Decision-making in nursing research and practice: application of the cognitive continuum theory: a meta-aggregative systematic review.

O'CONNOR, T., GIBSON, J., LEWIS, J., STRICKLAND, K. and PATERSON, C.

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REVIEW

Decision-making in nursing research and practice—Application of the Cognitive Continuum Theory: A meta-aggregative systematic review

Tricia O'Connor RN, MN, PhD Candidate[1,2] | Jo Gibson RN, MAdvNsgPrac, PhD, Churchill Fellow, Senior Lecturer[1] | Joanne Lewis RN, MPallC, PhD, Associate Professor[3] | Karen Strickland RN, PhD, MSc, PGCert, BSC, FHEA, FEANS, Professor[1,4,5] | Catherine Paterson RN, PhD, MSc, BA, PG Cert. LTA, FHEA, Professor of Cancer Nursing[1,6,7,8]

[1]School of Nursing, Midwifery and Public Health, University of Canberra, Bruce, Canberra, Australia

[2]Clare Holland House, North Canberra Hospital, Bruce, Canberra, Australia

[3]School of Nursing and Health, Avondale University, Wahroonga, New South Wales, Australia

[4]School of Nursing and Midwifery, Edith Cowan University, Perth, Western Australia, Australia

[5]School of Clinical Sciences, Faculty of Health and Environmental Sciences, Auckland University of Technology, Auckland, New Zealand

[6]Robert Gordon University, Aberdeen, UK

[7]Caring Futures Institute, Flinders University, Adelaide, South Australia, Australia

[8]Central Adelaide Health Network, Adelaide, South Australia, Australia

Correspondence
Tricia O'Connor, Faculty of Health, School of Nursing, Midwifery and Public Health, University of Canberra, Bruce, Canberra 2617, Australia.
Email: catherine.oconnor@canberra.edu.au

Abstract

Aim: To explore how the Cognitive Continuum Theory has been used in qualitative nursing research and to what extent it has been integrated in the research process using the Qualitative Network for Theory Use and Methodology (QUANTUM).

Background: Theory, research and nursing are intrinsically linked, as are decision-making and nursing practice. With increasing pressure on nurses to improve patient outcomes, systematic knowledge regarding decision-making is critical and urgent.

Design: A meta-aggregative systematic review.

Methods

Databases: CINAHL, Medline, PsycINFO, Embase and PubMed were searched from inception until May 2022 for peer-reviewed research published in English.

Seven studies were included and assessed for methodological quality using the Joanna Briggs Institute checklist for qualitative research. A meta-aggregative synthesis was conducted using Joanna Briggs methodology. The QUANTUM typology was used to evaluate the visibility of the Cognitive Continuum Theory in the research process.

Results: The review identified five synthesised findings, namely: 1. the decision-making capacity of the individual nurse, 2. nurses' level of experience, 3. availability of decision support tools, 4. the availability of resources and 5. access to senior staff and peers. Only two of seven studies rigorously applied the theory. The included studies were mainly descriptive-exploratory in nature.

Conclusion: The transferability of the Cognitive Continuum Theory was demonstrated; however, evolution or critique was absent. A gap in the provision of a patient-centric approach to decision-making was identified. Education, support and research is needed to assist decision-making.

A new Person-Centred Nursing Model of the Cognitive Continuum Theory has been proposed to guide future research in clinical decision-making.

Relevance to Clinical Practice: Nurses make numerous decisions every day that directly impact patient care, therefore development and testing of new theories, modification and revision of older theories to reflect advances in knowledge and technology in contemporary health care are essential.

1 | INTRODUCTION

Theory, research and nursing are intrinsically linked, as are decision-making and nursing practice (Falcó-Pegueroles et al., 2021). Theory guides research, research guides practice (Lor et al., 2017), and decision-making is an integral part of nursing practice. Poor clinical decision-making leads to unsafe care and adverse events, which then negatively impact patient care leading to poor patient outcomes, disability or death (World Health Organisation, 2019). While clinical decision-making in nursing has been explored in the literature and research (Nibbelink & Brewer, 2018), ongoing debate and consideration of decision-making theory, practice and research must occur to prevent complacency, as patient care and lives are dependent upon it. Development and testing of new nursing theories, modification and revision of older theories to reflect advances in knowledge and technology are essential for the ongoing development of nursing practice. Nurses make numerous simple and complex decisions every day, which impact on patient care (Nibbelink & Brewer, 2018). By acknowledging decision-making processes that positively contribute to patient-centric care (Truglio-Londrigan & Slyer, 2018), recognising contributors to poor decision-making (Dietrich, 2010) and working towards preventing them, patient care and safety can be improved (Heldal et al., 2019). With increasing pressure on nurses to reduce medical errors and improve patient outcomes, systematic knowledge regarding the linkages between nursing practice, theory, research and decision-making is critical and urgent.

The influential theory, the Cognitive Continuum Theory (which will be used as an exemplar in this study), was devised almost 50 years ago as a significant breakthrough in decision-making but has not been further developed since Standing's contribution in 2008. The Revised Cognitive Continuum Theory was viewed as providing an understanding of the multiple cognitive inputs available when nurses make decisions within the complex and ever-changing health environment (Standing, 2008). The purpose of this systematic review was to examine a seminal clinical decision-making theory—the Cognitive Continuum Theory (Hamm, 1988; Hammond, 1981; Standing, 2008), its use and its articulation in qualitative nursing research to highlight and advance the important discourse around nurse decision-making. This examination is informed by the use of the Qualitative Network for Theory Use and Methodology (QUANTUM) typology (Bradbury-Jones et al., 2022).

What does this paper contribute to the wider global clinical community?

- The important discourse around nurse decision-making is highlighted and explored to promote critical debate.
- The review adds to existing knowledge through the proposition of a new model of the Cognitive Continuum Theory to improve nurse decision-making and ultimately patient outcomes.

Reporting Method

This review adheres to the Enhancing Transparency in Reporting of the Synthesis of Qualitative Research (ENTREQ) statement.

Patient or Public Contribution

No patient or public contribution. This is a systematic review of published literature.

2 | THE REVIEW

2.1 | Decision-making

The concept of decision-making in nursing theory, education, research and practice has been widely researched (Nibbelink & Brewer, 2018). This review does not seek to examine the entirety of the decision-making theoretical domain but rather to systematically and critically review one theoretical approach to clinical decision-making. It behoves us however to mention nursing pioneers such as Florence Nightingale who made clinical decisions that dramatically changed both health care and nursing practice in the 1800s (Lee et al., 2013). Over a century later, nursing leaders such as Benner (2001) and Tanner (2006) were pivotal in creating a dialogue where the importance of nurse decision-making was directly linked to improved patient outcomes (Nibbelink & Brewer, 2018). The process of making decisions has been described by numerous nursing authors (Abdelhadi et al., 2020). Decision-making has been defined as choosing between

alternatives (Klein, 2008); and specifically as a 'contextual, continuous, and evolving process, where data are gathered, interpreted, and evaluated in order to select an evidence-based choice of action' (Tiffen et al., 2014, p. 399). dual process theory involves (System 1) intuitive, unconscious thinking and heuristic processes, and by contrast, System 2 thinking is more rational and analytical (Kahneman, 2011). The systematic-rational approaches to decision-making, such as the information processing theory (Holder, 2018) and the humanistic-intuitive approach typified by Benner in her Novice to Expert theory (Benner, 2001), do not provide a comprehensive model for conceptualising the breath of decision-making processes in a complex ever-changing nursing environment (Thompson et al., 2013). The Cognitive Continuum Theory (Hamm, 1988; Hammond, 1981; Standing, 2008) has been reported to bridge this dichotomous gap in nurse decision-making in a single framework (Cader et al., 2005; Standing, 2008). Standing's work (2008; 2010), and that of others (Cader et al., 2005; Harbison, 2001; Lauri & Salanterä, 1998), highlight how innovative the Cognitive Continuum Theory is in bringing together analytical and intuitive perspectives.

2.2 | Cognitive Continuum Theory

The significance of the Cognitive Continuum Theory as fitting the plurality of decision-making within the nursing profession emerged more than a decade ago (Standing, 2008). The Cognitive Continuum Theory was first devised by Hammond (1978) in the late 1970s and has since been applied in various nursing and non-nursing disciplines (Standing, 2010). The origins of the theory and comparisons to other dual process theories of decision-making have been discussed extensively elsewhere (Dunwoody et al., 2000; Hamm, 1988; Hammond, 1978, 1981; Standing, 2008, 2010). Hammond rejected the existing dichotomous view of intuition or analysis, instead viewing them as two ends of a cognitive spectrum or continuum (Hammond, 1981). According to Hammond, decision-making falls somewhere along the continuum depending on how the decision-maker perceives the complexity of the decision-making task (Hammond, 1981). Humans are adaptive, and as the task and

environment changes and alters, so too does the mode of cognition of the decision-maker, oscillating between intuitive and analytical processes, with quasi-rational, or 'common sense' being the central point (Dunwoody et al., 2000).

The characteristics of the task to be completed dictate the level of cognition required (Dunwoody et al., 2000). Information cues inform the task. The number and nature of the information cues, together with the decision-makers weighting of the information cues influence the mode of cognition (Cader et al., 2005). The more structured a task is, the more analytical the decision-making process will be, whereas a poorly structured decision-making task is likely to involve little analysis and therefore be based on intuition. The task therefore influences the mode of cognition (Hamm, 1988). The Cognitive Continuum Theory has since been adapted by Hamm for use in medicine (1988) and Standing (2008) for use in nursing (see Table 1).

2.3 | Cognitive Continuum Theory in nursing

In 2008, Standing revised the Cognitive Continuum Theory, arguing that her amendments provided a better fit for the specific needs of the nursing profession (Standing, 2008). Standing used Parse (2005) criteria for the evaluation of nursing theories to analyse and evaluate the Cognitive Continuum Theory (Standing, 2008). The modifications to the Cognitive Continuum Theory were viewed to be more relevant to clinical judgement and decision-making in nursing (Standing, 2008, 2010). The revised theory, according to Standing, adjusts the classification and terminology to better reflect a more patient-centred approach (Standing, 2008, 2010). The involvement of the patient in decision-making is acknowledged by the addition of the modes titled 'patient and peer-aided judgement', 'survey' and 'qualitative research' (Standing, 2010; see Figure 1). Other additions include acknowledgement of ethical and reflective judgement, evidence-based practice and professional accountability. The concepts of 'ill' and 'well' structured tasks in Hamm's (1988) adaptation are changed to a 'low' and 'high' task structures in Standing's (2008,

TABLE 1 Comparisons between the three seminal theorists expounding CCT and its application to research (Dunwoody et al., 2000; Hamm, 1988; Standing, 2008).

| Hammond's Cognitive Continuum Theory	Hamm's Cognitive Continuum Theory	Standing's revised Cognitive Continuum Theory
Physical scientific experiment	Scientific experiment	Experimental research
Control group experiment	Controlled trial	Survey research
		Qualitative research
Quasi-experiment	Quasi-experiment	Action research and clinical audit
		Critical review of experimental and research evidence
Computer modelling	System-aided judgement	System-aided judgement
Expert judgement	Peer-aided judgement	Patient and peer-aided judgement
Unrestricted judgement	Intuitive judgement	Reflective judgement
		Intuitive judgement
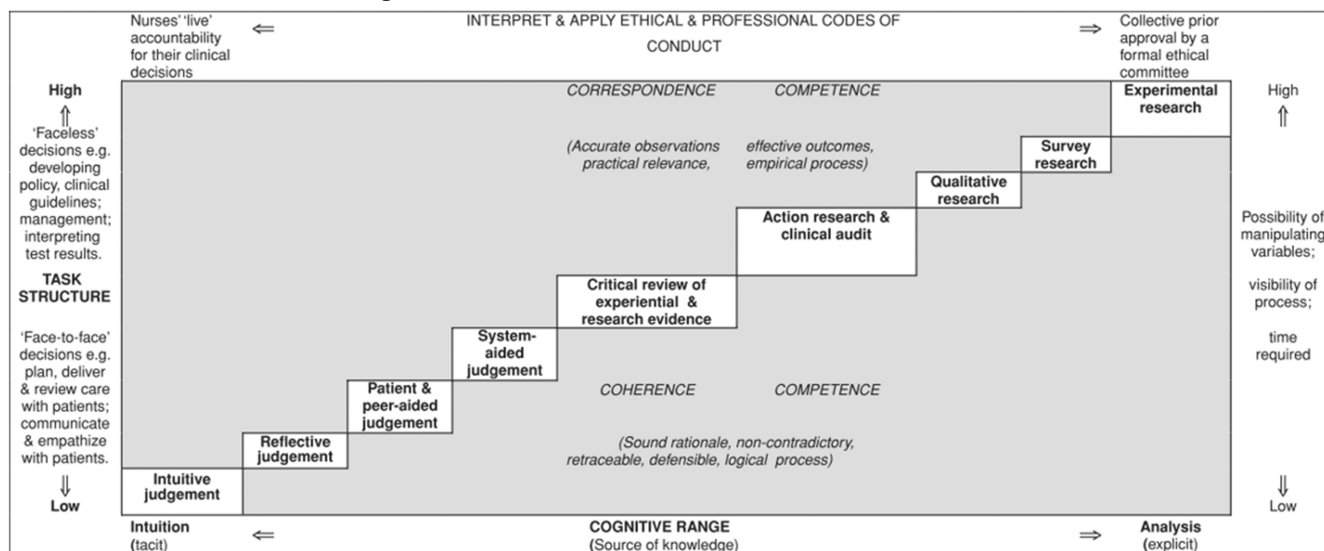
FIGURE 1 Revised Cognitive Continuum Theory (Standing, 2008).

2010) revised version, to alleviate any confusion in health-related contexts. Low-structured tasks involve face-to-face decisions, such as patient care, whereas high-structured tasks include decisions relating to research, and development of guidelines and policies (Standing, 2008). The revised theory does not include numbering the modes of inquiry, which precludes the notion of a hierarchy and is more in line with the notion of the oscillation that occurs between different cognitive modes (Standing, 2008).

Standing's revised theory is viewed as providing an awareness of the multiple cognitive inputs available when nurses make decisions within the complex and ever-changing environment of nursing (Smith, 2013). However, given that the purpose of nurse decision-making is to improve patient outcomes, the limited presence of the patient and their voice in the forefront of this theory must be highlighted. Furthermore, the main role of nurses is the provision of hands-on, face-to-face care, yet according to five of the nine modes of inquiry of Standing's (2008, 2010) theory, the 'faceless' decisions made by others can impact nurse decision-making and therefore ultimately patient outcomes (see Figure 1). Utility of the revised theory is thus brought into question when a section of the theory is not applicable in everyday nursing practice.

Decision-making is an everyday human experience, and clinical decision-making is an everyday nursing experience in all its complexity and in all its different clinical contexts (Nibbelink & Brewer, 2018). Despite extensive guidelines, policies and education, nurses' realities are socially constructed and subjectively interpreted (Cleland, 2017). To answer qualitative questions such as 'how' and 'why' regarding nurses' clinical decision-making, the researchers of this study elected to examine qualitative research outputs reported in the nursing literature. To explore the important narrative around nurse practice, decision-making, theory and research, the use of the Cognitive Continuum Theory (Hamm, 1988; Hammond, 1981; Standing, 2008) and its articulation in qualitative nursing research was systematically reviewed and evaluated. The QUANTUM typology was used to inform

and evaluate the visibility of the Cognitive Continuum Theory in nursing research (Bradbury-Jones et al., 2022; Bradbury-Jones et al., 2014; see Table 2).

2.4 | QUANTUM typology

In 2014, Bradbury-Jones and colleagues generated a five-level typological for evaluating the use of theory in qualitative research. Their framework aimed to provide guidance to critically appraise the relationship between theory and qualitative research (Bradbury-Jones et al., 2014). Bradbury-Jones et al. (2022) revisited their five-point typology after consulting with multiple experts in the field of theory and qualitative research and developed the QUANTUM typology to assist with the conduction and reporting of qualitative research (see Table 2). The degree of visibility within the reporting is assessed with guide descriptors indicating whether the theory is seemingly absent, or partially, or consistently described (Bradbury-Jones et al., 2022). How the research authors describe their usage of the theory is considered, through questioning of how the theory informed the study, where it is located, and how it interacts with the methodology (Bradbury-Jones et al., 2022).

3 | AIM AND OBJECTIVES

This systematic review set out to identify how the Cognitive Continuum Theory has been used in qualitative nursing research and to what extent it has been integrated in the research process using the Qualitative Network for Theory Use and Methodology (QUANTUM).

The objectives were:

1. to conduct a systematic review of the Cognitive Continuum Theory,

TABLE 2 QUANTUM typology.

The visibility of theory			The description of theory		
Question: How well are you able to 'see' theory?			Question: How do authors describe their use of theory?		
Seemingly absent	Partially described	Consistently described	How theory has informed the study	Where theory is located within the study	How theory interacts with methodology
A.1. Theory is not mentioned at all.	B.1. Theory (or theories) may be mentioned or discussed with reference to theorists in the field, but no explicit statement is made about the influence of these on the study.	C.1. The article is infused with theory.	D.1. The study may be described as empirical (inductive) research.	E.1. Theory may be evident from the beginning and guide the research questions.	F.1. Theory may be derived from the qualitative findings, as in a grounded theory study.
	B.2. It is not clear how theory and methodology are related.	C.2. Theory is consistently and clearly described throughout the entire research process.	D.2. The authors may draw on a single theory.	E.2. A theoretical lens may be identified during the study and is used as an analytical framework.	F. 2. Researchers use their findings to further develop or critique existing theory.
		C.3. Theory guides and directs the various phases of the research process and can be tracked throughout a published article.	D.3. The authors may blend multiple theories.	E.3. A single theory or the work of multiple theorists may be used near the end of a study to make sense of the study findings.	
		C.4. Theory is addressed in relation to the alignment of literature, research questions, methods, analysis and findings.	D.4. The appropriateness of the theory or theories is critiqued.	E.4: Theory (single or multiple) has been rigorously applied to all stages of the research.	

2. to analyse how the Cognitive Continuum Theory is currently guiding nursing research, through a meta-aggregation of the systematic review findings, and use of the QUANTUM typology as a guidance framework,

3. to critique the Revised Cognitive Continuum Theory for nursing, and

4. to present a reconceptualisation of the theory addressing identified limitations.

4 | METHODS

4.1 | Design

A systematic search of databases was conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). The QUANTUM typology framework provided guidance to critically appraise the relationship between theory and qualitative research. A meta-aggregative synthesis was conducted using Joanna Briggs methodology. The stages of meta-aggregation of the synthesised findings conform to the Enhancing Transparency in Reporting of the Synthesis of Qualitative Research (ENTREQ) statement (Tong et al., 2012; see Table S1 for completed checklist). This review was conducted according to a systematic review protocol, which is available on request.

4.2 | Search strategy

The search strategy aimed to locate peer-reviewed, published qualitative research. An initial scoping search of CINAHL was undertaken to identify articles on the topic. A systematic electronic literature search of publication databases (CINAHL, Medline (EBSCOhost), PsycINFO, Embase and PubMed) was undertaken in May 2022 from database inception. The text phrase 'Cognitive Continuum Theory' together with the truncation operator * for 'nurse', and NOT 'student nurse', formed the full search strategy (see Table S2 for search example). Hand searches of reference lists from included full-text studies were performed to assure inclusiveness of all relevant studies.

4.3 | Eligibility criteria

Inclusion and exclusion criteria were developed to identify studies that addressed the review question. Inclusion criteria:

- Only qualitative studies published in the English language in peer-reviewed journals with no date restriction.
- The phrase 'Cognitive Continuum Theory' included in the study text.
- All registered nurses, irrespective of years of experience, qualifications or role.

Exclusion criteria:

- Peer-reviewed quantitative and mixed method designs, with the rationale that the question can be sufficiently answered via standalone qualitative analysis.
- Grey literature, editorials, opinions and letters as they are not peer-reviewed.
- Student nurses or enrolled nurses, with the rationale that all other levels of nursing staff need to work under the direct or indirect supervision of a registered nurse.

4.4 | Search outcome

All identified references were imported to EndNote™ (X9.3) and then exported to Covidence™ Systematic Review Software where duplicates were removed. Title and abstract screening, based upon the inclusion and exclusion criteria, were performed independently by (TO'C) and one other reviewer (KS) from a team of five. Full-text publications were reviewed by (TO'C) and two other reviewers (KS and CP), and disagreements were resolved by consensus across the whole author team. Reasons for excluding studies at the full-text review stage were recorded (Page et al., 2021).

4.5 | Assessment of risk of bias and quality appraisal

To ascertain the quality and theoretical validity of the studies under review, a qualitative data appraisal tool was used. The Joanna Briggs Institute (JBI) checklist for qualitative research was chosen as the JBI checklist accentuates the congruence between the philosophy, methodology and methods used in the study (Lockwood et al., 2015). The JBI tool addresses the theoretical validity of qualitative studies, which is in keeping with the aims of this study. The Tool allocates 'yes', 'no', 'unclear' or 'not applicable' for 10 quality appraisal questions (see Table 4 for appraisal questions). Studies were not eliminated based on methodological quality or theoretical validity. All studies were included with the evidence summarised and recorded, noting concerns about quality and the assessed risk of bias. Quality assessment was conducted independently by two reviewers (TO'C and divided between CP, KS, JG and JL), and any disagreements resolved by discussion.

4.6 | Data extraction

Data and information informing the research question, and general study information (such as first author, publication year and country); participant characteristics; study design; theory, theoretical framework or conceptual model; findings on decision-making; and comments, including strengths and limitations of the Cognitive Continuum Theory, were managed using Microsoft Excel.

A second data extraction table was used to support appraisal using the QUANTUM typology (Bradbury-Jones et al., 2022). Data extraction was scrutinised by two researchers (TO'C and divided between CP, KS, JG and JL), and any disagreement resolved by discussion. Quotes and examples of text were extracted and mapped to satisfy the QUANTUM questions. Synthesis without meta-analysis was then conducted.

4.7 | Data synthesis

To preserve the interpretive value of the qualitative findings, a meta-aggregative synthesis was used based on the JBI approach to qualitative research (Aromataris & Munn, 2020). Verbatim extracts of the author's analytic interpretation of their findings were catalogued across the seven included studies. Findings were grouped based on meaning to generate categories. Categories were then synthesised into finding statements, which expressed their significance as a whole across the studies (Aromataris & Munn, 2020). Credibility

levels based on the congruence between authors' interpretation and the provided quote were assessed as either 'unequivocal', 'credible' or 'not supported' (Munn et al., 2014). Assessments were based on the findings of two reviewers (TO'C and divided between CP, KS, JG and JL).

The review also used a narrative synthesis based on mapped quotes to answer the QUANTUM typology questions. This process generated broad findings and conclusions and provided further evidence in answering the research question.

5 | FINDINGS

The search identified 95 studies, of which 48 were duplicates. Twelve full-text studies were assessed for eligibility, six were excluded and reasons documented (see Figure 2). One study author was contacted as the retrieved document was a conference poster presentation (Edwards et al., 2021). The full published text was supplied and included (Edwards et al., 2022). One article was identified
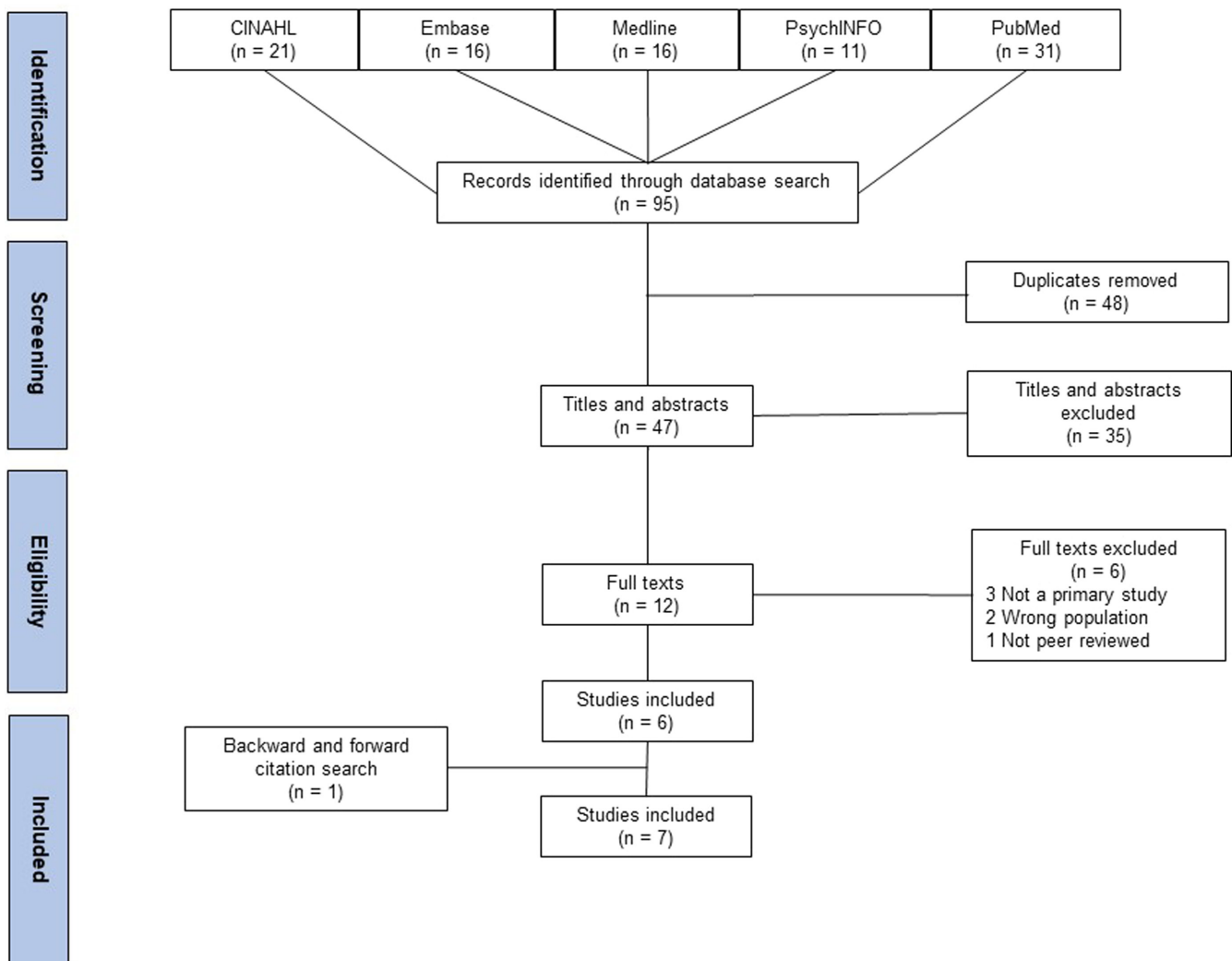
FIGURE 2 PRISMA.

from the backward and forward citation tracking and the hand-searching process (de la Cruz, 1994). A total of seven studies fully met the inclusion criteria.

An overview of the characteristics and outcomes of the seven included studies is presented in Table 3. The studies were published between 1994 and 2022, with three of the seven records (43%) published over 10 years ago. Two publications were based on a single study conducted in Australia and reported separately (Tower et al., 2012; Tower & Chaboyer, 2014). Three studies were conducted in the United Kingdom (Dowding et al., 2009; Edwards et al., 2022; Offredy et al., 2008) and one study in both Israel (Abdelhadi et al., 2020) and the USA (de la Cruz, 1994). Studies were based on clinical scenarios (Offredy et al., 2008), the community setting (Dowding et al., 2009), home (de la Cruz, 1994), hospital emergency departments (Edwards et al., 2022) and hospital wards (Abdelhadi et al., 2020; Tower et al., 2012; Tower & Chaboyer, 2014). One study did not report sample size (Edwards et al., 2022). Study participants included community nurses (de la Cruz, 1994), nurse prescribers (Offredy et al., 2008) and heart failure specialist nurses (Dowding et al., 2009). Studies involved decision-making related to nursing tasks: documenting care (Tower et al., 2012), situation awareness as a precursor to decision-making in nursing documentation (Tower & Chaboyer, 2014), decision-making processes that lead to missed nursing care (Abdelhadi et al., 2020) and primary care streaming in UK emergency departments (Edwards et al., 2022).

5.1 | Quality appraisal

Assessment of the methodological quality revealed that the included studies fulfilled most but not all of the assessed quality criteria (see Table 4). Appraisal of one of the two older studies suggested some incongruity in the reporting between the stated philosophical perspective and the research methodology (Offredy et al., 2008). Reporting was assessed as inadequate in the other (de la Cruz, 1994). Two studies were reporting on findings of larger projects, and it is therefore possible more methodological details were included in the original reporting (de la Cruz, 1994; Tower & Chaboyer, 2014). Notably, none of the studies contained a record locating the researcher culturally or theoretically and therefore how the researchers may have influenced the research. A lack of transparency was therefore apparent. The role of the researcher and how they may have influenced each part of the research process is considered a key marker of quality (Lockwood et al., 2015; Majid & Vanstone, 2018; Yadav, 2021). Assessing the theoretical validity of the included qualitative studies was in keeping with the aims of this review and therefore insufficient reporting was a major limitation, and some caution in interpretation should be taken (Majid & Vanstone, 2018).

5.2 | Synthesised qualitative findings

Findings from the meta-aggregation of the seven included studies and representative quotes are set out in Table S3, with the five synthesised findings presented here and more details provided in Table S4.

5.2.1 | The decision-making capacity of the individual nurse

The reviewed literature identified several attributes of nurses as decision-makers. The personal traits of the nurse, such as their values, motivation, commitment and job attitudes all influenced decision-making (Abdelhadi et al., 2020). Equally, positive or negative relationships with patients, families, peers and senior staff were reflected in the decisions nurses make (Abdelhadi et al., 2020; de la Cruz, 1994). The level of knowledge (Abdelhadi et al., 2020; de la Cruz, 1994; Offredy et al., 2008) and experience (Abdelhadi et al., 2020; de la Cruz, 1994; Edwards et al., 2022; Tower et al., 2012) influenced and affected nurses' decision-making. The combination of stored cognitive knowledge (Offredy et al., 2008) and practical experience led to heuristics, which simplified nursing care (de la Cruz, 1994). Regular or routine decision-making led nurses to be less analytic and more intuitive (Abdelhadi et al., 2020; Dowding et al., 2009).

5.2.2 | Nurses' level of experience

Gathering patient information, constant assessment of clinical status and recognition of cues (de la Cruz, 1994; Dowding et al., 2009; Tower et al., 2012; Tower & Chaboyer, 2014), by experienced nurses led to pattern matching and the generation of mental schemata or models (Tower et al., 2012; Tower & Chaboyer, 2014), which then influenced decision-making. Familiarity with the patient and environment allowed opportunities for repeat learning and reinforcement (de la Cruz, 1994; Offredy et al., 2008).

5.2.3 | Availability of decision support tools

Guidance through the availability of protocols, decision tools, guidelines and computerised systems assisted nurse decision-making and contributed to better care (Abdelhadi et al., 2020; Edwards et al., 2022). Available clinical protocols were however sometimes viewed as not fit for purpose (Dowding et al., 2009). Nurses articulated that they were sometimes constrained by their organisational and professional boundaries (Offredy et al., 2008).

5.2.4 | The availability of resources

The pressures and constraints of time were noted as having a negative effect on decision-making (Abdelhadi et al., 2020; de la Cruz, 1994). Nurses with less clinical experience took more time to complete assessments and make decisions (Edwards et al., 2022). In the absence of time pressures, nurses were allowed to think through various options to ensure optimised decision-making (Dowding

TABLE 3 Overview of the included Cognitive Continuum Theory studies.

Author (year) Country	Purpose	Sample size Mean age (SD, years) Gender Study design	1. Theory 2. Data collection 3. Time points 4. Data analysis	Major findings
Abdelhadi et al. (2020) Israel	To explore nurses' perspectives regarding the decision-making processes that lead to missed nursing care To identify the personal and contextual attributes involved in these processes	*n* = 28 registered nurses Mean age = 38 years (SD = 8.51) Gender = Female = 24 (86%) Qualitative descriptive	1. Cognitive Continuum Theory—Hammond (1996) 2. Focus groups using semistructured interviews 3. Between April and October 2018 4. Content analysis	Nurses fluctuate between automated and effortful modes of thinking that direct their decisions about whether to omit or delay care Personal and situational cues that affect decisions were identified—personal traits, values, job perceptions, motivational factors such as commitment and sense of belongingness 'Automated thinking' was triggered by work overload, scarce resources and difficult patients 'Effortful thinking' was triggered by patient urgency and the presence of head nurses and/or relatives
de la Cruz, 1994 USA	To describe three clinical decision-making styles of home health nurses	*n* = 21 registered nurses Mean age = (range 25–67) Gender = Female = 21 (100%) Qualitative inductive, grounded theory	1. Cognitive Continuum Theory—(Hammond, 1986; Hamm, 1988) 2. A combination of participant observation, open-ended interviews and document analysis 3. 37 home visits during full-day, evening and weekend shifts 4. Concurrent data analysis followed procedures for the constant comparative technique	Nurses' decision-making styles (skimming, surveying and sleuthing) were grounded in the day-to-day realities of clinical nursing practice, influenced by familiarity with the patient, clinical status and time constraints Matching between the type of thinking and the decision-making situation depends on what the decision-maker knows through stored knowledge and practical experience
Dowding et al. (2009) UK	To explore decision processes and types of decisions made by heart failure specialist nurses To identifying where on the continuum a particular decision task sits	*n* = 6 HFSN were observed, and *n* = 12 HFSN were interviewed Mean age = 38 years (range 32–43) Gender = Female = 17 (94%) Qualitative exploratory	1. Cognitive Continuum Theory—(Hammond et al., 1987) 2. 18 consultations were observed, 12 semistructured interviews 3. Between September 2005 and May 2006 4. Thematic content analysis	Decision-making is highlighted regarding pharmacological management of heart failure patients and management of patients in the palliative phase of their condition Pharmacological management decisions involve trading off risks and benefits of titrating medication, with nurses using internalised guidelines to inform their practice Nurses relied on support from other healthcare professionals when making decisions about patients' need for palliative care

TABLE 3 (Continued)

Author (year) Country	Purpose	Sample size Mean age (SD, years) Gender Study design	1. Theory 2. Data collection 3. Time points 4. Data analysis	Major findings
Edwards et al. (2022) UK	To explore the effectiveness of streaming patients to the most appropriate clinician or service in EDs with different primary care models to identify contexts and mechanisms that influenced outcomes	n=13 ED departments ED nurses, clinicians and GPs—no further specific data Mean age=n/d Gender=n/d Realist methodology	1. (i) Four initial theories that were developed from a previous rapid realist review (ii) Revised Cognitive Continuum Theory (Standing, 2008) (iii) Pawson's theory-building processes 2. Surveys, previsit interviews, observation and interviews—formal and opportunistic 3. Between February 2018 and April 2019 4. Coding framework (created in NVivo 11, QSR International)	Experienced nurses, good teamwork and strategic and operational management were key contextual factors Experienced nurses, good teamwork and strategic and operational management were key contextual factors A programme theory was produced to explain the contexts in which primary care streaming occurs and describe the mechanisms which influence effectiveness outcomes
Offredy et al. (2008) UK	To explore and test nurse prescribers' pharmacological knowledge and decision-making	n=25 nurse prescribers Mean age=47 years (range 28–60) Gender=n/d Qualitative exploratory	1. Cognitive Continuum Theory—Hammond (1978) 2. Semistructured interviews 3. Over a 1-year period from 2005 to 2006 4. Content analysis—Cognitive Continuum Theory guided the analysis	The cognitive complexity of nurse prescribers' decision-making includes how information is organised in memory and the weight or importance given to each piece of information before a decision is made and articulated Nurses are perhaps knowledgeable in their small area of practice but flounder outside their area of practice
Tower & Chaboyer (2014) Australia	To report on registered nurses' situation awareness as a precursor to decision-making when recording changes in patients' conditions in progress notes.	n=17 registered nurses Mean age=n/d Gender=n/d Qualitative descriptive	1. Cognitive Continuum Theory—Hamm (1988) 2. Think-aloud data collection and semistructured interviews 3. Across three shifts, including weekends 4. Texts were individually examined for evidence of cues and informed by descriptions of situation awareness	Nurses used a complex mental model for decision-making, drawing on three levels of SA. Level 1 SA provided context to documentation Level 2 SA signifies that something had changed and supports why the situation was significant for the patient Level 3 SA was evident when nurses thought aloud about what this information indicates Nurses may not understand or may not relate the significance of certain practices to patients' outcomes
Tower et al. (2012) Australia	To examine registered nurses' decision-making when documenting care in patients' progress notes	n=17 registered nurses Mean age=n/d Gender=n/d Qualitative descriptive	1. Cognitive Continuum Theory Hamm (1988) 2. Think-aloud data collection and semistructured interviews 3. Morning and afternoon shift and included weekend shifts, 153 episodes of patient care 4. A coding framework based on the three levels of SA was used	nurses use SA as a precursor to decision-making Experienced nurses form mental models regarding patients' needs based on clinical cues Cognitive Continuum Theory as a decision-making model could support SA when nurses make decisions about documenting patient care

Abbreviations: Cognitive Continuum Theory, Cognitive Continuum Theory; ED, Emergency Department; HFSNs, heart failure specialist nurses; SA, Situation Awareness; n/d, no data.

TABLE 4 Quality appraisal—JBI checklist.

Author (date)	Q1. Is there congruity between the stated philosophical perspective and the research methodology?	Q2. Is there congruity between the research methodology and the research question or objectives?	Q3. Is there congruity between the research methodology and the methods used to collect data?	Q4. Is there congruity between the research methodology and the representation and analysis of data?	Q5. Is there congruity between the research methodology and the interpretation of results?	Q6. Is there a statement locating the researcher culturally or theoretically?	Q7. Is the influence of the researcher on the research, and vice versa, addressed?	Q8. Are participants, and their voices, adequately represented?	Q9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	Q10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?
Abdelhadi et al. (2020)	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
de la Cruz, 1994	Y	UC	Y	UC	UC	N	N	Y	N	UC
Dowding et al. (2009)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Edwards et al. (2022)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Offredy et al. (2008)	UC	Y	UC	Y	Y	N	N	Y	Y	Y
Tower et al. (2012)	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Tower & Chaboyer. (2014)	UC	Y	Y	UC	Y	N	UC	Y	Y	Y

Note: Levels of quality assessment ▮ Y = Yes; ▮ UC = Unclear; ▮ N = no.

et al., 2009). Effective teamwork (Edwards et al., 2022) and supportive colleagues (Offredy et al., 2008) cultivated a positive culture, which led to positive outcomes.

5.2.5 | Access to senior staff and peers

Access to senior staff and peers assisted with care and was viewed as an aid to decision-making (Dowding et al., 2009; Offredy et al., 2008; Tower & Chaboyer, 2014). Supervision as oversight by senior staff or relatives was however viewed as stressful (Abdelhadi et al., 2020).

5.3 | QUANTUM typology

The level of theoretical visibility and articulation of the Cognitive Continuum Theory in each of the included studies was analysed using the QUANTUM typology questions (Bradbury-Jones et al., 2022). The findings of this analysis can be found in Table S5.

5.3.1 | Visibility of the Cognitive Continuum Theory in existing nursing research—How well are you able to 'see' theory?

The presence of the Cognitive Continuum Theory was part of the inclusion criteria and as expected no study scored 'seemingly absent' for theory visibility (i.e. category A1; Bradbury-Jones et al., 2022). Three studies were allocated B, indicating theory was 'partially described'. These three studies (Abdelhadi et al., 2020; Tower et al., 2012; Tower & Chaboyer, 2014) used other frameworks and models but included the Cognitive Continuum Theory to guide their research. Other studies were described as 'infused with theory' (de la Cruz, 1994), or having theory guide and direct the various phases of the study (Dowding et al., 2009). The remaining two studies (Edwards et al., 2022; Offredy et al., 2008) were deemed to have described the Cognitive Continuum Theory consistently and clearly throughout the entire research process.

5.3.2 | Authors' description of their use of the Cognitive Continuum Theory —How do authors describe their use of theory?

The Cognitive Continuum Theory was used to provide a framework for the research (Tower & Chaboyer, 2014), to examine relationships (Dowding et al., 2009), explain, understand and support research findings (Abdelhadi et al., 2020; de la Cruz, 1994; Edwards et al., 2022; Tower et al., 2012), to guide and inform analysis (Offredy et al., 2008), to help develop, inform or adapt guidelines and decision tools (Dowding et al., 2009), highlight decision-making that may result in harmful consequences (Abdelhadi et al., 2020) and add to

the transparency associated with clinical decision-making (Tower et al., 2012; Tower & Chaboyer, 2014).

Most of the included studies were descriptive-exploratory in nature (Abdelhadi et al., 2020; de la Cruz, 1994; Dowding et al., 2009; Tower et al., 2012; Tower & Chaboyer, 2014). Grounded theory was used in one study (de la Cruz, 1994). Applying a realist methodology, another study used the Revised Cognitive Continuum Theory to create and refine a set of theories to explain relationships within their phenomena of interest (Edwards et al., 2022). Only one study provided a brief critique regarding the appropriateness of the Cognitive Continuum Theory in relation to their research (Offredy et al., 2008). None of the researchers used their findings to further develop the Cognitive Continuum Theory.

5.3.3 | Overall findings

This review acknowledges the presence of conceptual models and theoretical frameworks other than the Cognitive Continuum Theory to support the research described in the included studies. The QUANTUM typology was applied solely to examine the description and visibility of the Cognitive Continuum Theory in the included studies rather than the authors' use of theory in general, and as such, this constrains the use of the typology in this review. The QUANTUM typology however provided a useful discussion focus for this research team in examining and categorising the included studies based on the two main questions: how well one is able to 'see' the Cognitive Continuum Theory and how the authors describe their use of the Cognitive Continuum Theory. Consensus among the members of review team was challenging, as many of the criteria were viewed as arbitrary, overlapping and open to interpretation. However, this is the first published work to the best of our knowledge using the typology and as such no worked example is available. The QUANTUM typology would benefit from further exploration; however, it provides a framework that can be used as a useful heuristic technique for appraising qualitative research.

The visibility of the Cognitive Continuum Theory within the studies using the QUANTUM typology was considered variable, with only two studies rigorously applying the Cognitive Continuum Theory to all stages of the research. Although the findings illustrated the use of the Cognitive Continuum Theory across the seven studies, the use of the Cognitive Continuum Theory's modes of inquiry has been limited. One of the studies used four of the nine modes available in the Revised Cognitive Continuum Theory (Edwards et al., 2022). Only two modes of the original Cognitive Continuum Theory (Hamm, 1988; Hammond, 1978), mode five, peer-aided judgement and mode six, intuitive judgement, were mentioned in one study (Offredy et al., 2008). Most studies focussed solely on the notion of an analytical, quasi-rational, intuitive continuum. The findings of this systematic review demonstrate the underutilisation of the Cognitive Continuum Theory in general and underutilisation of the full conceptual capacity of the theory. It is

therefore difficult to determine whether the theory explains nurse clinical decision-making or not. The absence of evidence does not prove the fact, and underutilisation does not necessarily mean the Cognitive Continuum Theory does not have the potential to contribute further to clinical practice, education, research or policy.

6 | DISCUSSION

This meta-aggregative review set out to identify how the Cognitive Continuum Theory has been used in qualitative nursing research and to what extent it has been integrated in the research process using the QUANTUM typology. The relatively small number of studies identified in this review indicates limited uptake within the discipline of nursing. Yet, Cader et al. (2005) examined the Cognitive Continuum Theory and considered its value and usability in nursing. The theory has been analysed and evaluated against Fawcett's framework for theory analysis and been deemed fit for purpose for explaining decision-making in nursing (Cader et al., 2005).

The reasons for the limited reporting in nursing literature (in contrast to, e.g. the uptake and reporting in other disciplines such as engineering or medicine) remain unclear. Regardless of the reasons, the limited use of Cognitive Continuum Theory, and the revised theory in particular, in nursing literature is noteworthy given the multiplicity of decision-making in everyday nursing practice. Given nurses provide the most direct patient care across all healthcare professional groups (Sekse et al., 2018), and the decision-making of the nurse has a substantial influence on patient outcomes (Nibbelink & Brewer, 2018), exploring, considering and researching clinical decision-making is of great significance.

Given the generally descriptive nature of the included studies, analysis or critique of the theory was not evident across the seven included studies. Strong theoretical underpinnings are essential for knowledge development (Roy, 2018), but equally theory should be dynamic and evolve as knowledge through research grows. There was no evidence of change or evolution of the theory across the studies.

Standing's rationale for revising the Cognitive Continuum Theory was to deliver greater congruency with nursing philosophy and to be more patient-centred (2008; 2010) than Hamm's revision for medicine (Hamm, 1988). The findings of this review did not reveal the importance of the patient at the centre of care. Critical to nursing is the nurse–patient relationship, which in recent years has received increasing international attention (Carmona et al., 2021). Shared decision-making is vital for incorporating the patient's values and preferences, which in turn leads to increased decision compatibility between what matters most to the patient and the expertise of the health professional (Truglio-Londrigan & Slyer, 2018). This was not evident in the findings of this review. The overarching reason for improving nurse decision-making is to improve patient care, experience and outcomes, which is not a new concept (Nibbelink & Brewer, 2018). As previously indicated,

the format in which the Revised Cognitive Continuum Theory is displayed renders the patient and their voice as seemingly absent and therefore inconsequential. Furthermore, although the hierarchical numbering of the Cognitive Continuum Theory modes of inquiry has been removed, Standing's continued use of the stepped format maintains an appearance of the same hierarchy, privileging empirical evidence.

This review acknowledges the contribution of the Cognitive Continuum Theory, and in particular the revised version for nursing. To enhance its contribution to knowledge development, a reconceptualised model is proposed given the limitations discussed in relation to the seemingly absence of patient-centric care and the implicit or implied hierarchical approaches to decision-making in the original models. The amended model positions the patient at the centre of the decision-making processes (see Figure 3). This is in keeping with the philosophy of nursing and the patient as a central focus in our profession. The findings from the meta-aggregation contribute to the proposed model.

The proposed new model is centric rather than hierarchically stepped. This places the patient at the centre, because without centring the patient, the patient remains voiceless in decision-making regarding their care (O'Connor et al., 2022). Good quality health care involves ensuring the patient's values, needs and concerns are heard (Kwame & Petrucka, 2021). This review examined all the available published qualitative research using the Cognitive

Continuum Theory and found no overt evidence of the patient's voice. 'Person-centred' is used in the proposed new model as it views the patient not just from a medical or illness perspective but from a whole person perspective (Eklund et al., 2019). Person-centred care involves provision of holistic care based on shared decision-making, engagement and connection by the nurse, and consideration for the patient's values and beliefs (McCormack et al., 2021).

The family provides an important role in the patient's life and can be viewed as an extension of the patient in relation to decision-making. The term family is used as a generic term for anyone the patient regards as family, whether they be a close relative, friend or caregiver (Dijkman et al., 2022). To reflect that not all patients have, or wish to have family involvement, the model depicts the family next to the patient (Dijkman et al., 2022). In keeping with the main concepts and premises of the Cognitive Continuum Theory, the decision-making continuum and tasks are included but depicted in a circular format, where the decision-maker oscillates back and forth in a decision-making space rather than in a linear format. The basic principles of the original theory remain unchanged where task complexity triggers a decision response that may oscillate on the continuum between three distinct states: intuitive, analytical and quasi-rational.

Surrounding the patient family are available modes of inquiry to assist with decision-making. The single intuitive judgement mode
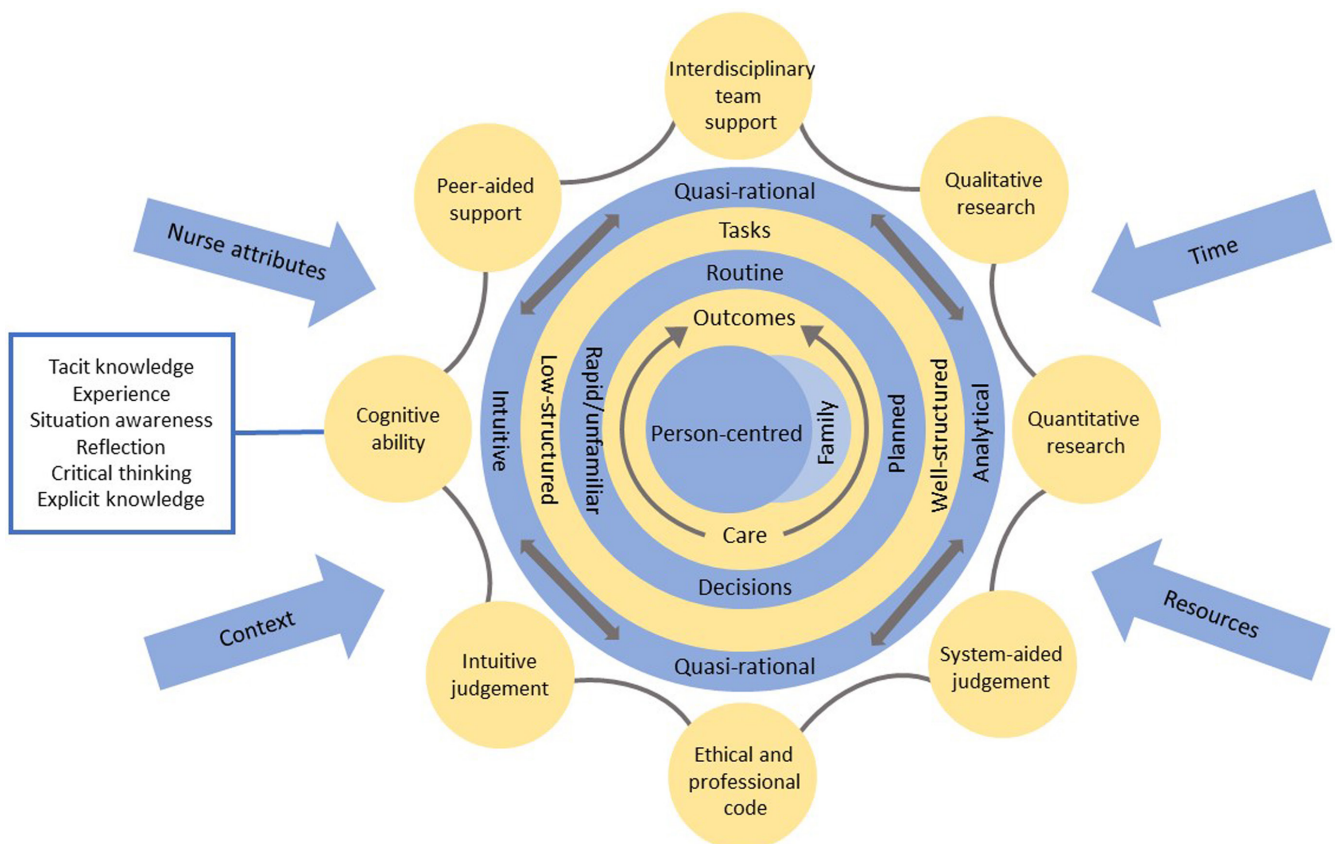

FIGURE 3 Person-centred Nursing Model of the Cognitive Continuum Theory.

has been supplemented with a 'cognitive ability' mode. In this context, cognitive ability refers to the individual nurse's ability to learn, reason and solve problems, think abstractly, prioritise competing tasks, anticipate, react, accommodate, adapt and manage complexity within a changing environment (Jackson et al., 2021). This systematic review, supported by the literature, identified that multiple cognitive skills support and improve decision-making, such as critical thinking, experience, reflection-in and on action, ongoing education and situation awareness (Falcó-Pegueroles et al., 2021). Intuitive judgement remains part of the reconceptualised Cognitive Continuum Theory (Standing, 2008, 2010), where intuitive judgement relates to insight, sensing change and recognising patterns, together with the notion of being an 'expert' as described by Benner (2001).

Peer-aid support remains; and recognition of the expertise of the interdisciplinary team in decision-making is added as a separate mode of inquiry (Gausvik et al., 2015). This new reconceptualisation of the Cognitive Continuum Theory continues to recognise the importance of all research methodologies. Access to digital technology in health care has progressed exponentially in the past 10–20 years since the Cognitive Continuum Theory and Revised Cognitive Continuum Theory were first published. Nurses now have access to information and knowledge 'at their fingertips' (Booth et al., 2021). They no longer need to become 'faceless decision-makers', as described by Standing (2008), who need to 'step-back' from clinical practice to access or contribute to experimental research or clinical audits (Standing, 2010).

Nursing informatics is an ever-growing field that facilitates the integration of up-to-date data, information and knowledge via online information (internet), smartphone applications, artificial intelligence and robotic systems (Booth et al., 2021). Nurses now have immediate access to information such as patient test results, medication information, Cochrane databases and clinical trials, to aid decision-making. More information is available to support and inform critical thinking. In this era of digital literacy, patients and families expect more than decisions based solely on nurse intuition, particularly when more analytical data is readily available (Benetoli et al., 2018). None of the studies in this systematic review explored how the Cognitive Continuum Theory is applied using digital technologies. Education directed towards nurse competency in this field is vital for the future of the nursing profession.

System-aided judgement and ethical and professional codes of conduct continue to be important in guiding decision-making (Standing, 2010). The proposed model highlights the availability of all modes of inquiry for decision-making in everyday nursing practice. Some modes of inquiry in the original and Revised Cognitive Continuum Theory were redundant as decisions were made by others.

Despite the increase in decision-making support, human and practical forces 'push in' and constrain 'good' decision-making (Abdelhadi et al., 2020; de la Cruz, 1994). The findings of this review, together with previous research, have shown lack of time and resources, personal attributes of the nurse, and context (which includes organisational and workplace culture), impact decision-making (McCormack

et al., 2021; Nibbelink & Brewer, 2018; Truglio-Londrigan & Slyer, 2018).

The expansion of nursing knowledge and its ability to inform practice through theory development needs to keep pace with the accelerating changes in society, health science and technology. Despite the increasing expectation of the use of theory in research, nursing theories such as the Revised Cognitive Continuum Theory have remained largely stagnant and underused. Theory guides research, and the research findings from this systematic review have guided the proposed revision of the Cognitive Continuum Theory, which remains to be explored by future research.

7 | LIMITATIONS AND STRENGTHS

Only studies in English were included, and all included studies focussed on decision-making in western countries which may infer a cultural bias. Although five commonly used nursing databases were searched, searches of additional databases such as Web of Sciences or Scopus may have produced further studies. The authors acknowledge that the meta-aggregative method used in this study does not consider the heterogeneous nature of qualitative studies (Bergdahl, 2019). The authors have however provided a rigorous framework using verbatim extracts to demonstrate transparency. To the best of our knowledge, this is the first published study using the QUANTUM typology. The goal of this typology was to 'unmask theory' and to help identify and articulate theory in qualitative research (Bradbury-Jones et al., 2022). The findings of the QUANTUM analysis regarding the visibility and description of Cognitive Continuum Theory reflect, to a degree, the subjective views of the research team, and in these instances, the findings are informed by their collective consensus-based interpretation. However, this systematic review adopted a rigorous methodological process to explore the Cognitive Continuum Theory. The review adds to existing knowledge through the proposition of a new person-centred model of the Cognitive Continuum Theory.

8 | CONCLUSION

The versatility and transferability of the Cognitive Continuum Theory has been demonstrated by this review with the theory being applied across multiple fields of nursing research. The findings highlight the need for informatics and digital technology education to be a part of basic nursing education to contribute to clinical decision-making in practice. Guidelines and policy support clinical decision-making and need to be based on empirical research evidence in the relevant field of patient care. These guidelines and policies need to be at nurses 'fingertips' to contribute to decision-making in practice.

None of the researchers used their findings to suggest further developments or critique of the Cognitive Continuum Theory. Ongoing development of new theories, modification and revision of older theories to reflect advances in knowledge and technology are essential

for the continuing evolution of nursing as a profession. The outcome of this review has underscored the importance of a patient-centric reconceptualisation of the Cognitive Continuum Theory. The Person-centred Nursing Model of the Cognitive Continuum Theory has the potential to guide future research in clinical decision-making and requires testing through future well-designed nursing research.

AUTHOR CONTRIBUTIONS

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CONFLICT OF INTEREST STATEMENT

DATA AVAILABILITY STATEMENT

ORCID

Tricia O'Connor https://orcid.org/0000-0002-6770-8295

Jo Gibson https://orcid.org/0000-0002-3217-2101

Joanne Lewis https://orcid.org/0000-0001-8668-712X

Karen Strickland https://orcid.org/0000-0003-3123-8778

Catherine Paterson https://orcid.org/0000-0002-1249-6782

TWITTER

Karen Strickland strictlykaren

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supplementary Table 1: ENTREQ statement

No	Item	Description	Page
1	Aim	To explore how the Cognitive Continuum Theory has been used in qualitative nursing research, and to what extent it has been integrated in the research process.	7
2	Synthesis methodology	Meta-aggregation, to bring together qualitative data to form a new understanding of the uses of the cognitive continuum theory.	7, 8
3	Approach to searching	A pre-planned systematic electronic literature search was performed to seek all available studies.	8
4	Inclusion criteria	Inclusion and exclusion criteria were developed to identify studies that addressed the review question.	8-9
5	Data sources	A systematic electronic literature search of publication databases (CINAHL, Medline (EBSCOhost), PsycINFO, Embase, and PubMed) was undertaken in May 2022 from database inception. These databases were chosen based on the most likelihood of containing nursing research articles. Hand searches of reference lists from included full-text studies were performed to assure inclusiveness of all relevant studies.	8
6	Electronic Search strategy	The text phrase 'cognitive continuum theory' together with the truncation operator * for 'nurse', and NOT 'student nurse', formed the full search strategy (see Supplementary Table 2 for example search).	8 S2
7	Study screening methods	See sections titled 'Search outcomes' and 'Data extraction'	9-10
8	Study characteristics	See section 'Characteristics of the included qualitative studies' Also see 'Table 3: Overview of the included CCT studies'	11 Table 3
9	Study selection results	See section 'Study selection'. A flow diagram is presented in Figure 2 reporting on the selection process and results according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRIMSA) guidelines.	10-11 Fig 2
10	Rationale for appraisal	The Joanna Briggs Institute (JBI) checklist for qualitative research was chosen as the JBI checklist accentuates the congruence between the philosophy, methodology, and methods used in the study (Lockwood et al., 2015). The JBI tool addresses the theoretical validity of qualitative studies which is in keeping with the aims of this study.	9
11	Appraisal items	Joanna Briggs Institute (JBI) checklist for qualitative research. The Tool allocates "yes", "no", "unclear", or "not applicable" for ten quality appraisal questions. Studies were not eliminated based on methodological quality or theoretical validity. All studies were included with the evidence summarised and recorded, noting concerns about quality and the assessed risk of bias.	9 T 4
12	Appraisal process	Quality assessment was conducted independently by two reviewers and any disagreements resolved by discussion.	9
13	Appraisal results	Studies were not eliminated based on methodological quality or theoretical validity. All studies were included with the evidence summarised and recorded, noting concerns about quality and the assessed risk of bias.	11-12, T4

No	Item	Guide and description	Page
14	Data extraction	Data extraction was managed using Microsoft Excel and recorded information related to: general study information (such as: first author, publication year, country); participant characteristics; study design; theory, theoretical framework, or conceptual model; findings on decision-making; and comments, including strengths and limitations of the CCT	10
15	Software	EndNote™ (X9.3), Covidence™ (Covidence systematic review software), Microsoft Excel	9, 10
16	Number of reviewers	Full texts publications were reviewed by three researchers and disagreements were resolved across the whole author team of 5 authors. Credibility levels based on the congruence between authors' interpretation and the provided quote, were assessed as either 'unequivocal', 'credible', or 'not supported' (Munn et al., 2014). Assessments were based on the findings of two reviewers.	9-10, 11
17	Coding	A meta-aggregative synthesis was used based on the JBI approach to qualitative research (Aromataris & Munn, 2020). Verbatim extracts of the author's analytic interpretation of their findings were catalogued across the seven included studies. Findings were grouped based on meaning to generate categories. Categories were then synthesised into finding statements which expressed their significance as a whole across the studies.	10-11
18	Study comparison	Findings were grouped based on meaning to generate categories. Categories were then synthesised into finding statements which expressed their significance as a whole across the studies. Verbatim extracts of the author's analytic interpretation of their findings were catalogued across the seven included studies.	10-11
19	Derivation of themes	Process of deriving the themes – see section 'Data synthesis'	10
20	Quotations	Findings from the meta-aggregation of the seven included studies and representative quotes are set out in Supplementary Table 3, with the five synthesised findings presented here and more details provided in Supplementary Table 4.	12 S3, S4
21	Synthesis output	See section 'Synthesised Qualitative Findings' and 'Discussion'.	S3 and S4 12-20

Supplementary Table 2: Example of database search strategy for CINAHL and MEDLINE

Search no.	Concept	Search Terms
1	Cognitive continuum theory	'cognitive continuum theory'
2	Nurse/nursing/nurses	nurs*
3	Cognitive continuum theory and nursing	#1 AND #2
4	Student nurse	'student nurse'
5	Cognitive continuum theory and nursing	#3 NOT #4

Supplementary Table 3: Study findings and illustrations

Study		Evidence			Label
		Unequivocal	**Credible**	**Not supported**	
Study	Abdelhadi **et al. (2020)**				
Finding	**MNC: A result of scarce resources, or the nurse's agency?** - **MNC as a result of scarce resources**				
Illustration	"Frequently the shift ended and tasks still needed to be completed" p26164	X			F1
Finding	**MNC: A result of scarce resources, or the nurse's agency?** - **MNC as a result of nurses' agency**				
Illustration	"A nurse that is more responsible will miss care to a lesser degree. She will employ another style of thinking and be more aware of the tasks she performs" p26165	X			F2

Finding	**Is the nurse simply following recognized patterns, or "thinking harder"?**
	
	   - **Automated thinking**
	   - **Effortful thinking**				

Illustration	"When the level of awareness decreases and the nurse is less alert, MNC can prevail" p26165 "Patients who are not stabilized, or complex patients, require rapid care and it will lead me to think before I provide care, to broadly address all patients' needs and to provide more complete care" p26166	X			F3
Finding	**Situational factors triggering fluctuations in the nurse's awareness.** - **Task type**				
Illustration	"If I don't have enough time to complete all the tasks, I would consider postponing basic care of the patient, because these tasks are less monitored and take a lot of time. For example, bathing, cleaning, oral therapy and changing diapers p26166	X			F4

Finding	**Situational factors triggering fluctuations in the nurse's awareness.** - **Difficult patients**				
Illustration	"In case of a nagging patient, I try to work around… and if he keeps nagging, I will invest less efforts in analyzing his or her condition and get away" p26166	X			F5
Finding	**Situational factors triggering fluctuations in the nurse's awareness.** - **Patients' relatives**				
Illustration	"Sometimes families can reduce delays or omissions of treatments by helping the staff, helping with turning the patient and mobilization. So good families may help us complete our tasks and attend to other patients' needs" p26167	X			F6
Finding	**Situational factors triggering fluctuations in the nurse's awareness.** - **Head nurse's presence**				
Illustration	"I do not like to work in her presence, I feel good when she's not on shift and she causes overload and stress" p26167	X			F7
Study	**dela Cruz (1994)**				
Finding	**Skimming**				
Illustration	"There's no fat, … no frills. It's the least the patient can get along with and not be put in jeopardy" p223	X			F8
Finding	**Surveying**				
Illustration	"Our forms have to be printed up so that the necessary information is uniform and obtained in a uniform way …." p224	X			F9
Finding	**Sleuthing**				
Illustration	"Well, I just ask …. I already know …. I rely on past knowledge, knowledge that I've gained from nursing school and working … all these years …. It's knowledge that I've already gained through [the] practice of nursing" p224	X			F10
Study	**Dowding et al. (2014)**				
Finding	**Pharmacological management of heart failure patients**				

Illustration	"As you go home you'll think, oh god please let me be right. But then if you're wrong you just down titrate them and I think that's kind of, it does take a bit of balls but that's come from doing it quite a lot of times and touch wood it not going dramatically wrong" p1319	X			F11
Finding	**Managing patients in the palliative phase**				
Illustration	"So from a moral point of view I always feel a bit like the grim reaper, is this it? Because it's you who usually instigates that decision. But like I said I always ask for backing, I always speak to consultants and is there anything else we can do" p1321	X			F12
Study	**Edwards et al. (2022)**				

Finding	**Streaming to the most appropriate clinician or service**
	
	   - **Context: Nurse experience**
	   - **Context: Streaming guidance and training**
	   - **Context: Team-working and communication**				

Illustration	"We have the flow charts…………. ….but I think there's also a place for experience and clinical judgement, and knowing where to override the guidance, and that comes with confidence and experience" p4	X			F13

Finding	**Waiting times and patient flow**
	
	   - **Context: GPs working in a streaming role**
	   - **Context: Nurse experience**
	   - **Context: Guidance**
	   - **Context: Operational and strategic management of streaming**				

Illustration	"… they will go in too deep to why people have come, which then takes time…they have less influence …some of them don't know how to approach sort of people … and talk to them in a medical way that speeds this transition along" p5	X			F14
Finding	**Safe streaming decisions** - **Context: Nurse experience**				
Illustration	"… you've identified this clinical need for this patient but what you don't want is for their card to languish on the top of printer until the team leader sees it, picks it up, and then calls them through to a cubicle" p5	X			F15
Study	**Offredy et al. (2008)**				
Finding	**Time spent on prescribing issues**				

Illustration	"saw ''the same patients'' on a regular basis" p861		X		F16
Finding	**Participants' response to patient scenarios**				
Illustration	''I know from memory'' p862		X		F17
Finding	**Participants' self-rated knowledge and confidence levels in medication**				
Illustration	"I suppose I would say that I'm confident in my prescribing because I deal with the same conditions and you get to know the type of medication and which ones should not be given with others because of the interaction. It also depends on the patients as well. I don't have a problem giving advice about prescribed medication to do with their condition or with over-the-counter drugs" p863	X			F18
Finding	**CCT and response to scenarios**				
Illustration	''I don't know for certain but my first reaction would be …''p864 ''refer the patient to the GP'' p864		X		F19
Study	**Tower et al. (2014)**				
Finding	**Deterioration in condition**				
Illustration	"At 18:35 the patient stated not feeling well (level 1). Umm, she was cyanosed and peripherally cold (level 1). Her obs I'm going to write, her heart rate 109, her respiratory rate was 22, her blood pressure was 100/60, her oxygen saturations were 79% on room air (level 1). Umm, the reason I'm writing this was because it's to show that she really was having quite a bit of trouble (level 2). Ward call was called and ward call attendant" p1406-6	X			F20
Finding	**Not responding to prescribed treatments as expected**				
Illustration	"He's only a young chap, 19 years old (level 1). Had an incision and drainage of his pilonidal sinus (Level 1). Umm, initially he had fluids running, initially his blood pressure was quite low (level 2), umm, but during the whole theatre and recovery, his blood pressure was you know, still quite low in the low 90's (Level 2). But anyway he had the fluids running, he's only young (level 1). Monitored his umm, obs half-hourly for the first I think three hours (level 1). Umm, I just wanted to make sure that his blood pressure was steadily going up which it was (level 2)" p1406		X		F21
Finding	**Issues related to professional practice that impacted on patients' conditions**				
Illustration	"My colleague has already written in the progress notes but I think I want to add more. Umm, what I am going to write is that this patient was actually quite wheezy	X			F22

	and quite distressed early in the shift, was quite upset (level 1). She was asking me whether her anti-depressant medication had been given today and yesterday (level 1). Checked whether yesterday's medication, anti-depressant was given (level 1). It hadn't been and I think this might have contributed to the lady's umm, reason why she was distressed (level 2)" p1407				
Study	**Tower et al. (2012)**				
Finding	**The newly admitted patient**				
Illustration	"SA1 Verbatim quote - Came in with chest pain; Newly diagnosed diabetic, Mobilising well; tolerating diet" "SA2 Verbatim quote - So he's completely independent; His diabetes is really well controlled" "SA3 Verbatim quote - Allied Health will be able to support him in the community as well; He'll probably be discharged" p2922 (SA: situation awareness; 1-3: levels of situation awareness)	X			F23
Finding	**The patient whose condition was as expected**				
Illustration	"SA1 Verbatim quote - He had some difficulty breathing (patient admitted with respiratory tract infection); He's been prescribed a saline neb (nebulised saline)" "SA2 Verbatim quote - It's had a good effect" "SA3 Verbatim quote - So if the night shift are concerned as to why this patent is short of breath they can say, he had a neb earlier and that helped him, so let's try again" p2924 (SA: situation awareness; 1-3: levels of situation awareness)	X			F24
Finding	**The discharging patient**				
Illustration	"SA1 Verbatim quote - Next of kin notified; there's an ambulance booked" "SA2 Verbatim quote - I've done this because a few times the patient's family hasn't been notified" "SA3 Verbatim quote - Families get very concerned that the patient has gone without them knowing where they are" p2925 (SA: situation awareness; 1-3: levels of situation awareness)	X			F25

Evidence is allocated to a category based on quality level of finding: **Unequivocal** (findings accompanied by an illustration that is beyond reasonable doubt; therefore, not open to challenge), **credible** (findings accompanied by an illustration lacking clear association with it and therefore open to challenge) and n**ot supported** (findings are not supported by the data)

Supplementary Table 4: Synthesised finding statements

Findings	Categories	Synthesised Finding
22 findings: F2, F3, F4, F5, F6, F7, F10, F11, F12, F13, F14, F15, F16, F17, F18, F19, F20, F21, F22, F23, F24, F25	Personality / character Decision-making ability Knowing - education - intuition - experience - judgement - mental models	**The decision-making capacity of the individual nurse** *Statement:* The decision-making capacity of the nurse is dependent on their personal traits, their ability to incorporate multiple ways of knowing, together with their decision-making ability.
10 findings: F2, F3, F5, F12, F14, F16, F17, F18, F19, F20	Clinical cues - pattern matching Assessment	**Nurses level of experience** *Statement:* Information gathering, through assessment and recognition of patient cues, by experienced nurses lead to pattern matching and the generation of mental schemata or models which aid decision-making.
4 findings: F11, F13, F20, F21	Guidelines Protocols	**Availability of decision support tools** *Statement:* Decision support tools, together with organisational and professional boundaries, both assisted and hindered nurses' decision-making.
6 findings: F1, F4, F8, F13, F14, F15	Time Resources Lack of experience	**The availability of resources** *Statement:* The pressures and constraints of time, lack of resources and limited work experience inhibited decision-making and resulted in reduced quality of patient care.
4 findings: F12, F19, F20, F23	Consult with others	**Access to senior staff and peers** *Statement:* Shared decision-making through access to senior staff and peers aid decision-making, whereas supervision can be stressful.

Author(s)	The visibility of theory			The description of theory			Summary
	Question: How well are you able to 'see' theory?			Question: How do authors describe their use of theory?			
	Seemingly absent	Partially described	Consistently described	How theory has informed the study	Where theory is located within the study	How theory interacts with methodology	How authors describe their use of the CCT
1. Abdelhadi et al. 2020		B1. Theory (or theories) may be mentioned or discussed with reference to theorists in the field, but no explicit statement is made about the influence of these on the study.		D1. The study may be described as empirical (inductive) research.	E3. A single theory or the work of multiple theorists may be utilised near the end of a study to make sense of the study findings.		
Quote		INTRODUCTION - Our study explores the rationing of care through the lens of decision-making theory (Abdelhadi et al., 2020, p. 2162)		... our findings might be understood through the lens of Hammond's (1996) cognitive continuum theory (CCT) of decision-making (Abdelhadi et al., 2020, p. 2168)	... our findings might be understood through the lens of Hammond's (1996) cognitive continuum theory (CCT) of decision-making (Abdelhadi et al., 2020, p. 2168)		... our findings might be understood through the lens of Hammond's (1996) cognitive continuum theory (CCT) of decision-making (Abdelhadi et al., 2020, p. 2168)
Quote		DISCUSSION - Taken together, our findings might be understood through the lens of Hammond's (1996) cognitive continuum theory (CCT) of decision-making (Abdelhadi et al., 2020, p. 2168)		... exploring the phenomenon through the lens of CTT (Hammond, 1996) (Abdelhadi et al., 2020, p. 2168)	... exploring the phenomenon through the lens of CTT (Hammond, 1996) (Abdelhadi et al., 2020, p. 2168)		
Quote		CONCLUSION - Theoretically, these findings suggest that scholars should also embrace an agency perspective for MNC, exploring the phenomenon through the lens of CTT (Hammond, 1996) (Abdelhadi et al., 2020, p. 2168)					
2. dela Cruz, 1994			C1. The article is infused with theory.	D1. The study may be described as empirical (inductive) research.	E3. A single theory or the work of multiple theorists may be utilised near the end of a study to make sense of the study findings.		

Quote			INTRODUCTION – Using the grounded theory method, this study describes the CDM styles … (dela Cruz, 1994, p. 222) … the grounded theory method is most useful in areas where little research has been done … (dela Cruz, 1994, p. 222)	METHODOLOGY - Consistent with grounded theory, theoretical sampling led to … (dela Cruz, 1994, p. 222)	CONCLUSIONS AND IMPLICATIONS - The shifting of clinical decision making styles supports the idea of a cognitive continuum … (dela Cruz, 1994, p. 225)		… supports the idea of a cognitive continuum … (dela Cruz, 1994, p. 225)
			METHODOLOGY - Consistent with grounded theory, theoretical sampling led to … (dela Cruz, 1994, p. 222)				… corresponds to … (dela Cruz, 1994, p. 224)
Quote			DATA COLLECTION AND DATA ANALYSIS - This study uses the constant comparative technique that requires concurrent data collection and analysis (Strauss & Corbin, 1990) (dela Cruz, 1994, p. 223)				
Quote			Amassing information before diagnosing corresponds to the simultaneous scanning strategy that Hammond and his associates (Hammond et al., 1966) found in their studies (dela Cruz, 1994, p. 224) CONCLUSIONS AND IMPLICATIONS - The shifting of clinical decision making styles supports the idea of a cognitive continuum … (dela Cruz, 1994, p. 225)				
			… the matching between the type of thinking and the decision-making situation depends on what the decision-maker knows (Hamm, 1988) (dela Cruz, 1994, p. 226)				
3. Dowding et al., 2009			C3. Theory guides and directs the various phases of the research process and can be tracked throughout a published article.	D1. The study may be described as empirical (inductive) research.	E2. A theoretical lens may be identified during the study and is used as an analytical framework.		

Quote							
Quote				BACKGROUND - Cognitive continuum theory (CCT) (Hammond et al. 1987, Hamm 1988, Thompson 1999) suggests that the structure of a decision task can be analysed according to its characteristics. (Dowding et al., 2009, p. 1314)	DATA COLLECTION - Figure 2 Interview topic guide. How do you interpret pt cues? How does your knowledge of the patient inform your decisions/actions? How does your previous experience inform your actions? (Dowding et al., 2009, p. 1317)	BACKGROUND - Cognitive continuum theory (CCT) (Hammond et al. 1987, Hamm 1988, Thompson 1999) suggests that the structure of a decision task can be analysed according to its characteristics. (Dowding et al., 2009, p. 1314)		… to examine the relationship between decision tasks and the processes …" (Dowding et al., 2009, p.1313)
Quote				DATA COLLECTION - Figure 2 Interview topic guide. How do you interpret pt cues? How does your knowledge of the patient inform your decisions/actions? How does your previous experience inform your actions? (Dowding et al., 2009, p. 1317)		FINDINGS - Table 2 Summary of findings Appeared to collect a lot of clinical-physical information, guided by 'checklist'. >intuition inducing Guidelines/protocols available based on research evidence. >analysis inducing There is the potential to 'optimise' the patient on therapy. Some difficulty predicting interactions between medications. There is the ability to reverse the decision. >quasi-rationality What time is available for the decision? Decision strategies No time pressure within consultations – have the time available to think through options. >analysis inducing Decision strategies		

Quote			FINDINGS - Table 2 Summary of findings Appeared to collect a lot of clinical-physical information, guided by 'checklist'. *>intuition inducing* Guidelines/protocols available based on research evidence. *>analysis inducing* There is the potential to 'optimise' the patient on therapy. Some difficulty predicting interactions between medications. There is the ability to reverse the decision. *>quasi-rationality* What time is available for the decision? Decision strategies No time pressure within consultations – have the time available to think through options. *>analysis inducing* Decision strategies			
			DISCUSSION - Cognitive continuum theory suggests … (Dowding et al., 2009, p. 1321)			
4. Edwards et al., 2022			C2. Theory is consistently and clearly described throughout the entire research process.	D2. The authors may draw on a single theory.	E4. Theory (single or multiple) has been rigorously applied to all stages of the research.	
Quote			ABSTRACT - We used realist methodology, synthesising a middle-range theory with our qualitative data … (Edwards et al., 2022, p. 1)	We integrated a psychological theory, the Revised Cognitive Continuum Theory (RCCT) … (Edwards et al., 2022, p. 2)	ABSTRACT - We used realist methodology, synthesising a middle-range theory with our qualitative data … (Edwards et al., 2022, p. 1)	Using a middle range theory (RCCT) as a theoretical lens to help us examine our findings helped explain how … (Edwards et al., 2022, p. 6)
Quote			METHODS - We integrated a psychological theory, the Revised Cognitive Continuum Theory (RCCT) [14], with our findings … (Edwards et al., 2022, p. 2)		METHODS - We integrated a psychological theory, the Revised Cognitive Continuum Theory (RCCT) [14], with our findings … (Edwards et al., 2022, p. 2)	These findings are consistent with other literature describing nurses decision-making … (Edwards et al., 2022, p. 6)
						We integrated … with our findings to explain mechanisms … (Edwards et al., 2022, p. 2)

Quote			FINDINGS - - … they did not consider the type of intuitive questions that more experienced nurses might ask (M) … Because junior nurses were less experienced in using their intuitive and reflective judgements (C), they took longer to … … there were fewer opportunities for peer-aided judgment (M) leading to poorer patient flow (O). … relied more on system-aided judgement to inform their decisions (M) (Edwards et al., 2022, p. 3). DISCUSSION - Using a middle range theory (RCCT) [14] as a theoretical lens to help us examine our findings … (Edwards et al., 2022, p. 6) IMPLICATIONS FOR POLICY AND PRACTICE - To guide our consideration of implications for policy and practice we draw upon … middle-range theory … (Edwards et al., 2022, p. 6)		FINDINGS - - … they did not consider the type of intuitive questions that more experienced nurses might ask (M) … Because junior nurses were less experienced in using their intuitive and reflective judgements (C), they took longer to … … there were fewer opportunities for peer-aided judgment (M) leading to poorer patient flow (O). … relied more on system-aided judgement to inform their decisions (M) (Edwards et al., 2022, p. 3). DISCUSSION - Using a middle range theory (RCCT) [14] as a theoretical lens to help us examine our findings … (Edwards et al., 2022, p. 6) IMPLICATIONS FOR POLICY AND PRACTICE - To guide our consideration of implications for policy and practice we draw upon … middle-range theory … (Edwards et al., 2022, p. 6)	To guide our consideration of implications for policy and practice we draw upon … middle-range theory … (Edwards et al., 2022, p. 6)	To guide … (Edwards et al., 2022, p. 6)
5. Offredy et al., 2008			C2. Theory is consistently and clearly described throughout the entire research process.	D4. The appropriateness of the theory or theories is critiqued.	E4. Theory (single or multiple) has been rigorously applied to all stages of the research.	F2. Researchers use their findings to further develop or critique existing theory.	
Quote			INTRODUCTION - The responses to the scenarios are explained within Hammond's (1978) cognitive continuum theory (Offredy et al., 2008, p. 856) Patient scenarios and cognitive continuum theoretical framework can help explain … and inform … to develop and improve … (Offredy et al., 2008, p. 856) The use of CCT in this paper assumes … (Offredy et al., 2008, p. 857)	CRITIQUE - Hammond's view about the use of intuition in decision-making is in stark contrast to … (Offredy et al., 2008, p. 865) … agree with Hammond's view about … (Offredy et al., 2008, p. 865) This view concurs with CCT, which suggests … (Offredy et al., 2008, p. 865)	Patient scenarios and cognitive continuum theoretical framework can help explain … and inform … to develop and improve … (Offredy et al., 2008, p. 856)	Hammond's view about the use of intuition in decision-making is in stark contrast to … (Offredy et al., 2008, p. 865) … agree with Hammond's view about … (Offredy et al., 2008, p. 865) This view concurs with CCT, which suggests … (Offredy et al., 2008, p. 865)	Patient scenarios and cognitive continuum theoretical framework can help explain … and inform … to develop and improve … (Offredy et al., 2008, p. 856)

Quote			METHOD - Hammond's (1978) theoretical framework guided and informed the analysis (Offredy et al., 2008, p. 857)		Hammond's (1978) theoretical framework guided and informed the analysis. (Offredy et al., 2008, p. 857)		Hammond's (1978) theoretical framework guided and informed the analysis. (Offredy et al., 2008, p. 857)
			FINDINGS (from scenario 1) - According to the theory, the six participants … used mode 5—moderately strong quasi-rational thought (Offredy et al., 2008, p. 864)				
			… there were two important cues … (Offredy et al., 2008, p. 864)				
			… From the theory's perspective it could be postulated that this cue … (Offredy et al., 2008, p. 864)				
			The mode of thinking will depend on … (Offredy et al., 2008, p. 864)				
			… Hammond (1978) explains that … (Offredy et al., 2008, p. 864)				

Quote			DISCUSSION - Hammond (1978) states that … (Offredy et al., 2008, p. 864) CRITIQUE - Hammond's view about the use of intuition in decision-making is in stark contrast to … (Offredy et al., 2008, p. 865) … agree with Hammond's view about … (Offredy et al., 2008, p. 865) This view concurs with CCT, which suggests … (Offredy et al., 2008, p. 865) CONCLUSIONS - CCT provides a general framework for describing features of cognition. (Offredy et al., 2008, p. 866) CCT places emphasis on … (Offredy et al., 2008, p. 866)		CCT provides a general framework for describing features of cognition. (Offredy et al., 2008, p. 866)		The responses … are explained within Hammond's (1978) cognitive continuum theory … (Offredy et al., 2008, p. 856)
7. Tower et al., 2014		B2. It is not clear how theory and methodology are related.		D1. The study may be described as empirical (inductive) research.	E3. A single theory or the work of multiple theorists may be utilised near the end of a study to make sense of the study findings.		

Quote		ABSTRACT - Hamm's cognitive continuum theory, when related to situation awareness, is a useful decision-making theory to provide a platform on which to draw together components of situation awareness and provide a framework on which to base decision-making regarding documentation. (Tower & Chaboyer, 2014, p. 1403)		DISCUSSION - One theory that highlights the complexity of decision-making is Hamm's cognitive continuum theory (CCT) … (Tower & Chaboyer, 2014, p. 1407)	DISCUSSION - One theory that highlights the complexity of decision-making is Hamm's cognitive continuum theory (CCT) … (Tower & Chaboyer, 2014, p. 1407) Related to SA, this decision-making theory is useful because it embraces many of the key concepts of SA, but importantly provides a platform on which to draw together the components of SA to provide a framework on which sound judgement can be based. Applied to the study findings, such a framework could be used to make explicit … (Tower & Chaboyer, 2014, p. 1407) Making decisions, informed by SA and guided by CCT, provides further transparency to the decision-making process … (Tower & Chaboyer, 2014, p. 1407)		… highlights the complexity of decision-making … (Tower & Chaboyer, 2014, p. 1407)
Quote		DISCUSSION - One theory that highlights the complexity of decision-making is Hamm's cognitive continuum theory (CCT) … (Tower & Chaboyer, 2014, p. 1407)					… to provide a platform on which to draw together components of situation awareness and provide a framework on which to base decision-making … (Tower & Chaboyer, 2014, p. 1403)
8. Tower et al., 2012		B2. It is not clear how theory and methodology are related.		D1. The study may be described as empirical (inductive) research.	E3. A single theory or the work of multiple theorists may be utilised near the end of a study to make sense of the study findings.		
Quote		DISCUSSION - A model of decision making that compliments SA is Hamm's (1988) model of decision-making, adapted from Hammond's CCT. Hamm (1988), drawing on Hammond's (1978) theoretical development regarding decision-making (Tower et al., 2012, p. 2926)		BACKGROUND - There is also a well-established theory base that relates to clinical decision-making (Tower et al., 2012, p. 2918).	BACKGROUND - There is also a well-established theory base that relates to clinical decision-making (Tower et al., 2012, p. 2918).		… used to help understand the findings presented in this paper (Tower et al., 2012, p. 2926)

Quote		DISCUSSION - The notion of CCT can be used to help understand the findings presented in this paper. First, it can assist by predicting the most appropriate mode of cognition … Second, it can provide transparency in decision-making ... (Tower et al., 2012, p. 2926)		Cognitive continuum theory (CCT) embraces both intuitive and analytic approaches but contends that the approach employed by the decision-maker will be based on the complexity of the task structure, the ambiguity of the task and the nature of the presentation of the task (Hamm 1988) (Tower et al., 2012, p. 2918)	Cognitive continuum theory (CCT) embraces both intuitive and analytic approaches but contends that the approach employed by the decision-maker will be based on the complexity of the task structure, the ambiguity of the task and the nature of the presentation of the task (Hamm 1988) (Tower et al., 2012, p. 2918)		
Quote		CONCLUSION - It was recognised here that whilst SA was important, it was also important to choose an appropriate decision-making framework. CCT was suggested as a decision-making model that could support SA … (Tower et al., 2012, p. 2927)		DISCUSSION - The notion of CCT can be used to help understand the findings presented in this paper. First, it can assist by predicting the most appropriate mode of cognition … Second, it can provide transparency in decision-making ... (Tower et al., 2012, p. 2926) CONCLUSION - It was recognised here that whilst SA was important, it was also important to choose an appropriate decision-making framework. CCT was suggested as a decision-making model that could support SA … (Tower et al., 2012, p. 2927)	DISCUSSION - A model of decision making that compliments SA is Hamm's (1988) model of decision-making, adapted from Hammond's CCT. Hamm (1988), drawing on Hammond's (1978) theoretical development regarding decision-making (Tower et al., 2012, p. 2926) The notion of CCT can be used to help understand the findings presented in this paper. First, it can … (Tower et al., 2012, p. 2926) CONCLUSION - It was recognised here that whilst SA was important, it was also important to choose an appropriate decision-making framework. CCT was suggested as a decision-making model that could support SA … (Tower et al., 2012, p. 2927)		

Visibility	How well are you able to 'see' theory?		
A. Seemingly absent	B. Partially described	C. Consistently described
A1. Theory is not mentioned at all.B.1. Theory (or theories) may be mentioned or discussed with reference to theorists in the field, but no explicit statement is made about the influence of these	B1. Theory (or theories) may be mentioned or discussed with reference to theorists in the field, but no explicit statement is made about the influence of these on the study.	C1. The article is infused with theory.
	B2. It is not clear how theory and methodology are related.	C2. Theory is consistently and clearly described throughout the entire research process.
		C3. Theory guides and directs the various phases of the research process and can be tracked throughout a published article.
		C4. Theory is addressed in relation to the alignment of literature, research questions, methods, analysis and findings.

Description	How do authors describe their use of theory?	
D. How the theory informed the study	E. Where theory is located within the study	F. How theory interacts with methodology
D1. The study may be described as empirical (inductive) research.	E1. Theory may be evident from the beginning and guide the research questions.	F1. Theory may be derived from the qualitative findings, as in a grounded theory study.
D2. The authors may draw on a single theory.	E2. A theoretical lens may be identified during the study and is used as an analytical framework.	F2. Researchers use their findings to further develop or critique existing theory.
D3. The authors may blend multiple theories.	E3. A single theory or the work of multiple theorists may be utilised near the end of a study to make sense of the study findings.	
D4. The appropriateness of the theory or theories is critiqued.	E4. Theory (single or multiple) has been rigorously applied to all stages of the research.	