

Situating uncertainty in clinical decision making

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In the clinical context conditions of uncertainty is an ever-present factor. The inability to eliminate uncertainty constrains the effectiveness of decision-making. In light of this, it is important to appreciate the current state of understanding uncertainty and position its role in decision making more specifically clinical decision making.

The concept of uncertainty

Various perspectives and disciplines have studied the concept of uncertainty and there is no common agreement on its terminology, definition, or classification. The complexity of uncertainty has led to multiple taxonomies (Beresford, 1991; Boschetti, 2011; Hans et al., 2011). In the ignorance taxonomy proposed by Smithson (1989,1993) uncertainty is conceptualized as arising from the incompleteness of knowledge of a phenomenon or event when available information is characterized by probability (the likelihood of a future event), ambiguity (a multiplicity of possible states for a single concept or event), or vagueness (a multiplicity of possible values on a continuum). Analysis of the concept of uncertainty has identified antecedents and defining attributes of uncertainty. Smith (2018) identified antecedents as lack of information, ambiguity, variability in interpretation, unpredictability, and inability to weigh outcomes appropriately. With defining attributes of uncertainty being probability (something could happen), individual perception of meaning or outcomes of a situation, temporality, unpredictability, and ambiguity of a given situation (Smith, 2018). The complex concept of

uncertainty remains incomplete with information in the dynamic state of uncertainty being unclear; and the paradoxical nature of the experience not well delineated (Marzantowicz, 2020).

A broad framework for uncertainty proposed by Wakeham (2015) has both objective and subjective dimensions of uncertainty. The subjective dimension is experienced by an individual in regard to their knowledge about some particular topic and the objective dimension of uncertainty assumes a world out there that is knowable only to a degree (Wakeham, 2015). The subjective dimension is supported by a previous analysis by Penrod (2002) that emphasizes the experience. Thompson & Dowding (2001) note experience is a form of knowledge.

In conclusion, uncertainty has been conceptualized most often to involve a level of information and knowledge being sourced to knowledge itself and to the knower with the challenge being working at the limits of knowledge. The completeness of current conceptualizations is questionable. There is a lack of a single overarching theoretical perspective on uncertainty in general. A coherent integrative taxonomy is required to capture the full range of uncertainties and provide specific distinctions that are meaningful.

Uncertainty in decision making

Within the decision-making, context uncertainty has been positioned as information processing within cognitive psychology (Smithson 1989) and has led to multiple descriptions. Cosier and Dalton's (1988) framework propose four levels of uncertainty in association with the relevance of information. These four levels are low uncertainty with highly relevant information, low uncertainty with low relevant information, high uncertainty with highly relevant information, and high uncertainty with low relevant information. For Lipshitz and Strauss (1997) uncertainty in decision making has two dimensions, source, and issue, with the source being incomplete information, inadequate understanding, or undifferentiated alternatives of equal attractiveness; and issue being particular outcomes, situation, or alternatives to which a given uncertainty applies. Another two-dimensional categorization of uncertainty in decision-making situations by Klein (1999) is objective and subjective involving the level of information; the level of knowledge, in which inferences are drawn about the data; and the level of understanding, in which the inferences synthesized involve the experiences the decision-maker has of the phenomena. Tannert et al., (2007) supports Klein and Hoffman's (1990) view of objective and subjective dimensions and points out there is a mismatch between the knowledge required and the knowledge available for decision-making. According to Simpkin and Armstrong (2019), incomplete knowledge can result in incomplete decision-making.

In response to the complex situation of uncertainty decision-making, processes have been proposed. According to Klein (1999), decision-makers need to search for workable solutions

as they are aware they do not have enough available information. More recently Gilboa, Minardi, and Samuelson [2017] showed in conditions of decision-making under uncertainty the decision maker evaluates possible actions by their case-based similarity and a set of scenarios affecting outcomes. This confirms Greenhalgh's (2013) process involving the use of case-based reasoning focused on what is best to do in a particular decision-making situation of uncertainty given a particular set of circumstances and how tacit knowledge informs judgment.

The complexity of conditions of uncertainty when making decisions and the decision-making processes to manage uncertainty remains challenging. A beginning point may be a broad framework of uncertainty in the decision-making of two dimensions, objective and subjective.

Uncertainty in clinical decision making

In the clinical context uncertainty has been found to often be ignored, its importance underappreciated and its consequences suppressed (Hatch, 2017). A recent systematic review of uncertainty in clinical situations determined there was a lack of a clear definition of clinical uncertainty (Bhise et al., 2018). This reflects the lack of a coherent integrative taxonomy of the full range of uncertainties and a comprehensive understanding of the effect of uncertainty in decision-making. The clinical domain provides its own contribution. The Institute of Medicine defines clinical uncertainty as, the degree of doubt that a health care provider experiences in relation to a patient's condition, which may, in turn, lead to ambiguities in the provider's understanding and interpretation of health-related information (Affonso et al., 2004). Though the acquisition of additional knowledge can reduce uncertainty intrinsic uncertainty cannot be completely eliminated in medical decision making (Dhawale et al., 2017).

In clinical work, Greenhalgh (2013) describes uncertainty as a singular, shadowy, and irrevocably fuzzy construct that continually slips from awareness and is not tidy and well-defined. Broadly, uncertainty in clinical work can be thought of as the conscious awareness of being unsure, of having doubt, of not fully knowing (Hans et al., 2011; Goodman, 1999). It exists in a form of awareness of incomplete understanding of a situation or event (Han, 2013). The awareness spectrum proposed by Boschetti (2011) has four quadrants with two axes: uncertain to certain and unaware to aware. This is an example of a development that could help to avert not recognizing uncertainty (McKenna & Martin-Smith, 2005). There is an agreement to some degree about sources of uncertainty in clinical work (Beresford, 1991; Hans et al., 2011; Hillen 2017). Beresford (1991) described the sources as technical, conceptual, and personal. Hans et al., (2011) integrative taxonomy include two other dimensions besides

sources. These are substantive issues and locus. Though the dimensions are conceptually useful their application is limited as they lack operational definitions.

A framework for decision making in uncertainty by Helou and Ryan (2020) outlines strategies for decision making beginning with a clinician's ability to recognize uncertainty then expects the decision-maker to continually increase their understanding of the uncertainty and priorities before ultimately arriving at a decision through a purposefully chosen approach or by effectively reducing the uncertainty in the situation so that the decision is clear. Performance of clinicians in conditions of uncertainty has shown clinicians accept uncertainty as an unavoidable part of practice recognizing cues that signal uncertainty and developing recurrent responses to uncertain situations (Han et al., 2021; Cristancho et al., 2013; Ledford et al., 2015; Simpson et al., 1986). However, clinicians were also found to disregard uncertainty and tend to avoid acknowledging and disclosing it (Katz, 1984; Kim & Lee, 2018; Ghosh, 2004).

In nursing uncertainty in decision-making has received little attention (Cranley et al., 2009). Thompson asserted that in clinical decision-making nurses grapple with irreducible clinical uncertainty (Thompson & Yang, 2009). A concept map of uncertainty has been developed from the literature by Cranley (2009). Antecedents identified to influence the perception of uncertainty include nurse attributes being years of nursing experience, level of domain knowledge, patient characteristics, and task characteristics (Cranley, 2009). Frequently cited factors related to the complexity of the task were perception of uncertainty, the number of information cues, intercorrelations between information cues, extraneous, irrelevant, or inconsistent information (Cranley, 2009). Nurses' experiences and responses to uncertainty in their practice, and the influence of uncertainty on their information needs and information-seeking requires more understanding.

Currently, uncertainty in clinical decision-making is understood only in a fragmented and incomplete manner. In general, no evidence was found that clinicians apply current knowledge proposed in conceptualizations and taxonomies of uncertainty in their practice. In the clinical context clinicians' awareness of uncertainty, an ever-present factor demands clinicians recognize and hold a clear and comprehensive understanding of its nature and implications for the decisions they are making. The usefulness of conceptualizations of clinical uncertainty lies in their ability to map key dimensions of uncertainty for clinicians' understanding and insight in clinical decision-making. A framework that captures the full range of uncertainties in clinical decision-making in a coherent useful way is required. A shift in the clinical culture to acknowledge clinical uncertainty and to make it explicit in practice and education is professionally overdue and needs to be addressed more strongly.

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