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CONCEPT ANALYSIS

Clinical reasoning: concept analysis

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Abstract

Title. Clinical reasoning: concept analysis.

Aim. This paper is a report of a concept analysis of clinical reasoning in nursing.

Background. Clinical reasoning is an ambiguous term that is often used synonymously with decision-making and clinical judgment. Clinical reasoning has not been clearly defined in the literature. Healthcare settings are increasingly filled with uncertainty, risk and complexity due to increased patient acuity, multiple comorbidities, and enhanced use of technology, all of which require clinical reasoning.

Data sources. Literature for this concept analysis was retrieved from several databases, including CINAHL, PubMed, PsycINFO, ERIC and OvidMEDLINE, for the years 1980 to 2008.

Review methods. Rodgers's evolutionary method of concept analysis was used because of its applicability to concepts that are still evolving.

Results. Multiple terms have been used synonymously to describe the thinking skills that nurses use. Research in the past 20 years has elucidated differences among these terms and identified the cognitive processes that precede judgment and decision-making. Our concept analysis defines one of these terms, 'clinical reasoning,' as a complex process that uses cognition, metacognition, and discipline-specific knowledge to gather and analyse patient information, evaluate its significance, and weigh alternative actions.

Conclusion. This concept analysis provides a middle-range descriptive theory of clinical reasoning in nursing that helps clarify meaning and gives direction for future research. Appropriate instruments to operationalize the concept need to be developed. Research is needed to identify additional variables that have an impact on clinical reasoning and what are the consequences of clinical reasoning in specific situations.

Keywords: clinical reasoning, concept analysis, decision-making, diagnostic reasoning, clinical judgment, nursing, problem-solving

Introduction

Clinical reasoning guides nurses in assessing, assimilating, retrieving, and/or discarding components of information that affect patient care. It is considered a characteristic that separates professional nurses from ancillary healthcare providers. Worldwide, nurses are increasingly more autonomous, responsible, and accountable for patient care.

Shortened hospital stays, patient acuity (nursing care intensity level), and advances in technology require nurses to think quickly to resolve problems. Decision-making under conditions of uncertainty, risk and complexity has become the norm of professional practice (Ebright *et al.* 2003, 2006). It is clinical reasoning that enables nurses to make these decisions, often without collaboration. However, little is known about the reasoning processes that nurses use to make clinical decisions, or how clinical reasoning differs from other commonly used terms (Norman 2005, Tanner 2006, Banning 2008). The term 'heuristics' has been used to explain decision-making by some authors (Cioffi 1997, Greenwood *et al.* 2000) and 'clinical reasoning' by others (Fonteyn 1998, Ferrario 2004). Greater understanding of this concept will enhance nursing education, improve nursing practice, and offer direction for further research.

Background

Multiple concepts have been used synonymously in the literature: *decision-making*, *problem-solving*, *clinical judgment*, *diagnostic reasoning* and *clinical reasoning*. While these concepts all include elements of both process and outcome, the concepts diagnostic reasoning and clinical reasoning focus on the thinking strategies that a nurse uses to make a judgment or decision and solve problems (Murphy 2004, Kautz *et al.* 2005, Su *et al.* 2005). Clinical reasoning is the precursor to a decision and action. Although authors provide conceptual and operational definitions for the terms they use, these definitions may only apply to that individual study or review paper. The same term may be redefined in subsequent work. Therefore, a concept analysis of clinical reasoning is necessary to clarify the meaning of this term and distinguish its attributes from those of other concepts.

Rodgers's method of evolutionary concept analysis was chosen as the method for this inquiry because of its rigorous inductive approach and its relevance to concepts that continue to evolve or change. It also focuses on current application of the concept and its relationship or 'interconnectedness' with multiple factors (Rodgers 2000). Rodgers suggests a technique of concept analysis that begins with a literature search using key words, titles, or abstracts that include the concept of interest. Table 1 lists the eight steps used in Rodgers's evolutionary method of concept analysis.

Data sources

Multiple databases and search strategies were used to review the literature, including the term *clinical reasoning* and the surrogate terms *diagnostic reasoning*, *decision-making* and *problem-solving*. Of these three, the term *decision-making* gave access to the most literature. This was the initial step in Rodgers's evolutionary method of concept analysis.

The EBSCOHost online search platform and CINAHL (Cumulative Index of Nursing and Allied Health Literature) databases were used with Boolean operators and an advanced search process. A thematic approach was employed to determine the relevance of citations, and all papers with the words 'decision-making,' 'clinical reasoning,' 'problem-solving' or 'judgment' in the title were retrieved, yielding a

Table 1 Applying Rodgers's method of concept analysis to clinical reasoning

Rodgers's evolutionary method	Concept analysis of clinical reasoning
Rodgers's steps in concept analysis	
1. Identify the concept of interest and associated expressions/terminology	1. Concept: clinical reasoning
2. Identify and select an appropriate discipline and period of time for data collection	2. Disciplines: philosophy, psychology, education, medicine, nursing; Databases: FirstSearch, Philosopher's Index, PsychINFO, ERIC, Medline, CINAHL; Time period: 1980–2008
3. Collect data regarding the attributes of the concept, including surrogate terms, antecedents, consequences, and references	3. Surrogate terms: diagnostic reasoning Antecedents: cues, cognitive perception, knowledge, experience, education, memory Consequences: judgment, decision, action, choice, inference, evaluation. References: nursing practice
4. Identify related concepts	4. Related concepts: problem-solving, decision-making, clinical judgment
5. Analyse data regarding the above characteristics	5. Identification of major themes: cognitive processes
6. Conduct interdisciplinary comparisons	6. Clinical reasoning in medicine
7. Identify a model case of the concept, if appropriate	7. Not identified
8. Identify hypotheses and implications for further development	8. Attributes: analysis, deliberation, heuristics, inference, metacognition, logic, cognition, information processing, intuition

total of 5966 publications. Due to the volume of data retrieved, additional limits of *source type* (periodicals), *major heading* (decision-making, clinical) and *years* (1980–2008) were placed. This yielded 1014 publications. Rodgers suggests that 20% of the retrieved literature be included in the sample, which further reduced the volume to 200 with adjustments for double entries (Rodgers 2000) (Table 2). This sample was drawn by assigning a number to each article and using a random number table to determine which publications would be included in the sample. Papers that included decision-making by physicians, advanced practice nurses, physical therapists or patients, and those that addressed ethical decision-making, were eliminated. This search completed the second step in Rodgers's method of concept analysis.

The literature was analysed for antecedents and consequences, surrogate terms, related concepts and attributes of clinical reasoning. Antecedents and consequences are defined as those events that either precede or follow the concept under analysis. Multiple conditions, behaviours or attitudes that occur prior to the concept are considered antecedents. Similarly, events or phenomena that occur afterwards suggest an action, outcome or response. Identification of surrogate terms and related concepts differentiates words that are synonymous and interchangeable with the concept under analysis. Finally, attributes that comprise the definition of the concept are listed. These activities represent multiple steps in the evolutionary method of concept analysis and can be carried out simultaneously (Rodgers 2000).

Results

Literature review

Psychology is credited with the two major theoretical frameworks which explain cognitive processes: subjective

Table 2 Search strategies for nursing literature

1. EBSCOHost online research platform
2. CINAHL (Cumulative Index of Nursing & Allied Health Literature) database
3. Advanced string search – Boolean/Phrase
4. Clinical reasoning in title (or)
5. Decision-making in title (or)
6. Problem-solving in title (or)
7. Judgment in title (and)
8. Nursing practice (5966)
9. Narrow results by Source type: periodicals (5545)
10. Narrow results by Subject: Major Heading – Decision-making, Clinical (1051)
11. Narrow results by year 1980–2008 (1014)
12. Access 20% of literature as sample for concept analysis

expected utility theory (SEUT) and information processing theory (Von Neumann & Morgenstern 1944, Newell & Simon 1972). Research methods developed and implemented in numerous studies have increased the scientific knowledge base of the discipline and stimulated research that followed later as these theories were applied to medicine and nursing. SEUT explains how decisions 'ought' to be made by expressing the best choice as a mathematical estimate of highest probability. Using this theory, a decision is made by assigning values, or utilities, to expected outcomes and by assigning probabilities, or decision weights, to uncertain outcomes (Von Neumann & Morgenstern 1944, Lopes 1987, Goldstein & Hogarth 1997). It has been suggested that judgment quality and decision accuracy may be better predicted by using SEUT, in which normative criterion measures indicate the best outcome (Dowding & Thompson 2003). Application of SEUT to nursing is apparent in basic life support (BLS) and advanced cardiac life support (ACLS) algorithms, emergency room triaging, and pain management. Although certain outcomes can be achieved by taking prescribed steps, not all situations can be standardized.

As interest in psychology increased, a new theory was needed to describe the process of decision-making in behavioural terms. Information processing theory (IPT) explained decision-making as a process of gathering information, weighing alternative options, and then making a final judgment (Newell & Simon 1972). Bounded rationality is an assumption of this theory. It states that only a limited number of bits of information (seven plus or minus two pieces) can be stored and easily retrieved from short-term memory. All other information is stored in long-term memory, which is harder to access (Miller 1956). Information processing theory is descriptive and focuses on how decisions *are* made rather than how decisions *ought to be* made, the basis of SEUT. Contrary to the linear algorithms of decision analysis, IPT represents decision-making as a multidimensional, cyclical, recursive process that easily adds or subtracts pieces of information for consideration.

The concept of clinical reasoning evolved from the application of decision-making to the healthcare professions. The goal of clinical reasoning in medicine is the accurate diagnosis of disease (Elstein 1995). Decision analysis has been the preferred normative and prescriptive model of decision-making in medicine, where a final 'best' outcome is depicted through an algorithm or decision tree (Cohen 1996, Eeckhoudt 1996). Elstein *et al.* (1978) proposed a medical descriptive model of decision-making based on information processing to guide clinicians in hypothesis generation and testing: the hypothetico-deductive method. Elstein used the terms *clinical reasoning*, *clinical decision-making*,

problem-solving and *diagnostic reasoning* interchangeably in his work. *Clinical judgment* is yet another term that has been used in medical research, which adds to the conceptual confusion (Feinstein 1994).

The concept of clinical reasoning fits well within the context of Benner's Model of Skill Acquisition in Nursing. In their seminal work, Dreyfus and Dreyfus (1980) developed a model of skill acquisition that ranked a person's performance according to five levels of proficiency. In 1984, Benner adapted this model to nursing skills at different levels of practice, ranging from limited cue recognition and analytic thinking (novice) to comprehensive understanding and intuition (expert). Conceptual reasoning was considered a requirement of problem-solving (Benner 1984). While the terms *decision-making* and *problem-solving* were used in her early research, the term *clinical judgment* was later preferred to describe the way a nurse understands problems, issues and concerns of patients (Benner 1984, Benner & Tanner 1987, Benner *et al.* 1992).

The term *clinical reasoning* was introduced into nursing literature in the 1980s to refer to the cognitive processes used by healthcare providers to *think about* patient issues (Jones 1988). It has been described as a 'forward chaining process' that moves sequentially through a series of logical inferences to a final decision. A representative model of clinical reasoning depicts it as an upward and outward spiral, which begins with an initial patient encounter and moves forward through data interpretation until a final outcome is reached (Higgs & Jones 1995). This model, which is congruent with information processing theory, integrates multiple key elements: cognition (thinking), metacognition (reflective thinking), knowledge, and contextual parameters of the patient and the environment.

Attributes of clinical reasoning have been identified in studies using information processing as the dominant theoretical framework and think-aloud approach with protocol analysis as the methodology (Greenwood *et al.* 2000, Simmons *et al.* 2003, O'Neill *et al.* 2005, Andersson *et al.* 2006, Funkesson *et al.* 2007, Banning 2008, Goransson *et al.* 2008). Beginning distinctions were made among terms that had previously been used indistinctly: *decision-making*, *problem-solving* and *clinical reasoning* (Norman 2005, Tanner 2006, Banning 2008). Simmons *et al.* (2003) propose that the terms *decision-making* and *problem-solving* imply an outcome or result of thinking, while *clinical reasoning* is the cognitive process of thinking about healthcare information. Recent publications have emphasized the impact of theoretical and procedural knowledge on thinking strategies used when making clinical decisions (Ferrario 2004, Murphy 2004, Su *et al.* 2005).

Findings from the selected nursing research indicated several attributes of clinical reasoning. These attributes differ according to nursing experience and domain-specific knowledge. Novice nurses identify fewer patient cues, are limited in their ability to cluster these cues, have difficulty identifying complex diagnoses, and do not reevaluate data as often as more experienced nurses (Benner *et al.* 1992, Greenwood & King 1995, O'Neill *et al.* 2005). While novices readily retrieve patient data, important cues are often overlooked as the degree of uncertainty or decision complexity increases (O'Neill *et al.* 2005, Andersson *et al.* 2006). In addition, experiential, formal and informal knowledge are all components of the reasoning process, but higher level of education is not always consistent with improved reasoning skills (Kuiper & Pesut 2004, Murphy 2004).

With increasing clinical experience, expert nurses employ heuristics (informal thinking strategies or cognitive shortcuts) to reason about complex issues. Heuristics enable nurses to review extensive patient information quickly by using numerous mental techniques (Cioffi 1997, Fonteyn 1998, Ferrario 2004, Judd 2005). Such heuristics can enable quick decision-making, but may result in erroneous conclusions due to 'thumbnail' views (O'Neill 1995, Cioffi 1997, Buckingham 2000). Nursing studies have identified several components of clinical reasoning: discipline-specific knowledge, experience, and both formal and informal thinking strategies (Bynes & West 2000, Funkesson *et al.* 2007, Banning 2008). Multiple informal thinking strategies have been identified, several of which include pattern recognition, generating hypotheses, setting priorities and making generalizations (Cioffi 1997, Fonteyn 1998, Buckingham & Adams 2000). While these techniques speed the thinking process, they may lead to erroneous conclusions when data are overlooked or discarded.

Surrogate/related terms

The term clinical reasoning is often used interchangeably with other concepts. The term *reasoning* is defined as a cognitive process directed toward forming conclusions, judgments or inferences from facts or premises (Webster's Dictionary 1989). Critical thinking is related to clinical reasoning. However, it is a broader concept that involves particular dispositions, skills and mental habits (Gordon 2000, Scheffer & Rubenfeld 2000, Hicks 2001). The terms *decision-making*, *problem-solving* and *clinical judgment* suggest an endpoint to the thinking process, while the terms *diagnostic reasoning* and *clinical reasoning* emphasize the cognitive processes involved prior to the endpoint.

Antecedents/consequences

Antecedents are events that occur prior to clinical reasoning, and consequences are events that occur as a result of it (Table 3). The review of literature elucidated distinctions among terms. Multiple events or circumstances may precede clinical reasoning and account for the skill with which this process is used. Variables that are difficult to measure may also be involved, including risk taking, maturity, formal and informal education, and experience. Similarly, events or phenomena that follow clinical reasoning indicate the outcome or the product of the concept. Choices may be correct or incorrect, appropriate or inappropriate. Every choice has implications and responsibilities associated with it. The consequences make the concept purposeful, directive, and dynamic. Clinical reasoning in nursing is as concerned with the process (cognition) as it is with the product (choice, decision, or resolution). If more strategies and models of clinical reasoning are proposed, the process will facilitate improved patient outcomes. Consequences from previous reasoning may become the antecedents to the next process, making it cyclical and recursive. Identification of surrogate and related terms, as well as antecedents and consequences of the concept, is an essential step in Rodgers's evolutionary method.

Attributes constitute the real definition of the concept under analysis and emerge as essences of meaning. Defining

**Table 3** Antecedents and consequences of reasoning

Antecedents	Consequences
Cognitive perception	Choice
Tacit or explicit knowledge	Cognitive awareness of additional cues
	Evaluation of alternatives
Cues	Decision
Perceived need for action	Implied action
Discipline-specific knowledge	
Experience	
Short- and long-term memory	
Formal/informal education	Judgment
	Inference

attributes of clinical reasoning are: data analysis (interpreting information), deliberation (rumination), heuristics (informal thinking strategies), inference (speculation), metacognition (reflective thinking), logic (argument), cognition (perception or awareness), information processing (organizing data) and intuition (insight independent of reasoning) (Figure 1).

Definition

Based on this concept analysis, clinical reasoning in nursing can be defined as a complex cognitive process that uses formal and informal thinking strategies to gather and analyse patient information, evaluate the significance of this information and weigh alternative actions. Core essences of this concept include cognition, metacognition and discipline-specific knowledge. Formal and informal thinking strategies blend decision analysis, information processing and intuition to evaluate the value of patient data. Information that is initially discarded as non-essential may be retrieved later in the process. Possible nursing actions are simultaneously proposed and evaluated for relevance. Clinical reasoning is dynamic, expansive and recursive, as information, interventions and alternative actions are considered or discarded at multiple cognitive entrance points.

Whether inductive or deductive reasoning is used, multiple variables affect this process in nursing, including cognitive ability, life experience, maturity and skill level within practice. The amount of information that is available, degree of risk involved and level of uncertainty also affect outcome. Clinical reasoning is context-dependent and domain-specific, incorporating knowledge unique to nursing within a specific practice setting. Each practice setting has its own standards of care, degrees of independence and interdependence with other healthcare professionals, risks involved and repercussions related to implied decisions. The use of formal strategies (decision analysis or information processing) or informal strategies (heuristics) depends on the situation and the experience of the nurse. The recursive nature of the process allows the nurse to move forward or backward
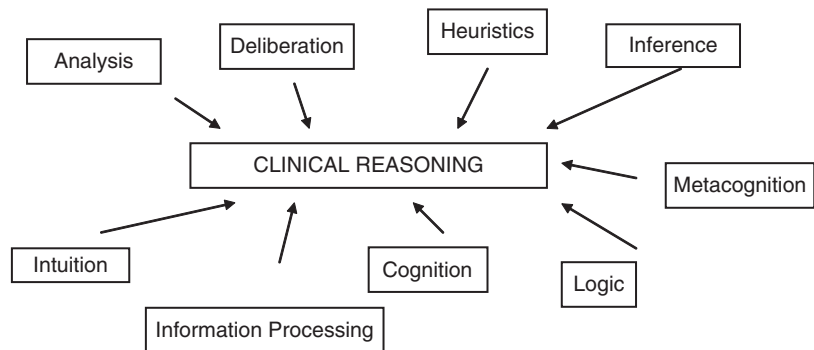
Figure 1 Attributes of clinical reasoning.

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What is already known about this topic

- Clinical reasoning is an ambiguous term that is often used synonymously with decision-making and clinical judgment.
- Clinical reasoning has not been clearly defined in the literature.
- Healthcare settings are increasingly filled with uncertainty, risk and complexity due to increased patient acuity, multiple comorbidities, and enhanced use of technology, all of which require clinical reasoning.

What this paper adds

- An analysis of the concept using Rodger's evolutionary method distinguished clinical reasoning from problem-solving and decision-making.
- Clinical reasoning in nursing is defined as a complex cognitive process that uses formal and informal thinking strategies to gather and analyse patient information, evaluate the significance of this information, and determine the value of alternative actions.
- Clinical reasoning in nursing is recursive and uses both inductive and deductive cognitive skills.

Implications for practice and/or policy

- This concept analysis provides a middle-range descriptive theory of clinical reasoning in nursing that helps clarify meaning and gives direction for future research.
- Appropriate instruments to operationalize the concept need to be developed.
- Research is needed to identify additional variables that have an impact on clinical reasoning and the consequences of clinical reasoning in specific situations.

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cognitively as information is added, deleted or re-evaluated. Cognitive flexibility enables a person simultaneously to assess cues, determine relevance, apply knowledge and experience, and weigh the value of data and possible interventions.

Discussion

The purpose of this analysis was to define the concept 'clinical reasoning' through literature retrieval from key disciplines. However, there were limitations. The inclusion of additional disciplines, research prior to 1980, and languages other than English would have broadened the

analysis. This concept analysis is a contribution toward the development of a middle-range descriptive theory of clinical reasoning in nursing. However, it has limitations in separating the term from similar ones identified in the literature search. Formal and informal thinking strategies, discipline-specific knowledge, and experience in practice intertwine to enable nurses to evaluate data in the context of a clinical situation. The clinical reasoning concept is also well-situated within Benner's model of skill acquisition in nursing. Essential concepts in her model are experience, knowledge, skills, and caring (Benner 1984, Benner *et al.* 1992, 1996, Johnson & Webber 2005). In the present analysis, Rodgers's evolutionary method was used to investigate a concept that is dynamic and still evolving within the practice of nursing. The use of other methods of concept analysis, such as Wilson's approach, might produce different outcomes (Wilson 1963).

Multiple additional variables may affect the outcome of clinical reasoning, including the complexity of the task, uncertainty of outcome, time, practice setting and risk involved. In addition, each nurse has a unique set of personal traits that influence the process. Recent research has identified what teaching strategies promote clinical reasoning and how various technologies assist nurses at the point of care (Murphy 2004, Kautz *et al.* 2005, Kuiper *et al.* 2008). However, research is still needed to determine what cognitive skills improve reasoning speed and accuracy, if English as a second language or gender of the nurse affects the process, and how increased risk and shortened deliberation time have a negative impact on outcome.

Conclusion

This concept analysis will yield better understanding of the term in nursing practice, theory development and research. Correlations between clinical reasoning and various attributes, antecedents and consequences are areas for future research, as are gender differences, English as a second language, area of practice and educational preparation. Other questions might include what effect technology has on the reasoning process, how the nursing shortage and patient acuity affect clinical reasoning, what resources can be developed or better implemented to assist nurses as they reason about clinical situations, and how novice nurses can learn the cognitive shortcuts and thinking strategies that expert nurses use.

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Conflict of interest

No conflict of interest has been declared by the authors.

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