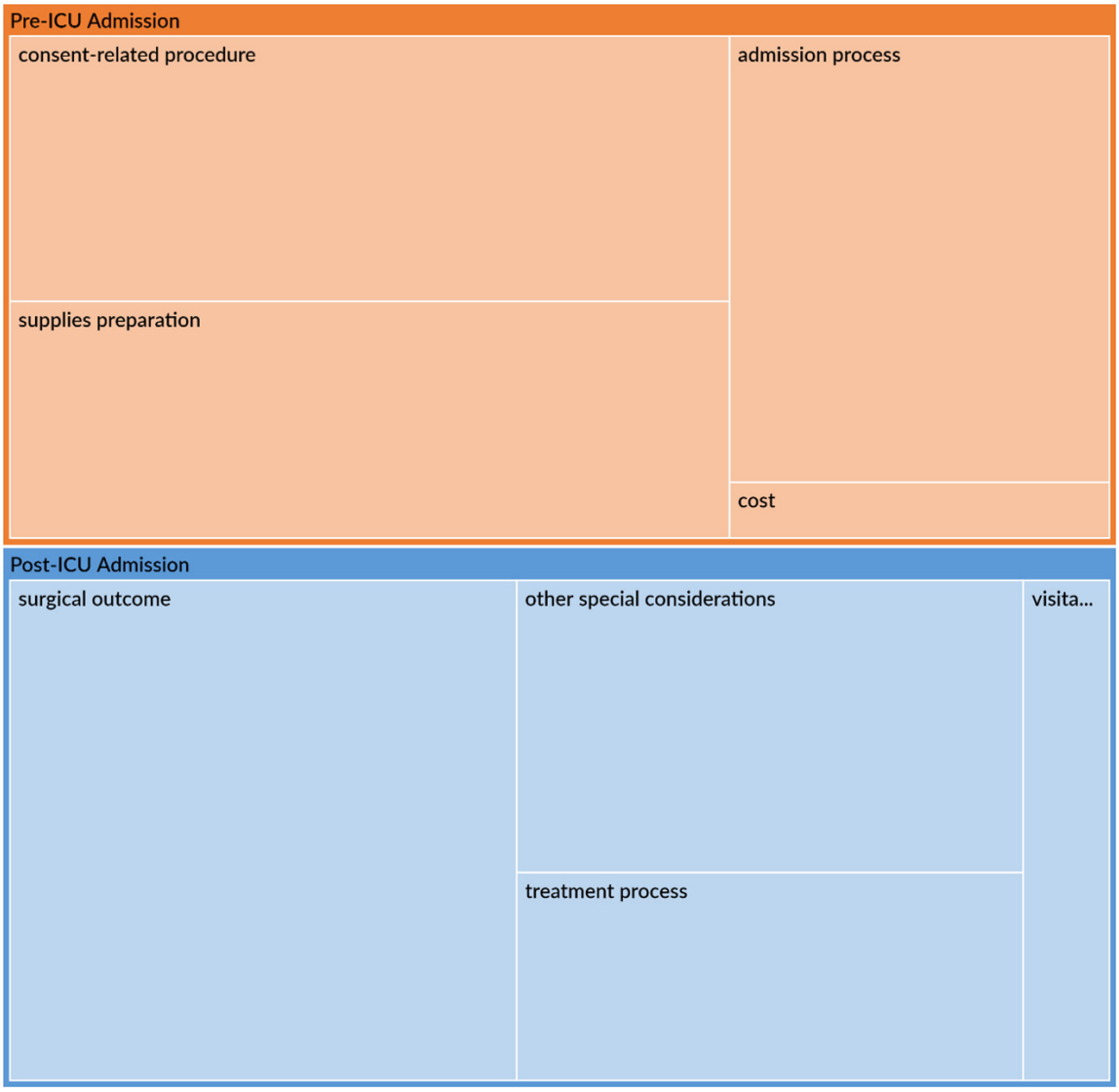

Figure 5. Hierarchy of family information needs. Abbreviation: ICU, Intensive Care Unit.

The admission process included details such as the scheduled time for patient transfer to the ICU and the designated waiting area for families. Consent-related procedures refer to the requirement for families to sign various documents upon the patient's ICU admission and the need to understand the content and number of these items. Owing to the restricted access policy of the ICU, which separates families from the patients, their information needs shifted after the patient's admission. The major needs at this stage concerned the patient's surgical outcome, treatment progress, visitation regulations, and other specific considerations. The progress of treatment included information about the patient's post-operative recovery and general physical condition. The visitation policies referred to details regarding whether visiting was permitted, along with the specific times and approaches. A summary of the analysis of families' information needs is presented in **Table 3**.

Discussion

This qualitative study, which was based on interviews with 36 lung cancer surgery patients and their families, investigated their information needs regarding the ICU, and yielded the following main findings. First, information needs are specific to patients, and are focused

Table 3. Summary of the results of the analysis of the information needs of patients and their families post-ICU

Theme	Number of Themes	List of Material Sources	Number of Coding Reference Points	Examples of Reference Points
Admission Process (A2-1)	14	g, k, l, o, w, z, a'	23	F: I also wanted to know what I should do when he comes out later? Would anyone inform me?
Supplies Preparation (A2-2)	17	g, k, l, n, p, r, z, a', d'	18	F: I needed to take the towels, wet wipes, water cups, and a packet of paper, as well as the bowl, right?
Consent-related Procedure (A2-3)	17	g, i, k, n, p, r, w, y, z, a', e', h'	22	F: You need to inform family members about signing-related matters before the surgery so that they can be prepared.
Cost (A2-4)	1	n	1	F: Most likely, not that costly.
Surgical Outcome (B2-1)	8	h, i, k, l, m, w, x, y	14	F: In fact, all we cared about was the outcome of the surgery.
Treatment Process (B2-2)	7	g, h, i, j, m, t, j'	8	F: I definitely could not care about the equipment in the hospital. My concern was whether he was in good condition.
Visitation Regulations (B2-3)	2	s, t	2	F: We could not see him after entering the ICU, right?
Other Special Considerations (B2-4)	1	w	1	F: Where should I wait?

Abbreviation: ICU, Intensive Care Unit; F, Family.

primarily on post-ICU admission patient care and physical perceptions. Key concerns among these included physical restraints, tracheal intubation and extubation, pain management and sleep disturbance. Second, families directed comparatively less attention toward their own information needs, focusing instead on patient-related matters, such as the pre-ICU admission transfer process, supplies preparation, the patient's surgical outcome, and treatment progress. Third, owing to the unique restricted-access nature of the ICU environment, both patients and their families share common concerns regarding specific information. These shared needs included details about patients' diet and drinking, the procedure for transfer into and out of the ICU, and the visitation policies of the ICU.

Lu and colleagues conceptualized stress as a nonspecific response to external stimuli [21]. However, Obbarius attributed its origin to environmental changes [22]. They posited that when such changes exceed an individual's coping capacity, they can result in physiological and psychological imbalance, accompanied by alterations in emotional and behavioral functioning. Unlike general wards, the ICU is characterized by stringent cleanliness protocols and, to minimize cross-infection, is relatively isolated from the outside world, forming an independent clinical unit. Consequently, public knowledge regarding the ICU remains limited. Studies on ICU environmental stressors have identified a closed and unfamiliar environment, busy healthcare providers, intrusive machine noise, and restrictive visitation policies as significant stressors for conscious patients [23, 24]. Consistent with these international findings, the primary pre-ICU admission information needs expressed by patients in our 36 interviewees pertained to the distinctive features of the ICU including its defining attributes, environmental noise, light levels, and commonly used equipment. Furthermore, compared with the general ward, the ICU workload is notably more intense. While healthcare providers focus on the patient's physiological status, treatment efficacy, and equipment operation, this focus can sometimes come at the expense of holistic communication and emotional support. Therefore, when providing an ICU preexperience for lung cancer patients and their families, healthcare providers should incorporate a thorough introduction to the unique environmental and operational particularities of the unit.

Patients' most prominent information needs during their ICU stay pertained to patient care and physical perceptions, a finding that is consistent with research from the United Kingdom [25]. Studies emphasize the critical importance of meeting information needs in cancer care. Patients who are well-informed about their disease severity, changes in condition, and treatment approaches are better equipped to cope with and manage their illness, leading to improved quality of life and reduced levels of anxiety and depression [24, 26]. Additionally, owing to the specificity of lung cancer surgery, patients cannot cough effectively during the immediate postoperative period. The retention of sputum can lead to airway obstruction, atelectasis, and respiratory insufficiency. Therefore, it is essential for patients to understand key respiratory nursing interventions prior to their ICU admission, such as sputum suction, assisted and encouraged coughing and expectoration. It is recommended that ICU healthcare providers actively provide targeted education on disease-specific knowledge and postoperative care during pre-ICU admission for lung cancer patients and their families. Ensuring that patients fully understand and are prepared for their ICU stay can increase treatment compliance and help prevent adverse events, including unplanned extubation.

Patients admitted to the ICU are often critically ill and unable to make autonomous decisions, making their families the primary spokespersons and medical decision-makers [27]. Families' needs refer to the comprehensive related not only to the patient's condition and treatment but also to the families' own physical and psychological support during the patient's illness [28]. In this study, the information needs of families were predominantly focused on the patient, encompassing the pre-ICU admission transfer process, supplies preparation, surgical outcome, and treatment progress. A study involving pediatric cancer patients indicated that providing information regarding diagnosis, treatment, and potential complications can alleviate parental distress, foster a stable family environment, reduce anxiety, and enhance parents' sense of control [29]. Similarly, a study

conducted with families of patients with amyotrophic lateral sclerosis(ALS) revealed that knowledge about disease management and nursing care reduced the psychological burden on families and improved their quality of life [30]. Therefore, it is essential for healthcare providers to communicate timely and clear information about the patient's condition to their families. Such communication can help resolve doubts and uncertainties, strengthen families' confidence in the treatment process, and mitigate their negative emotional experiences.

Other information needs expressed by families pertained to signatures and treatment-related costs. Given that many documents - such as doctor-patient communication forms, nurse-patient communication forms, and nursing supply handover forms - must be signed by families when a patient is admitted to the ICU after surgery, many families reported feeling rushed or impatient during the process because of concerns about the patient's condition. Some signed quickly and left the ward, whereas others expressed frustration with the volume of paperwork. It is therefore recommended that healthcare providers inform families in advance about all required documentation to prevent omissions and improve overall satisfaction. Although ICU treatment costs are significantly higher than those in general wards, patients and their families in this study did not express major cost concerns. This may be attributed to 2 factors. First, as the study was conducted at the Lung Cancer Center of West China Hospital, patients and their families who chose surgery at this tertiary facility had certain financial expectations and prioritized obtaining the best treatment. Second, through prior health education, many families understood that ICU admission was for short-term postoperative monitoring, which may have alleviated concerns about financial burden.

In 2021, the World Health Assembly adopted the Global Patient Safety Action Plan 2021-2030, which recognizes patients and their families as partners in safe healthcare delivery and redefines their role from passive recipients to active participants in medical and health services [31]. Patient-centered care is a nursing approach that incorporates patients' perspectives on their physiological, safety, and self-esteem needs, while also respecting their personal decisions, preferences, and goals. Previous studies have shown that this nursing approach can improve patient satisfaction and reduce healthcare costs [32]. For example, Hwang and colleagues reported that improving nurses' capacity for patient-centered care and developing a supportive care environment are essential for encouraging patient participation in treatment and care procedures [33].

Traditional face-to-face health education pre-ICU admission is dependent primarily on the clinical experience, communication skills, and subjective judgment of healthcare providers. This reliance often results in education content that is abstract, incomplete, and nonstandardized, leading to suboptimal communication outcomes [34]. When delivered solely from the healthcare provider's perspective, such education can hinder effective communication with patients and their families, potentially increasing medical disputes. This health education approach is therefore unsuitable for the ICU, a specialized setting characterized by information isolation. To address this information asymmetry between healthcare providers and patients in the ICU, this study explored and established an ICU pre-experience pattern. This pattern is grounded in the information needs of patients and families during the peri-ICU period and is structured around key time-points of the patient's ICU treatment pathway. By providing tailored information on the ICU transfer process, this pattern aims to enhance patient compliance, reduce complications, improve the satisfaction and sense of empowerment among patients and their families, and decrease the incidence of medical disputes.

To our knowledge, this is the first study to investigate the pre-ICU health education information needs of both lung cancer surgery patients and their families simultaneously. It also systematically explored their information needs across entire ICU tours, thereby expanding the content and scope of ICU health education. The findings provide a foundation for developing and establishing a structured ICU pre-experience pattern.

Several limitations should be acknowledged. First, as the interviews were conducted at a single institution, the generalizability of the findings may be limited. However, our institution is the largest in Western China and admits

patients from across the country, which enhances the sample's representativeness to a certain extent. Second, the potential for recall bias among participants exists, which could introduce information bias. To mitigate this, the interviews were conducted by ICU specialist nurses with extensive clinical and research experience, who facilitated associative recall during the conversations. Furthermore, the transcribed interview data were reviewed and analyzed by a team-based approach to ensure the accuracy of the content. Third, owing to the poor treatment outcome of some patients and the rotation of families, it was not feasible to conduct continuous preoperative and postoperative interviews with the same participants. Future research should expand the scope of the study, include a larger sample size, and ultimately develop and implement a guidebook for ICU information needs in patients with lung cancer, on the basis of research findings, within the ICU pre-experience pattern.

Conclusion

Healthcare providers are responsible for addressing the information needs of patients and their families. This qualitative study investigated these information needs among 36 lung cancer surgery patients and their families within an ICU pre-experience pattern. On the basis of these findings, a hierarchy and pattern of information needs were constructed. The results indicated that patients generally had greater information needs than their families did. For patients, the information of greatest concern for both themselves and their families pertained to post-ICU nursing care, including procedures related to tracheal intubation and extubation, dietary management, and pain management. Additionally, families expressed a need to understand the process of transferring the patient to the ICU and matters requiring their signature pre-ICU admission.

Acknowledgements

This study was supported by West China Nursing Discipline Development Special Fund Project, Sichuan University (HXHL20054).

Disclosure of conflict of interest

None.

Address correspondence to: Li Tang, Department of Operating Room, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, No. 37, Guoxue Lane, Wuhou District, Chengdu 610041, Sichuan, China. Tel: +86-028-85423792; E-mail: 18980601909@163.com

References

[1] Ferlay J, Colombet M, Soerjomataram I, Parkin DM, Piñeros M, Znaor A and Bray F. Cancer statistics for the year 2020: an overview. Int J Cancer 2021; 149: 778-789.

[2] Wu F, Wang L and Zhou C. Lung cancer in China: current and prospect. Curr Opin Oncol 2021; 33: 40-46.

[3] Liu W, Zhou D, Zhang L, Huang M, Quan R, Xia R, Ye Y, Zhang G and Shen Z; Cancer Critical Care Medicine Committee of the Chinese Anti-Cancer Association. Characteristics and outcomes of cancer patients admitted to intensive care units in cancer specialized hospitals in China. J Cancer Res Clin Oncol 2024; 150: 205.

[4] Elsayed HH, Ahmed MH, El Ghanam M, Hikal T, Abdel-Gayed M and Moharram AA. Patients after lung resection heading to the high-dependency unit: a cost-effectiveness study for managing lung cancer patients. Cardiothorac Surg 2022; 30.

[5] Osowiecka K, Szwiec M, Dolińska A, Gwara A, Kurowicki M, Kołb-Sielecki J, Działach E, Radecka W, Nawrocki S and Rucińska M. Unmet non-medical needs of cancer patients in Poland: a quantitative and qualitative study. Support Care Cancer 2024; 32: 183.

[6] Bala N, Brar AS, Attri JP, Mahajan P, Dahuja M and Kapila U. A cross-sectional study to assess the perceived and unmet needs of the relatives/family members of patients admitted in intensive care unit. Indian J Psychiatry 2025; 67: 436-440.

[7] Harris BR, Beesley SJ, Hopkins RO, Hirshberg EL, Wilson E, Butler J, Oniki TA, Kuttler KG, Orme JF and Brown SM. Heart rate variability and subsequent psychological distress among family members of intensive care unit patients. J Int Med Res 2021; 49: 3000605211057829.

[8] Gunnlaugsdóttir T, Jónasdóttir RJ, Björnsdóttir K and Klinke ME. How can family members of patients in the intensive care unit be supported? A systematic review of qualitative reviews, meta-synthesis, and novel recommendations for nursing care. Int J Nurs Stud Adv 2024; 7: 100251.

[9] Krishnamoorthy D, Senthilkumar, Venkataraman R, Ramakrishnan N and Vignesh C. Decision-making preferences and levels of anxiety and depression in family members of patients

admitted to the ICU. Indian J Crit Care Med 2025; 29: 155-163.
[10] Zhuo Q, Ma F, Cui C, Bai Y, Hu Q, Hanum AI, Wei W and Liang H. Effects of pre-operative education tailored to information-seeking styles on pre-operative anxiety and depression among patients undergoing percutaneous coronary intervention: a randomized controlled trial. Int J Nurs Sci 2023; 10: 174-181.
[11] Steves SL and Scafide KN. Multimedia in preoperative patient education for adults undergoing cancer surgery: a systematic review. Eur J Oncol Nurs 2021; 52: 101981.
[12] Xie L, O'Leary M, Jefferson FA, Karani R, Limfueco L, Parkhomenko E, Sung JM, Patel RM, Ichii H, Dafoe D, Clayman RV and Landman J. Interactive virtual reality renal models as an educational and preoperative planning tool for laparoscopic donor nephrectomy. Urology 2021; 153: 192-198.
[13] Mameli F, Zirone E, Girlando R, Scagliotti E, Rigamonti G, Aiello EN, Poletti B, Ferrucci R, Ticozzi N, Silani V, Locatelli M, Barbieri S and Ruggiero F. Role of expectations in clinical outcomes after deep brain stimulation in patients with Parkinson's disease: a systematic review. J Neurol 2023; 270: 5274-5287.
[14] Lari A, Alherz M and Jarragh A. Dissociating advances in orthopaedic trauma management from the climbing patient expectations. Eur J Trauma Emerg Surg 2022; 48: 1487.
[15] Wutich A, Beresford M and Bernard HR. Sample sizes for 10 types of qualitative data analysis: an integrative review, empirical guidance, and next steps. Int J Qual Methods 2024; 23: 16094069241296206.
[16] Dahlberg K, Bylund A, Stenberg E and Jaensson M. An endeavour for change and self-efficacy in transition: patient perspectives on postoperative recovery after bariatric surgery-a qualitative study. Int J Qual Stud Health Well-being 2022; 17: 2050458.
[17] Lee JY, Jang Y, Kim S and Hyung WJ. Uncertainty and unmet care needs before and after surgery in patients with gastric cancer: a survey study. Nurs Health Sci 2020; 22: 427-435.
[18] Fritz ML, Sommovilla J, Lawson EH, Zelenski AB, Schwarze ML and De Roo AC. "So, what are you saying?": a qualitative study of surgeon-patient communication in the rectal cancer consultations. Am J Surg 2025; 240: 116115.
[19] Stalter LN, Baggett ND, Hanlon BM, Buffington A, Kalbfell EL, Zelenski AB, Arnold RM, Clapp JT and Schwarze ML. Identifying patterns in preoperative communication about high-risk surgical intervention: a secondary analysis of a randomized clinical trial. Med Decis Making 2023; 43: 487-497.
[20] Wetzig K and Mitchell M. The needs of families of ICU trauma patients: an integrative review. Intensive Crit Care Nurs 2017; 41: 63-70.
[21] Lu S, Wei F and Li G. The evolution of the concept of stress and the framework of the stress system. Cell Stress 2021; 5: 76-85.
[22] Obbarius N, Fischer F, Liegl G, Obbarius A and Rose M. A modified version of the transactional stress concept according to lazarus and folkman was confirmed in a psychosomatic inpatient sample. Front Psychol 2021; 12: 584333.
[23] Gezginci E, Goktas S and Orhan BN. The effects of environmental stressors in intensive care unit on anxiety and depression. Nurs Crit Care 2022; 27: 113-119.
[24] Krampe H, Denke C, Gülden J, Mauersberger VM, Ehlen L, Schönthaler E, Wunderlich MM, Lütz A, Balzer F, Weiss B and Spies CD. Perceived severity of stressors in the intensive care unit: a systematic review and semi-quantitative analysis of the literature on the perspectives of patients, health care providers and relatives. J Clin Med 2021; 10: 3928.
[25] Hale AJ, Ricotta DN, Freed J, Smith CC and Huang GC. Adapting Maslow's hierarchy of needs as a framework for resident wellness. Teach Learn Med 2019; 31: 109-118.
[26] Jennings CS, Astin F, Prescott E, Hansen T, Gale Chris P and De Bacquer D. Illness perceptions and health literacy are strongly associated with health-related quality of life, anxiety, and depression in patients with coronary heart disease: results from the EUROASPIRE V cross-sectional survey. Eur J Cardiovasc Nurs 2023; 22: 719-729.
[27] Renckens SC, Pasman HR, Jorna Z, Klop HT, Perron CD, van Zuylen L, Steegers MAH, Ten Tusscher BL, van Mol MMC, Vloet LCM and Onwuteaka-Philipsen BD. Varying (preferred) levels of involvement in treatment decision-making in the intensive care unit before and during the COVID-19 pandemic: a mixed-methods study among relatives. BMC Med Inform Decis Mak 2024; 24: 46.
[28] Padilla Fortunatti CF. Most important needs of family members of critical patients in light of the critical care family needs inventory. Invest Educ Enferm 2014; 32: 306-316.
[29] Motlagh ME, Mirzaei-Alavijeh M and Hosseini SN. Information needs assessment among parents of children with cancer. Asian Pac J Cancer Prev 2019; 20: 1865-1870.
[30] Poppe C, Koné I, Iseli LM, Schweikert K, Elger BS and Wangmo T. Differentiating needs of informal caregivers of individuals with ALS across the caregiving course: a systematic review. Amyotroph Lateral Scler Frontotemporal Degene 2020; 21: 519-541.

[31] Hughes H. Patient safety and human rights. Routl Handb Glob Health Rights 2021; pp: 259-278.
[32] Fajarini M, Setiawan A, Sung CM, Chen R, Liu D, Lee CK, Niu SF and Chou KR. Effects of advanced practice nurses on health-care costs, quality of care, and patient well-being: a meta-analysis of randomized controlled trials. Int J Nurs Stud 2025; 162: 104953.
[33] Hwang JI, Kim SW and Chin HJ. Patient participation in patient safety and its relationships with Nurses' patient-centered care competency, teamwork, and safety climate. Asian Nurs Res 2019; 13: 130-136.
[34] Wellburn S, van Schaik P and Bettany-Saltikov J. The information needs of adolescent idiopathic scoliosis patients and their parents in the UK: an online survey. Healthcare (Basel) 2019; 7: 78.

Interview Protocol

Pre-operative Patient Version

Name: _____ Hospital ID: _____

1. You may be transferred to the ICU for post-operative transitional care. Prior to this, has any healthcare providers provided you with information about the ICU?

2. What is your current understanding (before surgery) about the ICU? Could you please describe this in detail? What specific sources did this information come from? (e.g., online videos, other patients, relatives/friends who have stayed in the ICU, personal prior experience)

3. What additional information about the potential post-operative transfer to the ICU would you like to know at this point (before your surgery)? (For example, what specific aspects)?

Post-operative Patient Version

Name: _____ Hospital ID:_____

1. Following your ICU stay, what are your overall feelings, and what stands out as the most distinct or memorable part of that experience?

2. Based on your experience, what information do you think would have been helpful for you to know before being admitted to the ICU to better support your treatment there?

3. During your treatment in the ICU, what was your greatest need, and what assistance from doctors and nurses was most important to you?

4. While you were in the ICU, how aware were you of your condition (e.g., tubes, indwelling needles, medical devices)? Before your surgery, would you have wanted to know in advance that you might experience such sensations or be in such a state?

5. Stage-Specific Recall

Stage	Prompt	Key questions
Pre-Extubation	Take a moment to carefully recall the period before tube removal, when you were unable to speak.	What was your general condition and what were you feeling?
		What help did you most need from the doctors and nurses at that time? (e.g., suction, breathing difficulties, limb restraints)
		What information or details were you most eager to know then?
		Before your surgery, would you have wanted to know you might experience these feelings and learn about relevant precautions?
Post-Extubation	Now, please carefully recall the period after the endotracheal tube was removed.	What was your condition, and what were your feelings? (How did they differ from before?)
		What help did you most need from the doctors and nurses at that time?
		Before your surgery, would you have wanted to know you might have these feelings and learn about relevant precautions?
		What information, if known before ICU admission, would have helped you during this post-extubation phase of treatment?
Rest Periods (Night/Other)	Now, please carefully recall times of rest, such as at night or during other rest periods.	How was your ability to fall asleep? What were your main concerns or sensations? (e.g., pain, bed comfort, noise, lighting, safety worries)
		What information did you most need to know during those times?
		When you couldn't sleep or had difficulty falling asleep, what help did you most need from the doctors and nurses?
		Before your surgery, would you have wanted to know you might experience these feelings or be in such a state?
ICU Discharge Day	Finally, please carefully recall your situation on the second day after surgery.	What was your condition on the morning after surgery? What feelings were different from the previous day? (e.g., more pain, less fatigue, poor sleep the night before)
		What help did you most need from the doctors and nurses at that time?
		Before your surgery, would you have wanted to know you might experience these feelings and learn about relevant precautions?
		What information did you most need to know at that time?
Conclusion	Does the information covered above meet what you wanted to know? What other information would you like to learn?	Regarding treatments (e.g., chest X-ray, bronchoscopy, routine care, suction) - recall which treatments you received in the ICU. Was there any treatment you were particularly aware of or concerned about?
		Regarding that specific treatment, what were you most keen to understand?
		During that treatment, what help did you most need from the doctors and nurses?

Abbreviation: ICU, Intensive Care Unit.

Pre-operative Families Version

Name: _____

1. Your family may be transferred to the Wenjiang ICU for post-operative transitional care. Prior to this, has any medical staff member provided you with information about the ICU?

2. What is your current understanding (before surgery) about the ICU? Could you please describe this in detail? What specific sources did this information come from? (e.g., online videos, other patients, relatives/friends who have stayed in the ICU, personal prior experience)

3. What additional information about the potential post-operative transfer to the ICU would you like to know at this point (before your surgery)? (For example, what specific aspects)?

Post-operative Families Version

Name: _____

1. From the time your family is taken to the ICU after surgery until he/she are transferred back to the general ward, what information are you most eager to receive during this waiting period? (Note: Based on the response, probe if necessary regarding the day of surgery vs. the day of ICU transfer.)

2. What information, if provided in advance, would be most helpful to you during this waiting process?

3. During this period, what kind of support do you most need from the doctors and nurses?/What specific information would be most helpful to you?