RESEARCH ARTICLES

Barriers and facilitators to managing uncertainty in nurses' clinical reasoning in post-anaesthesia care units: a qualitative thematic analysis

AUTHORS

LARA DANIELA MATOS CUNHA PhDc, MScN, RN[1]
MÁRCIA PESTANA-SANTOS PhD, MScN, RN[2]
LURDES LOMBA PhD, MScN, RN[3]
MARGARIDA REIS SANTOS PhD, MScN, RN[4]

CORRESPONDING AUTHOR

LARA DANIELA MATOS CUNHA Health Sciences Research Unit: Nursing (UICISA: E), Escola Superior de Enfermagem de Coimbra – Polo C, Avenida Bissaya Barreto, 3046-851 Coimbra, Portugal.
Email: enflaracunha@esenfc.pt

1. ICBAS School of Medicine and Biomedical Sciences – University of Porto, Porto, Portugal; Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESEnfC), Coimbra, Portugal
2. Nursing School of Coimbra (ESEnfC), Coimbra, Portugal; Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESEnfC), Coimbra, Portugal
3. Nursing School of Coimbra (ESEnfC), Coimbra, Portugal; Health Sciences Research Unit: Nursing (UICISA: E), Nursing School of Coimbra (ESEnfC), Coimbra, Portugal
4. ICBAS School of Medicine and Biomedical Sciences – University of Porto, Porto, Portugal; Nursing School of Porto, Porto, Portugal; Center for Health Technology and Services Research (CINTESIS@RISE), Porto, Portugal

ABSTRACT

Objective: To describe and analyse barriers and facilitators to managing uncertainty in nurses' clinical reasoning in post-anaesthesia care units.

Background: The diagnostic process in complex clinical settings often involves uncertainty. This can bias clinical reasoning and compromise the safety of healthcare. Still, little is known about how nurses deal with uncertainty in their clinical practice.

Study design and methods: This study employs a qualitative descriptive design. Fourteen nurses working at a post-anaesthesia care unit were selected through convenience sampling. Data was collected through semi-structured interviews and analysed using thematic analysis. The deductive analysis was undertaken based on the Theory of Reasoned Action. This study followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist.

Results: Two major themes emerged from the analysis: 'barriers' and 'facilitators'. Each major theme aggregated four themes: intention to perform the behaviour, attitudes, subjective norms, and external variables.

Discussion: The perceptions of barriers and facilitators provide valuable insights into current and desired practices that can help minimise uncertainty in nurses' clinical reasoning in post-anaesthesia care units. They provide knowledge and future direction for clinical practice improvements by addressing motivations for reasoning behaviour. The need to create more nurse-friendly working conditions and reduce the cognitive and emotional impact of uncertainty was also identified.

Conclusion: This study provides a comprehensive list of barriers and facilitators of uncertainty management in clinical reasoning based on nurses' perceptions. Recognising behaviours based on reasoned action is essential to manage uncertainty in nurses' clinical reasoning.

 https://doi.org/10.37464/2023.404.1120

Implications for research, policy, and practice: These findings can be used by different stakeholders to better manage uncertainty in healthcare settings. They are valuable resources for health professionals, researchers, and healthcare institutions attempting to improve health practices and enhance safety in health services.

What is already known about the topic?

- The safety and quality of post-anaesthesia care is highly influenced by the clinical reasoning of healthcare providers.
- In complex clinical settings, such as post-anaesthesia care units, uncertainty in clinical reasoning is common and expected.
- Identifying barriers and facilitators of clinical reasoning is essential to support nurses cope with uncertainty in post-anaesthesia care units.

What this paper adds:

- Embracing uncertainty as an opportunity for personal and professional development is a facilitating factor.
- The barriers to managing uncertainty are related to individual personality characteristics and the nature of interpersonal and professional relationships.
- Maladaptation to uncertainty in clinical reasoning has a major impact on nurses' wellbeing in post-anaesthesia care units.

Keywords: Clinical reasoning, clinical decision-making, patient safety, post-anaesthesia nursing, postoperative period, uncertainty

BACKGROUND

The immediate postoperative period carries a significant risk of severe complications. Missed or delayed post-anaesthesia diagnoses were cited as contributing factors in 56.3% of cases resulting in the death of a patient.[1]

Postoperative care is complex and involves making decisions in critical situations. The healthcare providers' ability to provide safe and appropriate care is dependent upon their clinical judgment and decision-making skills.[2] Controlling risks, planning care, and having adequate clinical reasoning skills are essential to maintain patient safety.[3]

Clinical reasoning is the process of applying knowledge and expertise to a clinical situation to develop a solution and manage a clinical problem.[4] Although it is considered a core competence in clinical practice, clinical reasoning has been addressed as either a multifaceted construct or a 'black box' phenomenon.[5] Decision-making depends on cognitive inputs from highly trained healthcare providers. Those cognitive inputs fall short of what clinical practice requires. The complex information process is under severe uncertainty, and the inevitable outcome is that decisions too often cannot be justified based on available knowledge, risk, cost, benefit, or patients' desires.[6]

A review, employing the Model of Uncertainty in Complex Healthcare Contexts (MUCH-S) taxonomy, considered uncertainty in nurses' clinical reasoning in Post-Anesthesia Care Units (PACU), examining it from personal, practical and scientific perspectives. The findings highlight an appreciation of nurses' intuitive reasoning, the perceived knowledge gaps and clinical (in)experience, providing valuable insights to inform and improve clinical reasoning in post-anesthesia settings. A review explored uncertainty in nurses' clinical reasoning under uncertainty in Post-Anaesthesia Care Units (PACU) from a personal, practical, and scientific perspective using the Model of Uncertainty in Complex Healthcare Settings (MUCH-S) taxonomy.[7,8] Another study offered archetypes applicable to various health ecosystems and proposed an overarching model of different types of uncertainty that demonstrated their interrelatedness in health systems.[9] Moreover, Kalke and colleagues *underscored* the necessity for a more in-depth exploration of healthcare providers' encounters with uncertainty and highlighted challenges in researching uncertainty communication, particularly emphasizing probability, scientific issues, and patient experiences.

Clinical reasoning is an interpretive practice, and it consists of several processes. It is an intrinsically contextual clinical competence that develops with practice, reflection on experience, response to knowledge retrieval capacity, and the organisation of thought during the hypothetical cause analysis.[11]

The universal form of conscious behaviour is an action designed to change a future situation inferred from a present one, which involves perception and twofold inference. Furthermore, we must infer what the future situation would have been without our inference, and what change will be wrought in it by our action. However, none of these processes are infallible, accurate, or complete. We do not infer the present as it is, and in its totality, nor do we infer the future from the present with a high degree of reliability, nor do we accurately know the consequences of one's own actions. In addition, actions are not always performed in the way in which they were imagined and desired.[12]

 https://doi.org/10.37464/2023.404.1120

In this sense, the Theory of Reasoned Action (TRA) intends to predict and understand intentional behaviour.[13] It focuses on individuals' beliefs concerning the future performance of a given behaviour. The central construct is intention, a motivational determinant of behaviour. Intention reflects the extent to which an individual is likely to plan to make and invest efforts in pursuing a given behaviour. It is conceptualised as a function of two belief-based constructs: attitudes and subjective norms. Attitudes are polarised evaluations of performing the behaviour in the future, while subjective norms reflect beliefs that significant others would want them to perform the behaviour.[13] According to the TRA, nurses' intentions are influenced by four subjective factors: their attitudes towards uncertainty management (i.e., their attitudes towards the behaviour), their perception of what other people would do (i.e., descriptive social norms), their perception of what others who are important to them would do (i.e. injunctive social norms), and their perception of whether they have the necessary internal and external resources to perform the behaviour (i.e., perceived behavioural control).[13] Therefore, TRA seems relevant to describe nurses' attitudes and behaviours regarding barriers and facilitators to managing uncertainty in clinical reasoning, which may contribute to behaviour change.

OBJECTIVE

This study aims to describe and analyse the barriers and facilitators of uncertainty management in nurses' clinical reasoning in PACU. Given the current emphasis on safety and quality of healthcare, a careful understanding of the barriers and facilitators of clinical reasoning is essential to support nurses in PACU to manage uncertainty in complex clinical scenarios.

STUDY DESIGN AND METHODS

DESIGN

We conducted a descriptive exploratory study using a qualitative design. This study was designed to explore the underlying nature of the perceived barriers and facilitators of uncertainty management and uncover the full nature of the ill-defined phenomenon.[14]

The Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist was used to ensure a comprehensive report of the findings.[15]

PARTICIPANT SELECTION AND RECRUITMENT

Participants were recruited by email. The procedure was intentionally led by the head nurse to minimise personal bias in the recruitment. A pamphlet was sent by email describing the study, objectives, methods, and data collection techniques. Interested nurses contacted the first author who conducted further screening to verify their eligibility.

Convenience sampling was used to ensure maximum variation in demographic characteristics. The inclusion criteria were nurses who provided postoperative care in phase I in the adults polyvalent PACU,[16] who agreed to participate in the study. As there is no specialisation in nursing anaesthesia in Portugal, all nurses working at the PACU were eligible regardless of their complementary training. Nurses in training/onboarding programs were excluded.

DATA COLLECTION

Data were collected using semi-structured interviews between April and May 2022. A pilot interview was undertaken with one participant to adjust the interview script and to refine the first author's interview skills. After the interview's transcription and discussion with the research team, no changes were made to the script. The pilot interview was included in data analysis.

After prior appointment with each participant, the interviews were conducted individually and took place in a meeting room of the anaesthesiology service, where privacy was guaranteed. All the participants were interviewed once. Only the researcher and the participant were present during the interview. All interviews were conducted by the first author, a female medical-surgical nurse specialist who also works in the PACU and who's a doctoral candidate. The interviewer discussed appropriate interview techniques and behaviours with the research team. Participants knew in advance the researcher's goals resulting from her academic studies. They reported no biases or pre-assumptions.

The interviews were audio recorded and lasted 30 to 64 minutes (mean 45 minutes). The semi-structured interview guide (Table 1) was developed based on the results of a previous literature review.[7] Field notes were taken immediately after the interview to clarify speech pauses and write reflective memos throughout the research. Since the interview was conducted in European Portuguese, the interview excerpts were translated and back translated to ensure the original meaning was preserved.

TABLE 1. THE SEMI-STRUCTURED INTERVIEW GUIDE

Questions
1. What effects do you think uncertainty in clinical reasoning can have on nurses in the Post-Anaesthesia Care Unit? a) Do you consider it to be an irrelevant, stressful, or benign event? b) Do you consider it to be a harmful, threatening, or challenging event?
2. What are your thoughts and feelings when you experience uncertainty in nursing clinical reasoning? a) Describe the main cognitive, emotional, and behavioural challenges.

Data saturation was reached with 10 interviews, which means that no new information emerged.[17] However, the 14 nurses willing to participate in the study were interviewed to confirm the phenomenon of interest.

DATA ANALYSIS

The interviews were transcribed verbatim using Microsoft Word and returned to participants for validation. No requests for changes were received. The documents were stored in an encrypted file in Google Drive and later analysed using MAXQDA Analytics Pro 2022 software.

Data was analysed using deductive thematic analysis with a pre-identified theoretical framework: the TRA.[13] Thematic analysis focuses on the perceived significance of ideas and how they connect practices, thus it is relevant to many perioperative concerns.[18] It was considered the most appropriate and pragmatic method to understand nurses' experiences of uncertainty in complex settings.

Thematic analysis was performed following the six steps by Braun and Clarke.[19] Phase 1, 'familiarisation with the data', consists of immersing yourself to become familiar with the depth and breadth of the empirical material collected through the interviews. Preliminary meanings and patterns were searched. In Phase 2, 'coding', codes were generated based on the theoretical framework's components, then data was classified into these predetermined theoretical relevant structures. From this stage onwards, two coders independently compared the analysis, identified points of convergence, divergence, and complementarity, and defined the coding guide. In Phase 3, 'searching for themes', data sets were coded and theme-organised using the coding guide arising from the theoretical framework. In Phase 4, 'reviewing themes', the themes were reviewed and refined by applying a hybrid interpretive/deductive analysis approach, that added interpretive patterns and themes to the coding guide. In Phase 5, 'defining and naming themes', the researchers involved in the initial coding and the other researchers (i.e., the independent reviewers) held two formal meetings to discuss discrepancies in data analysis and interpretation. Any discrepancies were resolved through a consensus discussion, to calibrate interpretations against each other or against baseline patterns. Additionally, the results were returned to participants to check for accuracy and resonance with their experiences. Phase 6 fulfilled the assumptions for producing the report. The results were the outcome of discussion and consensus among all authors.

RIGOUR

To ensure the rigorous criteria of qualitative research, were assessed the critical indicators of the TACT framework: (T)rustworthiness, (A)uditability, (C)redibility, and (T)ransferability.[20]

Trustworthiness was ensured by the transparency of results generated by the participants, throughout the neutrality towards the phenomenon under study. The diversity of responses suggested the effectiveness of distinguishing between the role of colleague and researcher, which reveals the rational acceptance that participants felt comfortable sharing different points of view from the researcher. Consistency in data analysis was obtained through evaluation of intercoder reliability. The neutrality of the results was achieved through different perspectives.

Auditability was ensured by checking if the research process and the decisions taken within it were fully documented and described in the trail audit. Supervision, consciousness-writing, self-interviewing, and clarification of the insider-researcher role were means employed to overcome potential bias.

Credibility was ensured through several strategies: content validation to provide findings' feedback through member checking, where data are fed back to participants to ensure that the experiences described are recognised, and sustained engagement. The main researcher's dual role provided opportunities to address the ethical and practical issues, namely the longitudinal approach, which helped build rapport and trust with the participants, the familiarity, which facilitated understanding of the phenomenon, and the use of the 'hazarding' process, which reduced prejudices and clarified inconsistencies between narrative and behaviour.[21] Self-reflection and a reflexive approach were necessary for the insider-researcher to be able to identify, construct, criticise, and articulate their positionality.[22] Moreover, the researcher was also able to reduce the 'bureaucracy' required to engage with the participants, which enabled social interactivity. Plus, the researcher's deep familiarity with the cultural and political structure of the clinical setting provided a more in-depth understanding of the data, given the knowledge about the local reality. Data triangulation was used to identify the convergence of data.

Transferability was ensured by detailed descriptions to promote dependability of the procedure and data analysis, so that the readers can judge applicability in other contexts. Additionally, the contextual exploration related to the institutional mandate, the social mandate, and the conceptual structure of nursing allowed broader interpretations.

ETHICAL CONSIDERATIONS

The study was approved by the hospital's Ethical Committee (date:14/04/2022, registration code 260/CES). Participants gave their informed consent prior to the interviews. Confidentiality was ensured by allocating an alphanumeric identification (e.g., P1) to each participant.

RESULTS

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

Most participants were female (71.4%), with a bachelor's degree in nursing (78.6%), and 7.14% were specialised nurses. The certification and job tasks of perianaesthesia nurses working in PACU differ across countries. The Netherlands, Ireland, and Australia are the only countries with formal education programs for perianaesthesia nurses.[23] As the qualification required of nurses to work at PACU is not formally required and defined in Portugal, some of the participating specialist nurses have a specialty outside the scope of the nurses' profile skills in the PACU. The socio-demographic characteristics of the participants are presented in Table 2.

TABLE 2. SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS (N=14)

Demographic Characteristics	N (%)
Gender	
Male	4 (28.6%)
Female	10 (71.4%)
Age	
[30-39 years]	4 (28.6%)
[40-49 years]	7 (50%)
[50-59 years]	3 (21.4%)
Qualification	
Nurse Without Specialisation	8 (57.2%)
Medical Surgical Specialisation	3 (21.4%)
Mental Health Specialisation	2 (14.3%)
Community Health Specialisation	1 (7.1%)
Higher Academic Degree	
Bachelor's degree	11 (78.6%)
Master's degree	3 (21.4%)
Experience as a Nurse	
[10-19 years]	4 (28.6%)
[> 20 years]	10 (71.4%)
Experience as a Nurse at PACU	
[<10 years]	3 (21.4%)
[10-19 years]	7 (50%)
[> 20 years]	4 (28.6%)

MAJOR THEMES AND THEMES

Two major themes emerged from the hybrid interpretive/deductive analysis approach: 1) 'barriers' and 2) 'facilitators' to managing uncertainty in nurses' clinical reasoning in PACU – Figure 1. The following themes were identified: a) intention to perform the behaviour, b) attitudes (sub-themes: behavioural beliefs, evaluations of behavioural outcomes), c) subjective norms (sub-themes: normative beliefs, motivation to comply), and d) external variables (sub-themes: demographic, attitudes towards the event of uncertainty, individual traits). Given that the thematic

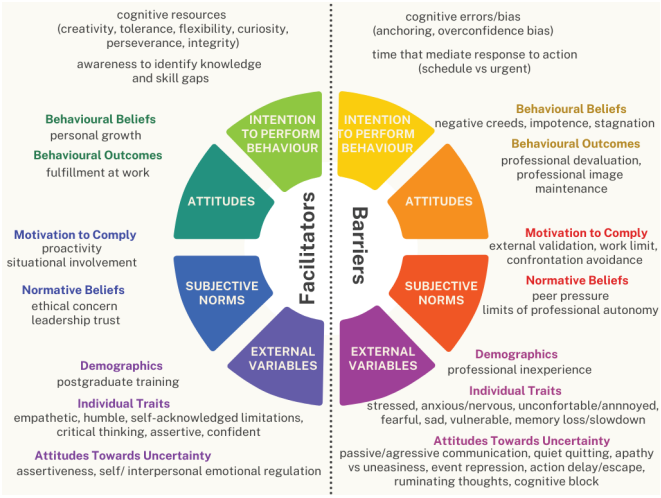

FIGURE 1. BARRIERS AND FACILITATORS TO MANAGING UNCERTAINTY IN NURSES' CLINICAL REASONING IN POST-ANAESTHESIA CARE UNIT

analysis was deductive and followed the assumptions of the TRA, the themes for barriers and facilitators were the same, with different codes distinguishing facilitators from barriers. A total of 51 codes were generated from the thematic analysis.

Barriers

The participants identified barriers to managing uncertainty in clinical reasoning in PACU based on their lived experiences.

Intention to perform the behaviour

Participants reported cognitive errors/biases (anchoring, overconfidence bias) in the intention to perform the behaviour as ineffective uncertainty management mechanisms. They reported that reaction times (scheduled versus urgent) influenced the response to a stimulus.

> *'I try to anchor myself in whoever is nearby. I have no problem in asking for help to minimise uncertainty.'* P14

> *'The higher number of complex actions per unit of time, the likelihood of acting with uncertainty or insecurity. Even if a person is very confident in a given context, acting under pressure without being able to check whether good practices have been followed makes us feel insecure. If there is no time to go over this mental checklist, we might miss care.'* P6

Attitudes

In the 'behavioural beliefs' sub-theme, participants identified negative creeds, impotence, and stagnation. In the 'evaluation of behavioural outcomes' sub-theme, nurses reported hiding their weaknesses to maintain their professional image. Professional devaluation was also listed as a barrier.

> *'As we do not want to convey an image of insecurity, uncertainty, or fragility, we end up making decisions alone, feeling unsure, which involves significant risk for the patient.'* P6

Subjective norms

In the 'normative beliefs' sub-theme, both professional interactions (peer pressure) and the limits of professional autonomy were identified.

> *'Each anaesthetist has their own agenda. I know the protocol, I know the algorithm, but then someone says: 'Oh no, we do it like this'. It confuses me. Do I follow the rules or the requirements?'* P8

In the 'motivation to comply' sub-theme, the participants reported that they are influenced by the dependence on action/external validation needs, the work of limit/interdependence, and avoidance of confrontation.

> *'My perception is that nurses do not have the ability to argue scientifically. Some nurses stand up, while others just do what they're told. Which is even more serious, isn't it?'* P10

External variables

In the 'demographic' sub-theme, the participants pointed out professional inexperience as a barrier.

> *'There are nurses with limited professional experience, and their uncertainty is even greater. I am worried that they might make some decisions on their own because they are afraid to ask questions or rely on older colleagues.'* P14

In the 'attitudes towards the event of uncertainty' sub-theme, the participants reported barriers mainly related to emotional self-regulation: passive-aggressive communication, quiet quitting, apathy, event repression, action delay/escape, ruminating thoughts, cognitive blocking, behaviour of aggression, irritation, frustration, hyperreactivity, impatience, uneasiness, apprehension, projection, disappointment, and disorientation.

> *'Sometimes I am passive-aggressive. I send my messages subtly and sarcastically.'* P13

> *'It does not slip my mind.'* P14

> *'You know the guidelines, but it creates uncertainty when two patients get worse at the same time. It looks like incompetence! It makes no sense!'* P4

In the 'individual traits' sub-theme, the following participant characteristics were listed as barriers: stressed, insecure, anxious/nervous, fearful/distressed, suffering/sad, uncomfortable/annoyed, vulnerable/weak, and memory loss/slowdown.

> *'Uncertainty, anxiety, insecurity, it is all related. The fear of failing and making clinical errors. The feeling of insecurity because you think you can't do it or you're not doing your best. Or even how the rest of the team feels about you. It always causes stress. These insecurities leave us increasingly vulnerable. On the one hand, we can try to overcome them with more theoretical support; on the other hand, we need positive reinforcements. And sometimes we may not even be able to react, right? A series of negative feelings can lead us to stagnation, to giving up, to think it's not worth it.'* P2

Facilitators

The participants identified facilitators to managing uncertainty in nurses' clinical reasoning in PACU. The facilitators were based on what the participants wanted to see happening in their clinical context (PACU).

Intention to perform the behaviour

The participants mentioned that awareness, the identification of knowledge gaps, and the use of cognitive resources (creativity, tolerance, flexibility, curiosity, receptivity, perseverance, reflection, integrity, concentration) could have a positive influence.

> *'The person is in a state of alert. I think this is it, but it may not be, so let me pay more attention, be more on top of it because if it's not this and it's something else, I have to take other measures to solve the problem in a timely manner.'* P12

> *'Nurses who work for many years in PACU learn to deal with uncertainty and get used to not being right, to being flexible and tolerant. The big advantage is the flexibility.'* P12

> *'It makes perfect sense to tackle uncertainty based on research, based on certainties. Fight uncertainty with certainty.'* P9

Attitudes

Participants described personal development as 'behavioural beliefs.' In the 'evaluation of behavioural outcomes' sub-theme, the participants reported a positive impact of feeling that they have fulfilled their duty.

> *'We made it through that situation, we succeeded, and the outcome was positive for the patient. It boosts our self-confidence, our self-esteem.'* P8

Subjective norms

In the 'normative beliefs' sub-theme, the participants reported their fear of causing harm to the patient and underlined the importance of leadership trust.

> *'I don't do certain tasks because I don't want to harm the patient by making a bad decision. Worsening the haemodynamic status, changing the breathing pattern, even exacerbating pain. So, I make a more careful and reasoned decision.'* P13

Participants mentioned proactivity and not being directly involved in the situation in the 'motivation to comply' sub-theme.

> *'I can't recall ever having an in-service training in this unit. And that says a lot about what we intend to do for it. It is up to us to make these changes happen.'* P9

> *'I can think more clearly and confidently when I am not responsible for the situation. Uncertainty is less stressful. So, that uncertainty makes you grow. 'Whoa, I really didn't see it that way!"* P13

External variables

In the 'demographic' sub-theme, the participants identified postgraduate training as a facilitator.

> *'The master's degree has broadened my horizons to how complacent we can be.'* P9

Participants identified assertiveness and emotional regulation of others and self as facilitators in the 'attitudes towards the event of uncertainty' sub-theme.

> *'Maintaining safety, keeping a safe posture, speaking calmly, behaving calmly, avoiding running around, containing tics.'* P3

In the 'individual traits' sub-theme, the following participant characteristics were identified as facilitators: empathy, humility/recognition of individual limitations, critical thinking, assertiveness, and confidence.

> *'Being humble is essential. No one is perfect, and it is through imperfection that we evolve.'* P12

DISCUSSION

This study identified nurses' perceptions of barriers and facilitators at PACU for managing uncertainty in clinical reasoning.

The first major theme, 'barriers', reflects on the conditioning impact of uncertainty in nurses' clinical reasoning. The participants reported the situations experienced in their clinical practice and their impact on the personal and (inter) professional levels.

It is imperative to understand nurses' behaviour from the perspective of the TRA and the specific environmental influence.[13] The contribution of perceived behavioural control related to the intention to perform the behaviour, the attitude toward the behaviour, and subjective norms may therefore be useful for the motivational force of change. Correcting misperceptions has been shown to reduce inadequate behaviours.[13]

An important aspect that emerged from this study is that nurses identified cognitive biases (anchoring, overconfidence) as adequate mechanisms for managing uncertainty. Nonetheless, these unconscious biases are not just individual; they also influence the organisational culture. Despite the most conscious efforts, the collective unconscious bias perpetuates the status quo and old patterns of behaviour and values. These unconscious norms of organisational behaviour exert an enormous influence over decisions and behaviours, influencing the effectiveness of practice improvement projects.[24]

Time pressure, resource constraints, and the need to rely on cognitive shortcuts are likely to produce a lack of information, leading to negative outcomes. Nurses must work faster and stabilise patients as quickly as possible, without compromising their safety.[3] The participants in this study also reported that reaction times influence the response.

Uncertainty can trigger aversive cognitive and emotional manifestations in individuals, which can lead to suboptimal decision-making and avoidance behaviours.[25] Underlining this, the occupational environment can also affect healthcare providers' wellbeing and mental health, leading in the short term to anxiety, concentration and sleep problems, headaches, and psychosomatic problems, as well as quality care problems.[26] The results of this study are consistent with the literature, namely regarding nurses' negative beliefs, sense of impotence and stagnation, need to hide professional fragility, dependence on action, avoidance of confrontation, and professional devaluation.

The participants mentioned that the lack of professional autonomy had an impact on their clinical practice. Labrague and colleagues also found that nurses with higher levels of autonomy tended to be high performing, satisfied, and committed in their jobs.[27] Organisational efforts are critical to fostering autonomy in practising nurses through adequate support, education, and training.

The attitudes towards the event of uncertainty revealed by participants suggest a risk of burnout. Self-regulation is impaired due to low motivation and poor ability to self-regulate behaviour.[28] Physical, behavioural, emotional, cognitive, social, and even existential problems presented by participants arise as a response to exposure to chronic occupational stress due to maladaptive strategies. Maladaptive regulatory resources lead nurses to self-blame (creating additional obstacles) and less job crafting (conditioning the balance between work demands and resources), negatively influencing their professional performance. Poor self-regulation, especially when nurses have low motivation and poor ability to regulate their behaviour, can lead to burnout.[28] In the perioperative environment, it may create an inefficient and toxic environment in which the organisation's goals, vision, and mission cannot be met.[29] Patient safety and access to surgical care may be compromised in organisations where nurses cannot manage uncertainty. Organisations must address the factors within their control to prevent burnout of their most precious resource, their staff.[29]

Not everyone copes with potentially disturbing events in the same way. Some experience acute distress from which they are unable to recover. Others suffer less intensely and seem to recover quickly but then begin to experience unexpected health problems or concentration difficulties.[30] Hutchinson and colleagues had already highlighted the role of nurses'

emotions in the development of clinical knowledge and skills.[31] Emotionally informed situational awareness was described as an ability to rapidly recognise the significance of emotional information. Foregrounding emotional reasoning is a process of checking the meaning of emotions and deciding a path of action, prioritising technical issues.

The second major theme, 'facilitators', focused on the various psychological and behavioural responses to 'the subjective perception of ignorance' to maximise the positive potential of uncertainty.[32] The more favourable a person's attitude is toward subjective norms and the greater the perceived control, the stronger the person's intention to perform the behaviour.[13]

Uncertainty may serve as a self-protective force, resulting in increased information-seeking.[25] The research on uncertainty in healthcare is mostly linked to negative and conditioning aspects of practice. However, this study also addresses the positive side of this phenomenon. The participants recalled the often-forgotten cognitive resources/soft skills (creativity, curiosity, integrity, alterity, proactivity) used to manage uncertainty. On the other hand, the notion of nurses' personal development, also associated with their emotional self-regulation, goes beyond the technical and operational aspects, adding the personal/emotional dimension.

Uncertainty has adverse effects on cognition and emotions. The information overload caused by information complexity can lead to a feeling of confusion. However, the participants saw uncertainty as a driving force, namely through alterity, humility, critical thinking, and self-confidence. The reported behavioural outcomes were proactivity and assertiveness, which is consistent with studies suggesting that positive evaluations of uncertainty contribute to psychological adjustment and are an opportunity for greater dispositional optimism.[33]

In addition, uncertainty presents challenges for patients, families, healthcare providers, policymakers, and researchers, and its management is key to providing patient-centred care.[34] The open disclosure of uncertainty is an ethical and moral imperative.[35] Personalised healthcare requires translating population-based evidence to the individual, which requires sophisticated understanding and communication skills.[10] If health professionals analyse their care experience based on their own individuality, they will make an approximation path in this sense.

Although uncertainty is not entirely synonymous with a lack of knowledge, it can emerge due to the characteristics and quality of available information. It seems natural that people would seek information when confronted with uncertainty.[33] This study corroborates these aspects, with the participants highlighting the importance of postgraduate training.

CONCLUSION

This study provides evidence supporting recent calls for the development of research and interventions to improve uncertainty management in ambiguous and complex healthcare settings like PACU. As uncertainty becomes a pervasive theme in healthcare, it is essential to recognise behaviours based on reasoned action and the realities of the context to undermine the barriers and maximise the facilitators. In moments of uncertainty, people are more likely to take refuge in non-analytical thinking that provides a sense of referential security. However, it is necessary to think about what is known, to see the phenomenon from another angle. Through uncertainty and doubt that the conscious construction of knowledge and the exercise of thought takes place.

IMPLICATIONS FOR RESEARCH, POLICY, AND PRACTICE

This study provides an overview of barriers and facilitators of uncertainty management in nurses' clinical reasoning in PACU. Understanding the moderators of uncertainty in clinical reasoning may has broad implications, impacting positively decision-making, patient safety, continuous professional development, professional communication and team collaboration, healthcare research, and the adaptability of healthcare providers to the complexities of their clinical practice. The crucial aspect of this research lies in exploring uncertainty within nurses' clinical reasoning, aligning with the goals of nursing knowledge and the imperative nature of evidence-based practice. Future studies on uncertainty in clinical reasoning should encompass both provider-centered and patient-centered outcomes.

Acknowledgements: The authors gratefully acknowledge the support of Dr Ana Margarida Fernandes from Translation Services of Nursing School of Coimbra (ESEnfC) for her support in the linguistic revision of the manuscript.

Funding Support: The work developed by LC was funded by the Foundation for Science and Technology (FCT) – reference 2023.02974.BD. The funder had no role in designing the study, in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

Declaration of conflicting interests: All authors declare no conflicts of interest.

REFERENCES

1. Kellner DB, Urman RD, Greenberg P, Brovman EY. Analysis of adverse outcomes in the post-anesthesia care unit based on anesthesia liability data. *J Clin Anesth*.2018;50:48-56.
2. Gaffney TA, Hatcher BJ, Milligan R, Trickey A. Enhancing patient safety: Factors influencing medical error recovery among medical-surgical nurses. *Online J Issues Nurs*. 2016;21(3).
3. Dahlberg K, Sundqvist A-S, Nilsson U, Jaensson M. Nurse competence in the post-anaesthesia care unit in Sweden: a qualitative study of the nurse's perspective. *BMC Nurs*. 2022;21:1-12.
4. Levett-Jones T, Hoffman K, Dempsey J, Jeong SY-S, Noble D, Norton CA, et al. The 'five rights' of clinical reasoning: An educational model to enhance nursing students' ability to identify and manage clinically 'at risk' patients. *Nurse Educ Today*. 2010;30(6):515-20.
5. Young ME, Thomas A, Lubarsky S, Gordon D, Gruppen LD, Rencic J, et al. Mapping clinical reasoning literature across the health professions: a scoping review. *BMC Med Educ*. 2020;20:1-11.
6. Weed LL, Weed L. Opening the black box of clinical judgment—an overview. *BMJ*. 1999;319(7220):1279.
7. Cunha LDM, Pestana-Santos M, Lomba L, Reis Santos M. Uncertainty in post-anaesthesia nursing clinical reasoning: An integrative review in the light of the model of uncertainty in complex health care settings. *J Perioper Nurs*. 2022;35(2):e32-e40.
8. Pomare C, Churruca K, Ellis LA, Long JC, Braithwaite J. A revised model of uncertainty in complex healthcare settings: a scoping review. *J Eval Clin Pract*. 2019;25(2):176-82.
9. Eachempati P, Büchter RB, Ks KK, Hanks S, Martin J, Nasser M. Developing an integrated multilevel model of uncertainty in health care: a qualitative systematic review and thematic synthesis. *BMJ Glob Health*. 2022;7(5):e008113.
10. Kalke K, Studd H, Scherr CL. The communication of uncertainty in health: A scoping review. *Patient Educ Couns*. 2021;104(8):1945-61.
11. Crescitelli MED, Ghirotto L, Artioli G, Sarli L. Opening the horizons of clinical reasoning to qualitative research. *Acta Biomed*. 2019;90(Suppl 11):8.
12. Knight F. Risk, uncertainty and profit. Vernon Press Titles in Economics. 2013.
13. Fishbein M, Ajzen I. Belief, attitude, intention, and behavior: An introduction to theory and research. 1977.
14. Hunter D, McCallum J, Howes D. Defining exploratory-descriptive qualitative (EDQ) research and considering its application to healthcare. *J Nurs Health Care*. 2019;4(1).
15. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349-57.
16. Schick L, Windle PE. Perianesthesia Nursing Core Curriculum E-Book: Preprocedure, Phase I and Phase II PACU Nursing: Elsevier Health Sciences; 2020.
17. Saunders B, Sim J, Kingstone T, Baker S, Waterfield J, Bartlam B, et al. Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual Quant*. 2018;52:1893-907.
18. Jowsey T, Deng C, Weller J. General-purpose thematic analysis: a useful qualitative method for anaesthesia research. *BJA Educ*. 2021;21(12):472-8.
19. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77-101.
20. Daniel BK. Empirical verification of the 'TACT' framework for teaching rigour in qualitative research methodology. *Qual Res J*. 2018;18(3):262-75.
21. Aburn GE, Gott M, Hoare K. Experiences of an insider researcher–interviewing your own colleagues. *Nurse Res*. 2023;31(3).
22. Saidin K. Insider researchers: Challenges & opportunities. Proceedings of the ICECRS. 2016;1(1):v1i. 563-v1i1. .
23. Dahlberg K, Brady JM, Jaensson M, Nilsson U, Odom-Forren J. Education, competence, and role of the nurse working in the PACU: an international survey. *J Perioper Nurs*. 2021;36(3): 224-31. e6.
24. White III AA, Chanoff D. Seeing patients: Unconscious bias in health care: Harvard University Press; 2011.
25. Strout TD, Hillen M, Gutheil C, Anderson E, Hutchinson R, Ward H, et al. Tolerance of uncertainty: A systematic review of health and healthcare-related outcomes. *Patient Educ Couns*. 2018;101(9):1518-37.
26. Anusiewicz CV, Shirey MR, Patrician PA. Workplace bullying and newly licensed registered nurses: An evolutionary concept analysis. *Workplace Health Saf*. 2019;67(5):250-61.
27. Labrague LJ, McEnroe-Petitte DM, Tsaras K. Predictors and outcomes of nurse professional autonomy: A cross-sectional study. *Int J Nurs Pract*. 2019;25(1):e12711.
28. Roczniewska M, Bakker AB. Burnout and self-regulation failure: A diary study of self-undermining and job crafting among nurses. *J Adv Nurs*. 2021;77(8):3424-35.
29. Sillero A, Zabalegui A. Organizational factors and burnout of perioperative nurses. *Clin Pract Epidemiol Ment Health*. 2018;14:132.
30. Shoshani A, Kor A. Psychological Trauma: Theory, Research, Practice, and Policy. American Psychological Association (APA). 2021.
31. Hutchinson M, Hurley J, Kozlowski D, Whitehair L. The use of emotional intelligence capabilities in clinical reasoning and decision-making: A qualitative, exploratory study. *J Clin Nurs*. 2018;27(3-4):e600-e10.
32. Han PK, Klein WM, Arora NK. Varieties of uncertainty in health care: a conceptual taxonomy. *Med Decis Making*. 2011;31(6):828-38.
33. Hamilton JG, Genoff MC, Han PK. Health-Related Uncertainty. The Wiley Encyclopedia of Health Psychology. 2020:305-13.
34. Snaman JM, Feraco AM, Wolfe J, Baker JN. 'What if?': addressing uncertainty with families. *Pediatr Blood Cancer*. 2019;66(6):e27699.
35. Simpkin AL, Armstrong KA. Communicating uncertainty: a narrative review and framework for future research. *J Gen Intern Med*. 2019;34:2586-91.