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Uncertainty in post-anaesthesia nursing clinical reasoning: An integrative review in the light of the model of uncertainty in complex health care settings

Abstract

Problem identification: Post-anaesthesia nursing plays an important role in the early detection and treatment of clinical deterioration after surgery and/or anaesthesia. Concomitantly, the effectiveness of post-operative care is highly dependent on the accurate analysis, synthesis of patient data and quality of diagnostic decisions through clinical reasoning. Given the dynamic processes required to come to a diagnosis, uncertainty is common in clinical reasoning and expected during practice. Nevertheless, uncertainty may permeate the foundations of clinical reasoning, which can jeopardise diagnostic accuracy and consequently the quality and safety of health care.

Literature search: The objectives of this review are to identify available evidence related to uncertainty in post-anaesthesia nursing clinical reasoning and to analyse the results from the perspective of the Model of Uncertainty in Complex Healthcare Settings (MUCH-S). A comprehensive search strategy using CINAHL (EBSCO), Cochrane Library (EBSCO), Medline (PubMed), ProQuest and Google Scholar databases was used to find published and unpublished relevant studies. Studies published in English and Portuguese were included. There was no temporal restriction, nor geographical or cultural limitation for the studies included.

Data evaluation synthesis: All papers were reviewed by the authors to extract key information about purpose, sample and setting, research design and method, key findings and limitations. The literature search identified a total of 248 studies, 22 of which were retrieved for full reading. A total of four articles were included in this review.

Implications for practice: Three main themes were identified: nurses' intuition to reason, feelings of uncertainty related to lack of nursing knowledge and clinical (in)experience to deal with uncertainty. These findings are encompassed within the MUCH-S taxonomy: personal, scientific and practical. This review offers post-anaesthesia nurses' greater levels of understanding of this phenomenon and may support more informed and reflexive clinical reasoning.

Keywords: clinical reasoning, patient safety, post-anaesthesia nursing, post-operative care, uncertainty

Introduction

Post-operative nursing care occurs in an uncertain and changing environment and post-operative nursing practice is complex, highly challenging and demands quick and efficient decision making.[1] This period of critical care, and of great vulnerability for the person being cared for, comes with the risk of complications associated with surgery and anaesthesia. Complications occur in 40 per cent of cases[2] with half of these occurring during the first hour after admission to the Post Anaesthesia Care Unit (PACU)[3] and 16.5 per cent being adverse events after discharge.[4] The reality is that patients' presentations in PACU are often obscure, uncertain and ill-fitting with a model of linear causality.[5] This means there may not be a straightforward relationship between causes and effects.[5]

It is also important to consider the attributes of the post-anaesthesia clinical scenario where nurses' work is highly influenced by interpersonal and interdisciplinary professional relationships,[6] diplomacy and collaborative competence are critical,[7] a highly specialised performance is necessary to manage complex clinical cases,[8] quick and distinct discernment is required when making decisions,[9] patients are vulnerable and dependent on nursing care[10] and environmental conditions and occupational exposure increase professional risk.[11]

Up to 70 per cent of adverse events are related to lapses in anaesthetists' non-technical skills, such as communication, teamwork, leadership, decision-making and risk assessment. Experience and observation are factors influencing situational awareness,[12] another non-technical skill. Situational awareness is the perception of environmental elements and events with respect to time or space, the comprehension of their meaning, and the projection of their future status.[12] Errors associated with medical diagnoses are related to more than ten per cent of all health care costs.[13] Direct costs accrue from failure to treat, inappropriate testing and treatments for incorrect diagnoses.[13] Given these facts, awareness of uncertainty increased physicians' anxiety which translated to a 17 per cent increase in average health care costs.[14]

The conceptualisation of uncertainty, which partly comes from maturity, appears as a professional gains experience in practice.[15] In relation to nursing discipline, uncertainty is described as a cognitive and emotive component, interrelated with stress and coping[16] derived from and related to ethical decision-making.[17] Nursing uncertainty research is mainly focused on a person's illness experience[18] but is hazy in regards to a nurse's reactions in clinical practice and their adaptive behaviours.

Diagnosis usually occurs under a veil of uncertainty so that those who identify it must develop advanced probabilistic reasoning skills given the well-known fact that intuitive probabilistic arguments are very likely to be biased. This also relates to the nature of the diagnostic framework, namely the normative criterion, the temporal structure and the teleological component.[19] Authentic clinical reasoning requires nurses to collect and interpret imperfect clinical data in real time. Learning how to successfully navigate uncertainty in this complex and ambiguous setting is essential for patient safety and high-quality care.[20] For this reason, clinical reasoning becomes relevant to gain an understanding of the phenomenon of uncertainty in post-anaesthesia nursing.

The Model of Uncertainty in Complex Health care Settings (MUCH-S),[21] based on Han's Model,[22] will be the guide to enhancing the understanding of the phenomenon in this review. MUCH-S is a recent three-dimensional model, or conceptual taxonomy, and characterises uncertainty in three broad categories: personal, scientific and practical. Specific issues are gathered into these categories: psychosocial, existential and ethical issues in the personal category; diagnosis, prognosis, causal explanations and treatment recommendations in the scientific category; and structures of care, processes of care and systems in the practical category.

Review methods

Following the methodology of an integrative review,[23] the research questions are:

- What is the available evidence related to uncertainty in post-anaesthesia nursing clinical reasoning?
- How does available evidence related to uncertainty in post-anaesthesia nursing clinical reasoning fit with the MUCH-S?

The literature search was conducted in the CINAHL (EBSCO), Cochrane Library (EBSCO), Medline (PubMed) databases and ProQuest and Google Scholar, in October 2021, using the natural language and index terms adapted for each included information source (See Figure 1). To ensure the hypothetical inclusion of recently published articles, we performed an additional research on 21 January 2022, with no extra findings.

Reference details for all returned searches were downloaded into the reference manager software, Mendeley. Duplicates were removed, then title and abstracts were screened by the first author against the inclusion criteria: empirical output, context of the PACU setting

(((((‘Postanesthesia Nursing’[Mesh]) OR ‘Perioperative Nursing’[Mesh]) OR ‘Postoperative Care’[Mesh]) OR (‘postanesthesia nursing’[Title/Abstract] OR ‘perianesthesia nursing’[Title/Abstract] OR ‘postoperative care’[Title/Abstract] OR ‘postoperative period’[Title/Abstract])) AND ((‘Uncertainty’[Mesh]) OR (uncertainty[Title/Abstract] OR ‘personal uncertainty’[Title/Abstract] OR ‘scientific uncertainty’[Title/Abstract] OR ‘practical uncertainty’[Title/Abstract] OR ambiguity[Title/Abstract] OR ambiguous[Title/Abstract] OR unsure[Title/Abstract] OR unpredict[Title/Abstract] OR doubt[Title/Abstract] OR equivocal[Title/Abstract]))) AND (‘clinical reasoning’[Title/Abstract] OR ‘decision making’[Title/Abstract] OR ‘decision-making’[Title/Abstract])
Filters: English; Portuguese.

Figure 1: Search expression example

and experience(s) of uncertainty discussed from the nursing perspective. Reference lists of included articles were also screened to identify additional studies. Any geographical, cultural, temporal or study type limitations were applied. Search results and studies selection were summarised in a flowchart adapted from Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)[24] (see Figure 2).

After removing duplicates and screening the remaining 248 studies by title and abstract, 22 were retrieved in full text and screened. Considering the inclusion criteria, four studies were included in the review.

Results

Studies originated from Sweden (n = 2), Canada (n = 1) and South Korea (n = 1). Clinical settings are general,[25] orthopedic[26] and surgical[27,28] caring for adult patients in the PACU. Nurses were recruited from mid-sized hospitals[25] and from major public hospitals[26,27,28]. All studies are qualitative and used semi-structured interviews for data collection. The number of participants varied from 9 to 20, with a ratio of 4:1 females to males. The participants’ clinical experience ranged from 1 to 32 years. The characteristics and key findings of the studies included are summarised in Table 1.

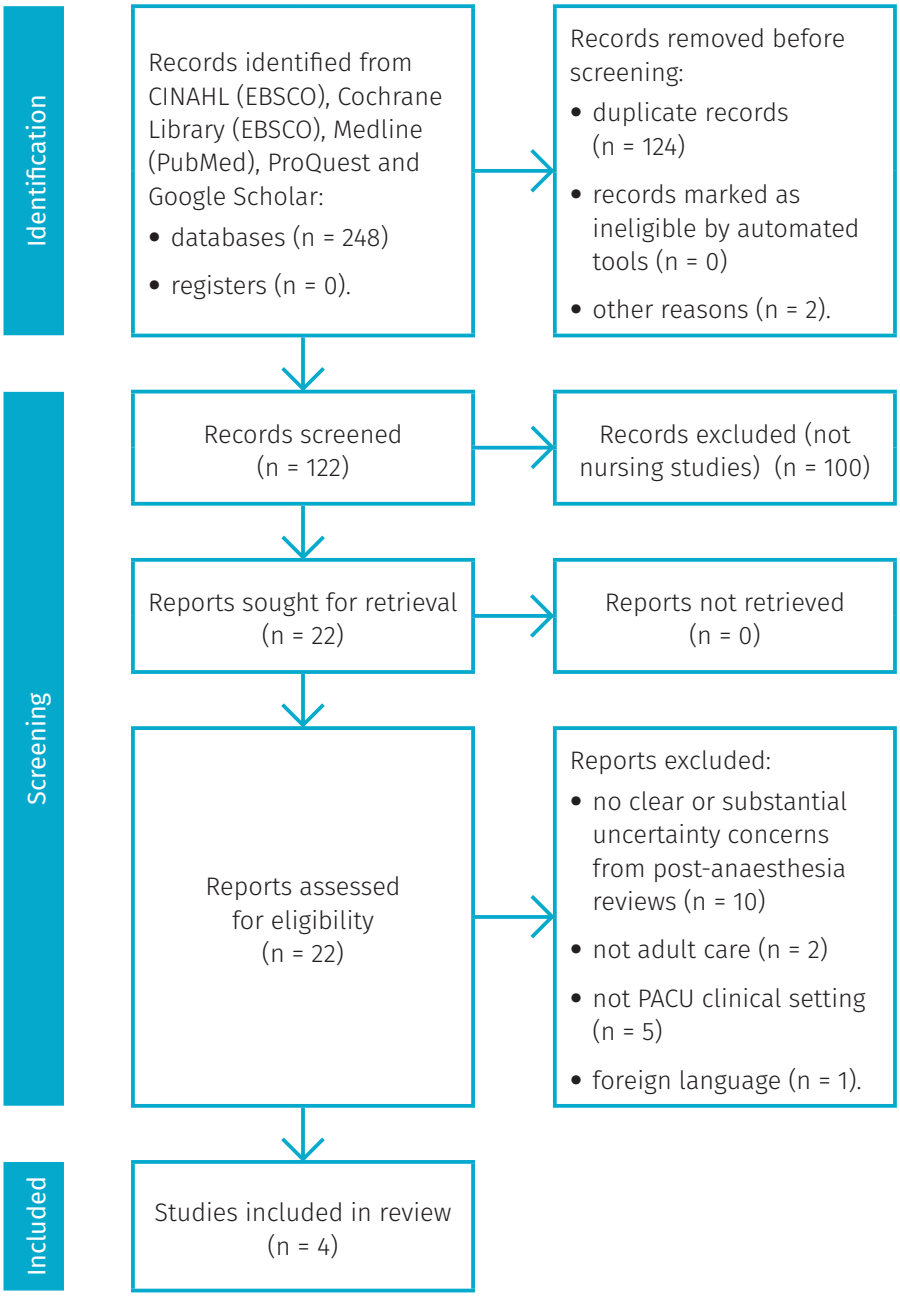

Figure 2: PRISMA flow diagram of review process

Table 1: Characteristics of included studies

Study (year)	Purpose	Sample and setting	Research design and method	Key findings
Calebrant et al. (2016)[28]	To determine the factors that affect how nurse anaesthetists in a county in Sweden decide how to manage perioperative fluid status.	n=16 nurse anaesthetists professionally qualified for at least two years	cross-sectional qualitative study through semi-structured interviews	Three categories emerged: 1. clinical criteria and thought processes that drive decision making 2. interdependence in decision making 3. uncertainty in decision making. They lacked guidelines and, at the same time, it was emphasised that each patient must be treated individually.
Forberg et al. (2017)[27]	To describe nurse anaesthetists' reflections on the provision of perioperative care to patients with previous substance dependence.	n=10 nurse anaesthetists from two surgical departments in Sweden	interpretative study with semi-structured interviews based on clinical vignettes	Nurses revealed a process of balancing between professionalism and preconceptions. This was based on three categories: 1. an anaesthesiological challenge of knowledge, experience and time 2. feelings of mistrust due to the difficulty in dealing with this group of patients 3. feelings of uncertainty because of lack of knowledge. The nurse anaesthetists experienced that these patients tended to react differently to anaesthesia and some nurses felt that their knowledge was not sufficient for taking care of patients. This requires skills, expertise, experience, time, open-mindedness and intuition. If guidelines were developed for this patient group, care could be made safer and nurses' sense of uncertainty minimised.
Jang et al. (2019)[26]	To identify nurses' experiences related to the reasoning methods employed during post-operative pain assessment.	n=20 nurses from the orthopaedic surgery ward of a university hospital in Seoul, South Korea	phenomenography Nurses were interviewed after post-operative pain assessments. A total of 60 patients who had experienced post-operative pain were discussed in the nurses' interviews.	The reasoning used by nurses in post-operative pain assessment was identified from two perspectives: 1. the frames of reference used to interpret a patient's perception of pain 2. the strategic efforts used to assess the pain. Holistic clinical pain assessment is the product of both the personal knowledge of the nurse involved and the practical knowledge that the nurse has developed through intuition. Nurses' own reasoning in post-operative pain assessment appears to reflect various forms of clinical knowledge, drawing from a variety of sources of information and taking into account multiple factors, some of which are unexplained by the research evidence.
Shannon et al. (2020)[25]	To explore PACU nurses' interactions with technology during the critical Phase I recovery period.	n=9 PACU nurses in three mid-sized hospitals in a Western Canadian province	interpretive description Nurse participants were interviewed using a semi-structured interview guide.	Nurses' interactions with technology are significantly influenced by the recovery room culture, as they constantly navigate through a level of uncertainty about the respiratory status of their patients. Three themes are described: 1. nurses' confidence and trust in a visual sensory respiratory assessment process and the influence of anaesthesia providers 2. PACU nurses' guarded trust or rationalised mistrust in technology 3. contextual influences on nurses' approach to respiratory assessment. Post-anaesthesia nurses practice their intuitive sensory assessments with a strong projected sense of expert practice and minimal reliance on technology.

The key findings were organised by the following themes, identified through deductive coding into MUCH-S taxonomy: 'nurses' intuition to reason' (personal), 'feelings of uncertainty related to lack of nursing knowledge' (scientific) and 'clinical (in)experience to deal with uncertainty' (practical). Firstly, the explicit empirical indicators of MUCH-S taxonomy were applied to the data analysis and confirmed that the codes appear in the data by finding examples. Secondly, themes were identified by pattern response and meaning and articulated with the propositions of the review. Finally, pattern matching was applied and compared the dataset with the MUCH-S framework through abductive inference.[29]

In 'nurse's intuition to reason as personal uncertainty', the psychosocial issue of communicating uncertainty manifests itself as a clinical assessment difficulty related to the influence of personal, practical knowledge and intuition factors.[26] The existential issue is due to the difficulty of understanding patient's behaviour and anticipating critical events.[27] The ethical issue is due to the difficulty in navigating through a more intuitive nursing practice.[25]

In 'feelings of uncertainty related to lack of nursing knowledge as scientific uncertainty' associated with diagnosis issues, nurses rationalised their mistrust in technology based on their personal beliefs about what clinical data readings are acceptable[25] and reported insecurity related to scientific knowledge deficit[27] and differences in practice related to clinical experience.[28] In the prognosis issue, nurses revealed difficulties in predicting patients' unexpected reactions to the anaesthesia and preventing adverse events.[27] In the causal explanations issue, nurses struggled to balance the relationship between patient's own needs assessment and nurse's assessment.[26] Related to treatment recommendations issues, nurses had difficulty challenging anaesthesia care due to insufficient knowledge[27] and lack of time to evaluate the impact of nurses' intervention.[28]

In 'clinical (in)experience to deal with uncertainty as practical uncertainty' related to structure of care, nurses adapted their evaluation priorities to the anaesthetist's preferences.[25] In processes of care, nurses reported feeling confused when there is variability in individual anaesthesia handover practises[25] (especially when they contradict evidence-based practises) and refer to peer counselling for evidence-based practice when difficult situations arise.[28] In the system's issues, nurses reinforce the need for clinical practice guidelines adapted to particular situations.[27,28]

Discussion

The aims of this review were to identify available evidence related to uncertainty in post-anaesthesia clinical reasoning and to analyse the results from the perspective of the MUCH-S model, which uses the taxonomy of personal uncertainty, scientific uncertainty and practical uncertainty. To our knowledge this is the first review study about the phenomenon of uncertainty in post-anaesthesia nursing clinical settings. The results were analysed using the MUCH-S model to facilitate understanding. The results presented in this paper highlight the complexity of this topic; additionally, nurses' difficulties were identified.

Nurses' intuition to reason as a personal uncertainty

Personal uncertainty is related to three main issues: psychosocial (communicating uncertainty), existential (effects of illness or treatment on life goals and quality of life) and ethical (inconsistency between self-values, sociocultural codes, the health care system and the organisation).[21]

Uncertainty is primarily managed through communicative practises, which emphasise communication in moderating the effect of uncertainty on health care decision-making.[30] As a matter of fact, pain assessment through personal knowledge, practical knowledge and intuition, allows the post-anaesthesia nurse to take clinical action leading to patient-centred care.[26] Coincidently, uncertainty affects a nurse's ability to maintain patient-centredness during patient–nurse conversation.[30]

Making predictions while uncertain is a challenge that nurses face daily in their practice. Nurses anticipate events based on experiences of past events in similar situations. Exposure to similar situations plays a decisive role in anticipating future events.[31,32] Safe work performance[33] cannot be expected from workers whose job designs involve multiple competing urgent priorities. Nurses need to develop skills to manage the unpredictable nature of their work, including dividing up care throughout the shift and redefining or adapting their care throughout.[33]

Given the mission of the PACU, nurses receive patients at high risk of complications, requiring close nursing clinical surveillance. If patient outcome may be maximised with guidelines,[27,28] an early recognition and intervention process is fundamental for preventing the occurrence of adverse events. Under certain circumstances and conditions of uncertainty (epistemic and random, tangible or not), deviations from reference situations can pose a specific threat to a given objective.[34] Patients' non-rational thinking and

behaviour (unnecessarily exposing themselves to factors that could be a direct threat to their life) made some nurses feel that patients with previous substance dependence were difficult to understand.[27] Nurses can apply simple strategies to recognise and effectively deal with existential uncertainty, including attending to emotions, slowing down clinical reasoning, exploring certainty within uncertainty and partnering with the patient.[35]

As we move towards more complex patient problems, we increasingly recognise the importance of non-analytical but integrative parts of clinical reasoning by recognising patterns and using clinical intuition.[25–27,36] Analytical and non-analytical reasoning[37] can operate separately but are mainly interconnected in clinical practice; to illustrate the complexity-based approach, the application of systemic thinking can benefit the understanding of clinical reasoning.[36] If, on one hand, nurses demonstrate confidence in their professional practice, on the other hand they demonstrate difficulties in articulating a subconscious and intuitive assessment approach.[25] This captures ethical uncertainty.[21]

In short, the collective consciousness of scientific knowledge is seen as the realm of absolute certainty and separate from the impressionistic knowledge of human intuition.[38]

Feelings of uncertainty related to lack of nursing knowledge as a scientific uncertainty

Scientific uncertainty includes issues related to diagnosis (classifying symptoms to abstract criteria), prognosis (regarding the longevity of disease), causal explanations (cause of illness) and treatment recommendations (regarding best mode of treatment).[21]

A study into post-anaesthesia nurses' reflections about caring for patients with previous substance dependence[27] reported that nurses feel uncertainty because of lack of knowledge and difficulty interpreting symptoms in these patients. The juxtaposition of nurses' desire to perform safe and good care with their preconceptions and inability to understand these patients affects both pre-operative and post-operative care.[27]

Clinical reasoning, as the process of applying knowledge and expertise to a clinical situation to develop a solution, involves the processes of cognition and metacognition.[39] Clinical reasoning in nursing revolves around the process of making professional judgements, evaluating the quality and contribution of available evidence to enhance problem solving and to consider to what extent the evidence available is sufficient to base decisions on and provide diagnosis and relevant treatment in regards to nursing care.[40] It also integrates meaningful phenomenological perceptions, experience, patient diversity and the uniqueness of the patient situation.[41] Nurses reported having insufficient knowledge of the pathophysiologic conditions associated with substance dependence during anaesthesia. This resulted in insecurity, especially in specific situations like determining the dosage of intravenous drugs.[27]

Clinical reasoning is viewed as a multidimensional, recursive cognitive process that employs formal and informal strategies to assemble and analyse patient information that is then evaluated relative to its significance and contribution to patient management.[42] Clinical reasoning allowed, for example, for nurses to rationalise their mistrust of technology based on their personal beliefs about what were acceptable respiratory data readings.[25]

Clinical reasoning competence is an essential nursing skill for providing safe and quality patient-centred care.[43,44] Effective clinical reasoning skills are found to be positively correlated with patient outcomes – nurses with poor clinical reasoning skills often fail to recognise impending patient deterioration or fail to prioritise appropriate interventions which may result in a failure to rescue or an irreversible situation. Post-anaesthesia nurses found it difficult to determine pharmaceutical dosage and know how to deal with patients' unexpected reactions to the anaesthesia and their behaviours.[27]

To address the inaccurate clinical reasoning associated with inappropriate interventions that could lead to increased and untimely patient mortality, Levett-Jones et al.,[45] created the Clinical Reasoning Model. This is represented as a circled eight-step diagram that reflects the ongoing and cyclical nature of clinical interventions and the importance of evaluation and reflection. When providing nursing care based on the reasoning cycle, nursing professionals learn to recognise, understand and work in each step, rather than just assuming they understand the patients' problems and perform interventions without adequately using higher order thinking. The recognition of the relationship between a patient's limited ability to express the intensity of their pain and the actual intensity of their pain is an important factor in nurses' post-operative pain assessments.[26] In this sense, effective clinical reasoning skills are a key factor in the prevention of iatrogenic harm.[43]

It is also important to mention research which measured the effects of guided clinical reasoning on the quality of the advanced nursing process in the knowledge and nurse's attitude. [46] Leoni-Scheiber et al., developed an educational approach aiming to improve nurses' diagnostic competencies to allow accurate nursing diagnoses and to link these with effective nursing interventions to achieve favourable patient outcomes.[46] Guided clinical reasoning data revealed improvement in nursing assessments, refinement of nursing diagnoses accuracy and effectiveness of nursing interventions.[46]

Post-anaesthesia nurses revealed that health care delivery becomes a challenge when their knowledge proves to be insufficient.[27] So, evaluating clinical reasoning in a context of uncertainty can also contribute to direct strategies for the teaching and learning of this competence.[47]

Clinical (in)experience to deal with uncertainty as a practical uncertainty

Practical uncertainty encompasses structures of care (absence of clarity regarding the expectations and responsibilities), processes of care (unclear procedures to access care) and systems (lack of clarity in system guidelines).[21]

Uncertainty is expressed in situations with distracting contextual factors, most of all in diagnosis and least in reflection.[48] Nurses' perceptions of inconsistent practises and processes of care of individual anaesthesia providers were often compromised by prioritising relationships over best practices.[25] In the absence of clarity regarding the expectations and responsibilities in care structure, post-anaesthesia nurses tend to adapt their assessment priorities to the preferences of the anaesthesia provider.[25] These results highlight how linguistic markers of uncertainty can shed light on the role contextual factors might play in uncertainty, which can lead to error, and why it is essential to find ways of managing it.

Research into uncertainty in health care has found that when there is lack of clarity in a system's guidelines nurses work to tame uncertainty, shape the environment and set boundaries around what can be tolerated and normalised.[49] This was highlighted by post-anaesthesia nurses who expressed a need for guidelines when caring for patients with substance dependence,[27] managing inotropic medication and applying restrictive fluid therapy.[28]

Nurses described confidence in their intellectual capacity based on their experience, perceptions and behaviours. Some of them referred to confidence in their ability to reason and described their base knowledge as tenuous, that is, accompanied by uncertainty and insecurity.[27,28,50] Thus, experienced post-anaesthesia nurses reported planning how they would act. The less experienced nurses used theoretical knowledge and comparison of different parameters to assess fluid requirements and later conferred with the anaesthetist.[28]

Feelings that can be attributed to nurses' uncertainty include anxiety, ambiguity, discomfort and stress. Additionally, their response to stress and uncertainty can directly impact patient care.[51] When in difficult situations related to fluid therapy, the post-anaesthesia nurses advised each other to use evidence-based practice.[28] Accordingly, some nurses found more clarity during times of uncertainty while other nurses reported negative emotional and physiological responses when faced with unresolved uncertainty. A positive response to a feeling of uncertainty may lead a nurse to seek trusted resources to work through the issue causing the uncertainty. Additionally, patients benefit when a nurse positively manages stress and uncertainty because the nurse finds more clarity or focus for patient care. Conversely, continuous practice in uncertain situations can negatively influence nurses' confidence, increase doubts and negatively impact satisfaction in practice.[51]

Practical knowledge of how a nurse perceives a patient's status in clinical settings and how a patient is assessed need to be fully explored to gain a practice-based understanding of clinical reasoning. How do nurses integrate scientific evidence into practical decisions? How are they taught the process of clinical reasoning in contexts of uncertainty in an era where it is believed that doubt can be resolved simply with the advent of evidence-based practice? Research concerning nursing clinical reasoning continues to be needed to understand nurse cognition in complex situations involving uncertainty. Increased knowledge and experience may decrease uncertainty in practice, but even with policies and resources in place, uncertainty may still occur.[52] Dealing with uncertainty requires humble reflection on our systems with an open mind to complex dynamics and emergent patterns.[53]

Conclusion

A significant gap remains in nursing scientific evidence related to uncertainty in complex clinical settings in health care. This integrative review briefly expresses the incipient understanding of post-anaesthesia clinical reasoning under uncertainty using the MUCH-S taxonomy of personal, scientific and practical uncertainty. The main themes identified were nurses'

intuition to reason (encompassed within personal uncertainty), uncertainty related to lack of knowledge (encompassed within scientific uncertainty) and clinical (in) experience to deal with uncertainty (encompassed within practical uncertainty).

For nurses, communicating uncertainty in clinical pain assessment, dealing with patient's behaviours and articulating intuitive professional practice are all associated with personal uncertainty. Related to scientific uncertainty, nurses struggle with balancing personal beliefs, lack of scientific knowledge and limited clinical experience with their clinical practice. The challenging relationship with patients impacts the recognition of causal explanations. Allied with practical uncertainty, the variability of individual anaesthesia providers' practises can induce uncertainty in nurses.

This review has some limitations. Only four studies met the inclusion criteria. Evaluation of the methodological quality of the included studies was not performed and, although reflexivity was considered for strengthening rigour and minimising potential bias in coding, the potential subjectivity in categorisation related to deductive coding into MUCH-S taxonomy is latent. Furthermore, due to the intrinsic characteristics of an integrative review, the scope is limited.

To support post-anaesthesia nurses to learn to manage complex clinical scenarios effectively, it is essential further research is conducted to understand the process of clinical reasoning. Analysing how personal, scientific and practical uncertainties shape clinical reasoning and lead to nursing outcomes also might be particularly important.

Despite the great benefits of uncertainty analysis and its application in certain contexts, it should not be considered as a panacea to guarantee absolute security. Notwithstanding, evidence suggests that uncertainty comprehension has in its favour the very positive fact that it places uncertain consequences or effects at the centre of decisions, thus being able to contribute to the improvement of safety in post-anaesthesia health care.

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