A GROUNDED THEORY OF INTENSIVE CARE NURSES’ EXPERIENCES AND
RESPONSES TO UNCERTAINTY

by

Lisa Anne Cranley

A thesis submitted in conformity with the requirements
for the degree of Doctor of Philosophy
Graduate Department of Nursing Science
University of Toronto

© Copyright by Lisa Anne Cranley 2009
ABSTRACT

A Grounded Theory of Intensive Care Nurses’ Experiences and Responses to Uncertainty

Lisa Anne Cranley

Doctor of Philosophy

Graduate Department of Nursing Science

University of Toronto

2009

The purpose of this study was to develop a theory to explain how nurses experience and respond to uncertainty arising from patient care-related situations and the influence of uncertainty on their information behaviour. Strauss and Corbin’s (1998) grounded theory approach guided the study. Semi-structured face-to-face interviews were conducted with 14 staff nurses working in an adult medical-surgical intensive care unit (MSICU) at one of two participating hospitals. The grounded theory recognizing and responding to uncertainty was developed from constant comparison analysis of transcribed interview data. The theory explicates recognizing, managing, and learning from uncertainty in patient care-related situations. Recognizing uncertainty involved a complex recursive process of assessing, reflecting, questioning and/or predicting, occurring concomitantly with facing uncertain aspects of patient care situations. Together, antecedent conditions and the process of recognizing uncertainty shaped the experience of uncertainty. Two main responses to uncertainty were physiological/affective responses and strategies used to manage uncertainty.
Resolved uncertainty, unresolved uncertainty, and learning from uncertainty experiences were three consequences of managing uncertainty. The ten main categories of antecedent, actions and interactions, and consequences that comprised the theory were interrelated and connected through temporal and causal statements of relationship. Nurse, patient, and contextual factors were linked through patterns of conditions and intervening relational statements. Together, these conceptual relationships formed an explanatory theory of how MSICU nurses experienced and responded to uncertainty in their practice. This theory provides understanding of how nurses think through, act and interact in patient situations for which they are uncertain, and provides insight into the nature of the processes involved in recognizing and responding to uncertainty. Study implications for practice, nursing education, and further theory development and research are discussed.
ACKNOWLEDGEMENTS

There are several individuals that I wish to acknowledge for their contribution to this dissertation. I first want to thank my doctoral supervisor and mentor, Dr. Diane Doran, Professor and Lawrence S. Bloomberg Limited Term Professor, Patient Safety, University of Toronto, who not only introduced me to nursing research but provided me with opportunities as a trainee to gain research experience and to develop my research interests. Your continued support and encouragement have inspired me to accomplish more than I thought possible, and have enabled me to embark on an academic career as an independent researcher. My sincerest gratitude.

My committee members Dr. Ann Tourangeau, Associate Professor, Lawrence S. Bloomberg Faculty of Nursing, University of Toronto, Dr. Lynn Nagle, Assistant Professor, Lawrence S. Bloomberg Faculty of Nursing, University of Toronto, and Dr. André Kushniruk, Associate Professor and Director, Health Information Science, University of Victoria, who challenged me to think in new and exciting ways and whose motivation and support have enabled me to achieve my research goals. Thank you for sharing your time and expertise.

I wish to further extend my gratitude to Dr. Ann Tourangeau, whose opportunities to engage in research as a research coordinator and co-investigator have enabled me to develop research skills and expand my knowledge. Thank you for your continued support. I am very appreciative of these opportunities.

My friends and colleagues with whom I have had the pleasure of completing my PhD with, in particular, Jen Lapum and Jessica Peterson, whose ongoing motivation and encouragement have enabled me to complete my studies. Thank you for always being there for me.
My family- my parents, my older sister Janice, and my twin sister Lori- thank you for your ongoing support and understanding.

My husband Chris, whose love, support, and encouragement kept me strong. Thank you for always believing in me.

Natasha Persaud, thank you for your involvement as a research assistant in the recruitment phase of this study.

I wish to thank the unit managers who welcomed me and introduced me to their nursing staff and the nurses who dedicated their time to participate in this research.

I also wish to acknowledge the financial support that I have received from the Canadian Institutes of Health Research, Doctoral Fellowship.
TABLE OF CONTENTS

A GROUNDED THEORY OF INTENSIVE CARE NURSES’ EXPERIENCES AND RESPONSES TO UNCERTAINTY ................................................................. i
ABSTRACT ........................................................................................................ ii
ACKNOWLEDGEMENTS ............................................................................... iv
CHAPTER 1: STUDY BACKGROUND AND SIGNIFICANCE ................................ 1
  Study Purpose ......................................................................................... 6
  Study Objectives ................................................................................... 7
CHAPTER 2: REVIEW OF THE LITERATURE ................................................. 8
  Scope of Literature Review ................................................................ 8
  The Concept of Uncertainty ................................................................. 9
  Uncertainty in Medical Practice ......................................................... 12
    Sources of Uncertainty .................................................................. 12
    Physicians’ Responses to Uncertainty ........................................... 13
      Cognitive Responses to Uncertainty ............................................. 14
      Affective Responses to Uncertainty .............................................. 16
      Cognitive/Behavioural Responses to Uncertainty ..................... 18
        Information needs ................................................................. 18
        Information seeking ........................................................... 21
  Summary of Uncertainty in Medical Practice ................................... 23
  Uncertainty in Nursing Practice ....................................................... 24
    Theoretical Perspectives: Clinical Decision Making Theory .......... 24
    Uncertainty Measures in Nursing ................................................. 30
    Study Findings that Indicate Nurses’ Uncertainty ....................... 33
    Nurses’ Information Needs and Information Seeking .................. 35
      Information needs ................................................................. 35
      Information seeking ........................................................... 37
  Related Concepts ............................................................................. 41
    Environmental Uncertainty .......................................................... 41
    Ambiguity ....................................................................................... 44
    Task Complexity ........................................................................... 45
  Summary: Definitions of Concepts .................................................... 49
    Uncertainty ....................................................................................... 49
    Information Need ........................................................................... 49
    Information Seeking ....................................................................... 49
    Environmental Uncertainty .......................................................... 50
    Ambiguity ....................................................................................... 50
    Task Complexity ........................................................................... 50
  Summary and Conclusions from the Review of the Literature .......... 50
  Concept Map of Uncertainty .............................................................. 53
  Antecedents ....................................................................................... 53
    Nurse attributes ........................................................................... 53
    Patient encounter ......................................................................... 54
    Patient characteristics ................................................................... 54
    Task characteristics ....................................................................... 54

vi
CHAPTER 3: METHODOLOGY ................................................................. 62
Definition of Theory ................................................................. 62
Grounded Theory ................................................................. 63
Research Design ................................................................. 64
Symbolic Interactionism .................................................. 64
Research Context and Procedures ........................................ 66
Setting ................................................................. 66
Sample ................................................................. 67
Sample Recruitment .................................................. 69
Recruitment Procedure- Interviews ...................................... 69
Recruitment Procedure- Member Checking ......................... 72
Data Collection ................................................................. 73
Interview Guide Pilot Test- Advanced Practice Nurses ............ 74
Interview Guide Pilot Test- Nurse Participants ..................... 76
Interview Procedure .................................................. 77
Mid-Analysis Member Check Interview Procedure ............. 78
Final Member Check Interview Procedure ......................... 80
Data Analysis ................................................................. 81
Open Coding- Discovering Categories ................................... 83
Axial Coding- Relating Categories ...................................... 85
Diagramming ................................................................. 86
Paying attention to participants’ language ......................... 87
Selective Coding- Integrating and Refining the Theory ............ 88
Theoretical Sensitivity .................................................. 90
Reaching Theoretical Saturation ...................................... 91
Data Management ................................................................. 91
Creating Free Nodes, Tree Nodes, and Annotations .............. 91
Memoing ................................................................. 93
Criteria for Establishing Trustworthiness .......................... 94
Ethical Considerations .................................................. 95
Protection of Human Subjects .......................................... 95
Confidentiality and Privacy ............................................. 96
CHAPTER 4: FINDINGS ................................................................. 97
The Experience of Uncertainty ........................................... 98
Uncertain Patient Care Situations: “A Web of Factors” ........ 98
Feeling “Caught Off Guard” ................................................. 99
Patients whose “condition changes really quickly.” ............... 99
How does uncertainty influence recognition of information needs? ................................ 202
Defining Uncertainty ........................................................................................................... 203
How do nurses respond to uncertainty in their daily practice? ......................................... 205
Physiological and Affective Responses to Uncertainty ...................................................... 205
Managing Uncertainty ......................................................................................................... 207
  Figuring it Out Myself ....................................................................................................... 207
  Collaborating with Nursing Colleagues ........................................................................... 208
  Working as a Team ............................................................................................................ 209
  Seeking Evidence .............................................................................................................. 210
Consequences of Managing Uncertainty ............................................................................ 212
How does uncertainty influence decisions to seek additional information? ...................... 213
  Uncertainty and the Moderating Role of Patient and Contextual Factors ...................... 213
  Fear of the Stupid Question and the Admission of Uncertainty .................................... 215
Theoretical Contribution to Nursing Knowledge ............................................................... 218
Study Implications ................................................................................................................ 219
  Implications for Nursing Practice .................................................................................... 219
  Implications for Nursing Education ................................................................................ 221
  Implications for Further Theory Development and Research ....................................... 222
Concluding Statement ........................................................................................................... 226
REFERENCES ......................................................................................................................... 227
LIST OF TABLES

Table 1. Sample Characteristics................................................................. 68
Table 2. Categories and Subcategories of Uncertain Patient Situations ............... 109
Table 3. Typology of Uncertain Patient Situations........................................ 110
Table 4. Summary of Nurses’ Conceptualizations of Uncertainty ....................... 120
Table 5. Categories of Strategies to Manage Uncertainty ................................ 146
Table 6. Interrelationships between Conditions and Actions and Interactions......... 171
LIST OF FIGURES

Figure 1. Concept map of uncertainty................................................................. 59
Figure 2. Initial scope of the study...................................................................... 61
Figure 3. Nurse conceptualizations of uncertainty across the nursing process..... 119
Figure 4. The process of recognizing uncertainty.................................................. 123
Figure 5. Figuring it out myself: reasoning process under procedural uncertainty. 130
Figure 6. Fear of the stupid question: asking an approachable nursing colleague. 134
Figure 7. Seeking a consistent answer. .................................................................. 141
Figure 8. Determining a patient’s readiness for transfer to a surgical floor: seeking concrete evidence. ........................................................................................................ 144
Figure 9. Four main categories of strategies to manage uncertainty and influencing factors. .............................................................................................................. 154
Figure 10. Recognizing and responding to uncertainty. ....................................... 163
Figure 11. Ten categories in relation to the coding paradigm. .............................. 165
LIST OF APPENDICES

Appendix A: Study flyer ........................................................................................................ 264
Appendix B: Study Explanation Letter ................................................................................. 265
Appendix C: Interview Consent Form .................................................................................. 266
Appendix D: Focus Group Information Letter ................................................................. 270
Appendix E: Original Interview Question Guide ........................................................... 271
Appendix F: Initial Data Collection and Analysis Plan ................................................... 273
Appendix H: Demographic Questionnaire ......................................................................... 275
Appendix I: Focus Group Consent Form ............................................................................. 276
Appendix J: Focus Group Question Guide .......................................................................... 280
Appendix K: Mid-Analysis Preliminary Findings (for Member Check) ......................... 281
Appendix L: Categories and Subcategories of Uncertain Patient Situations- Frequency Observations ............................................................................................................. 283
Appendix M: Categories of Strategies to Manage Uncertainty- Frequency Observations... 284
CHAPTER 1: STUDY BACKGROUND AND SIGNIFICANCE

“Knowledge is an unending adventure at the edge of uncertainty”
(Jacob Bronowski)

This doctoral research is an extension of my clinical interests and research experience. My clinical background is medical-surgical adult intensive care. I have worked as a registered nurse in intensive care in Canada and the US. Drawing from my clinical background, I am cognizant of the need to provide nurses with better access to current and real-time practice information to support nurses in their clinical decision making, and to reduce their patient care-related decision uncertainties. Nurses manage vast amounts of information for care delivery and require available evidence to effectively support their clinical decisions. My clinical background in medical-surgical intensive care has led to my interest in exploring uncertainty among this nurse population.

As a graduate student at the University of Toronto, I have had the privilege of working with interdisciplinary research teams from across Ontario on studies addressing nursing and other determinants of hospital-level outcomes (Tourangeau, Tu, Doran, Pringle, McGillis Hall, & O’Brien-Pallas, 2002) and nurse-related patient outcomes (Nursing and Health Outcomes Project [NHOP]; Doran et al., 2002). The primary goal of the NHOP feasibility study, led by Dr. Diane Doran, was to involve nurses in the collection and utilization of patient outcomes information relevant to their practice across the continuum of care (Doran et al., 2002). Building on the NHOP study, Dr. Doran and her research team examined the feasibility and usability of personal digital assistants for nurses to collect, utilize, and communicate patient health information to improve patient care outcomes and teamwork.
(Doran et al., 2004). It was within this study, entitled *Outcomes in the Palm of Your Hand: Improving the Quality and Continuity of Patient Care*, that this dissertation was situated.

The increased attention placed on the evidence-based practice movement by administrators, clinicians, and policy makers to improve the quality of patient care has created an imperative need to develop theoretical understanding of nurses’ uncertainty in practice, and the influence of uncertainty on their information behaviour and ultimately, their clinical decisions. The uncertainty associated with nursing practice and the widespread variation in the manner in which information is gathered, organized, understood, and used, contribute to the need for a stronger evidence base for nursing (Shapiro & Driever, 2004).

Evidence-based practice involves acknowledging the uncertainty that accompanies clinical decision making (Thompson, McCaughan, Cullum, Sheldon, & Raynor, 2002). Evidence-based nursing is the process by which nurses make clinical decisions by combining the best available evidence, their clinical expertise, and patient preferences in the context of available resources (DiCenso, Cullum, & Ciliska, 1998), and includes the accuracy and precision of nursing assessment measures and clinically relevant research concerning the effectiveness and safety of interventions (Affonso, Jeffs, Doran, & Ferguson-Paré, 2003).

Clinical decisions and their underlying processes are an integral part of nursing practice and the delivery of health care, but Thompson (2003) asserted that it is in this realm of clinical decision making that uncertainty manifests. The role of the nurse continues to expand, and with this expansion comes not only an increasing number of decisions, but also increasing decision complexity and clinical uncertainties (Kissinger, 1998). Nurses play an integral role in patient care quality and patient outcomes (Doran, 2003). In this age of accountability, nurses must be skillful in effectively using evidence-based and clinically
relevant information to facilitate the best possible nursing care (Snyder-Halpern, Corcoran-Perry, & Narayan, 2001), such as the collection and use of outcomes assessment data to inform patient care decisions (Cranley & Doran, 2004; Doran et al., 2002). Quality nursing care is dependent on good clinical decision making, which in turn is based on accurate judgements (Thompson & Dowding, 2002).

Patient safety literature has indicated that delivering processes of safe care through precision in assessments, planning appropriate care, monitoring and tracking patient responses, and ongoing evaluations of processes to prevent errors comprise one cornerstone to attaining safe systems in healthcare (Affonso et al., 2003). Pressures to improve patient safety within our health care system continue to gain momentum as a priority global health policy issue (WHO, 2004, cited in Tourangeau, Cranley, & Jeffs, 2006). This is due, in part, to the release of several reports in the last decade that have indicated that approximately 5-15% of hospital inpatient admissions experience an adverse event (e.g., Baker et al., 2004; Leape et al., 1991, cited in Tourangeau, Cranley, & Jeffs, 2006). Nurses have an essential role in contributing to improving patient safety through assessment and clinical decision making (RNAO, 2004), and while errors will never be completely eradicated from health care, many could be prevented by developing better defences, such as improving clinical decision making (Thompson, Dowding, & McCaughan, 2004). Decision inaccuracies and errors are a result of both system and individual contributors, and some key factors include lack of resources (e.g., time, access to information), uncertainty and complexity in decision making, patient acuity, stress, and the nurse’s ability to process information (Bourbonnais & Baumann, 1985; Bucknall & Thomas, 1997; Lewis, 1997). For example, increasing amounts of information of low relevance to inform decisions contribute to the potential for error
Furthermore, high stress in the clinical environment can reduce the efficiency and decision making capacity of the nurse, because specific cues that pertain to the patient situation can be missed (Bourbonnais & Baumann, 1985). Bourbonnais and Baumann (1985) posited that the quality of nurses’ thinking deteriorates as the quantity of environmental stressors increase, and appraisal of a situation as stressful or non-stressful may depend on the amount of perceived control the nurse has over the situation.

The intensive care unit (ICU) environment is particularly dynamic, complex, unpredictable, time constrained, and inherently stressful, with constant distractions and interruptions from nursing care that could potentially adversely affect the quality and safety of patient care (Bucknall, 2003; Bucknall & Thomas, 1997). The ICU differs from other areas of nursing because nurses make multiple decisions rapidly and patients are seriously ill and frequently unstable (Bucknall & Thomas, 1995), and this area has the highest reported mortality and complication rates in the hospital (Haugh, 2003). Adult medical-surgical patients present with many critical problems and illnesses, such as myocardial infarction, pneumonia requiring mechanical ventilation, patients recovering from invasive and/or surgical procedures such as cardiac catheterization or aortic aneurysm repair, and patients with cardiac arrhythmias requiring temporary pacemaker wires. The nature of patient problems determines the type, speed and complexity of decisions (Bucknall, 2003), and early recognition of patient problems, prioritizing decisions during crisis, and prompt treatment are key to preventing a patient’s condition from deteriorating to a life-threatening situation. Nurses working in an ICU are typically assigned direct care of one or two patients to enable close monitoring. In the ICU setting, several clinicians are involved in decision making about
patient care, and communication among clinicians is essential to optimal judgement by all
care providers (Chase, 1995). Jenks (1993) reported that nurses feel insecure and less certain
about their ability to make appropriate decisions when good relationships with colleagues
and patients do not exist.

Uncertainty has been depicted in the literature as an obstacle to effective decision
making (Lipshitz & Strauss, 1997) and has been linked with error (Lipshitz, Klein, Orasanu,
& Salas, 2001) and stress (Fox, 1957; Gerrity, DeVellis, & Earp, 1990; Gerrity, DeVellis,
Earp, & Light, 1992; Gray-Toft & Anderson, 1981; Lazarus & Folkman, 1984; Mishel,
1988). In the health care literature, uncertainty is largely situated within the context of
physicians’ clinical decision making, and has been described as an integral component of
health care providers’ decision-making processes (Baumann, Deber, & Thompson, 1991).
Kitson (1999) suggested that the most important skill for any health care professional is the
ability to recognize and handle clinical uncertainty: as manifested in the range of patient
conditions and in one’s own skill, expertise, and knowledge base. Despite the growing body
of theoretical and empirical literature addressing physicians’ clinical uncertainty, the study of
uncertainty in nurse decision making has received considerably less attention. Uncertainty in
nursing has focused on patients’ uncertainty in illness (Mishel, 1984, 1988) and nurses’
perceived environmental uncertainty in the context of turbulent health care environments
(Callahan, Young-Cureton, Zalar, & Wahl, 1997; Salyer, 1995, 1996). Gerrity et al. (1992)
acknowledged that beyond medicine, research has not begun to explore the predictors and
effects of uncertainty on other professionals, and they called for a comparative sociology of
uncertainty. More recently, nurse researchers highlighted the need to better understand
nurses’ clinical uncertainty by examining decisions nurses face (Thompson et al., 2002) and
establishing those areas where uncertainty is a feature of decision making and to which research knowledge can make a unique contribution (Thompson, McCaughan, Cullum, Sheldon, Mulhall, & Thompson, 2001b). Additionally, Affonso and colleagues (2003) emphasized the need to design and evaluate ways to enhance nurses’ precision in assessment and decision making, particularly under conditions of clinical uncertainty.

Nurses’ clinical judgements and decisions are complex, often involving the need to process a large number of information cues (Hammond, Kelly, & Castellan, 1966). Nurses strive to make the best possible decisions for their patients, yet information is not always readily available or in a usable format (Thompson, 2003). Access to research evidence and real-time patient information at the point of care (e.g., the patient’s bedside) may have a role to play in reducing the uncertainties associated with nurses’ clinical decisions. Yet gaps remain in our knowledge about nurses’ uncertainty and what aspects of clinical uncertainty, as described in medicine, are significant and relevant to nursing. To understand the potential for such evidence-based practice strategies, uncertainty in nursing practice must first be examined (Thompson & Dowding, 2002).

Study Purpose

The purpose of this study is to develop a substantive theory to explain how medical-surgical intensive care unit (MSICU) nurses experience and respond to uncertainty in practice. This theory is intended to further understanding about how nurses experience uncertainty and their recognition of information needs and their information seeking behaviour. Uncertainty is a phenomenon that is both under-described and under-investigated in the nursing literature and, in particular, in the ICU environment. This study will provide the foundation for theory
testing and strategy development to assist nurses in recognizing their information needs and managing their uncertainties.

Study Objectives

The two primary study objectives are:

1. To develop a substantive theory that explains how medical-surgical ICU nurses experience and respond to clinical uncertainties arising from patient care-related situations and the influence of uncertainty on their information behaviour.

2. To identify strategies that can be developed to assist medical-surgical ICU nurses to recognize information needs and manage their clinical uncertainties.
CHAPTER 2: REVIEW OF THE LITERATURE

Scope of Literature Review

An integrative review of theoretical and empirical literature was conducted to: (1) identify how uncertainty has been conceptualized and measured, (2) identify what aspects of uncertainty, as described in medicine, may be relevant to nursing practice, (3) identify what is known and not known about nurses’ uncertainty in their practice, (4) develop and refine the study research questions and objectives, and (5) develop preliminary interview questions.

An integrative review of research literature synthesizes information to draw conclusions about the current state of knowledge in a particular area (Polit & Beck, 2004).

A review of medical, nursing, decision making, psychology, medical-sociology, organizational behaviour, and library and information science literatures indexed in CINAHL, Medline, PubMed, PsycInfo, Social Sciences Abstracts, and ABI/INFORM Global databases from 1985-2005 was conducted. Earlier seminal studies were included where appropriate. Walker and Avant’s (2005) concept analysis methods and Rodgers’ (1989) evolutionary view of concepts provided frameworks that guided the literature review.

The literature review is organized into four sections. The first section provides an overview of the concept of uncertainty. The second section summarizes uncertainty in the medical-sociological and nursing literature. The third section describes concepts related to uncertainty, including environmental uncertainty, ambiguity, and task complexity. The fourth section summarizes the literature in terms of antecedents and consequences of uncertainty.
The Concept of Uncertainty

Uncertainty has been studied from a variety of perspectives and disciplines and appears in several literatures, such as sociology, psychology, decision making, organizational behaviour, and health care, where it has been predominately conceptualized as: (1) an attribute of the environment; (2) an attribute of the task; and (3) an individual’s response (e.g., cognitive, affective, and behavioural). These three attributes will be used to guide the review.

Because uncertainty has been studied from a variety of disciplines, several different conceptualizations, definitions, and theories exist. Lipshitz (1997) contended that the decision making literature alone offers a bewildering array of conceptualizations of uncertainty. In fact, Downey and Slocum (1975) stated that the everyday acquaintance with the term uncertainty makes it “all too easy to assume that one knows what he is talking about” (p. 562). Most notably, uncertainty has been studied in classical probability theory and theories of decision making. From its inception since the 1950s, the psychological study of “judgment and decision making under uncertainty” has been characterized by the critical role of the normative theory of rational belief and choice (Kahneman, 1991). Luce and Raffia (1957) introduced the logic of decision making under uncertainty, where it has been defined in the broad context of risk, choice, and probability. Expected utility theory and Bayesian probability theory have been the major theories for analyzing decision making under uncertainty (Tversky & Kahneman, 1974). Formal decision analysis uses the mathematical concept of probability as a tool for describing partial knowledge of uncertain situations (Kuipers, Moskowitz, & Kassirer, 1988). Decision theorists typically define uncertainty as a situation where the individual cannot assign probabilities (or accurately predict) the outcome
of events, and they distinguish it from risk situations where each outcome has known probability (Luce & Raiffa, 1957).

Organizational theorists describe uncertainty in the context of a turbulent organizational environment, labelled environmental uncertainty. Environmental uncertainty has been defined as an attribute of the environment, an attribute of the individual, and as an interaction between the individual and the environment. Most commonly, environmental uncertainty has been defined as a subjective phenomenon, or perceived environmental uncertainty (PEU), which refers to the individual’s perception of the lack of critical information about the environment, which results in the inability to accurately predict changes within the environment or assign probabilities to the likelihood of future events (Downey & Slocum, 1975; Duncan, 1972; Milliken, 1987).

In information science, the concept of uncertainty underlies the information-seeking process and has been described as the critical link between information and decision making (Whittemore & Yovits, 1973, cited in Kuhlthau, 1993). Uncertainty has also been conceptualized in this literature as a state of uncertainty, defined as a “state of doubt in which the individual’s own state of knowledge, work space and cognition cannot fill the problem space by thinking, causing interaction with the world around it to obtain supplementary information” (Ingwersen, 1992 p. 131, cited in Kuhlthau, 1993). Kuhlthau (1993) proposed an uncertainty principle for information seeking, defining uncertainty as “a cognitive state which commonly causes affective symptoms of anxiety (confusion and frustration) and lack of confidence…uncertainty due to a lack of understanding, a gap in meaning, or a limited construct initiates the process of information seeking” (p. 347). Uncertainty is characterized by vague thoughts, anxious feelings and exploratory actions (Kuhlthau, 1993).
In the health care literature, the concept of uncertainty is largely situated within the context of practitioners’ decision making and is often referred to as clinical uncertainty. The Institute of Medicine (2003) defines clinical uncertainty as “the degree of doubt that a health care provider experiences in relation to a patient’s condition, that may, in turn, lead to ambiguities in that provider’s understanding and interpretation of health-related information” (cited in Affonso, Andrews, & Jeffs, 2004, p.569). Using philosophical principles, Penrod (2001a) refined the concept of uncertainty based on literature from the disciplines of medicine, nursing, anthropology, sociology, and psychology, and proposed a theoretical definition of uncertainty: “a dynamic state in which there is a perception of being unable to assign probabilities for outcomes that prompts a discomforting, uneasy sensation that may be affected through cognitive, emotive, or behavioural reactions or by the passage of time and changes in the perception of circumstances…and is mediated by feelings of confidence and control” (p. 241).

This brief overview of the concept of uncertainty illustrates a number of theoretical perspectives regarding uncertainty exist in several literatures, and uncertainty has been conceptualized and used in a variety of ways. What follows is a review of clinical uncertainty, as it pertains to medical and nursing practice. The medical literature was reviewed for the following reasons: (1) uncertainty is a well described concept within the framework of physician’s decision making (Penrod, 2001a), (2) the concept of nurses’ clinical uncertainty in the nursing literature is under-developed (Penrod, 2001b; Thompson & Dowding, 2002), (3) the study of clinical decision making in nursing has developed from studies examining the decision-making process in medicine (Ellis, 1997), and (4) some aspects of physicians work are similar to nursing work. Like medicine, nurses’ work involves
decision making, from what information to gather, to what information to use in formulating a plan of care, to which treatments to initiate, to evaluating interventions (Shapiro & Driever, 2004). While physicians and nurses have different information needs (McKnight, Stetson, Bakken, Curran, & Cimino, 2002), both groups have similar questioning behaviours (McKibbon & Marks, 2001) and similar cognitive strategies concerning patient care (Buckingham & Adams, 2000), particularly in relation to gathering and organizing information (Crow, Chase, & Lamond, 1995). A review of the literature on physicians’ uncertainty might provide insight into areas to explore nurses’ uncertainty.

Uncertainty in Medical Practice

In the medical-sociological literature, the concept of uncertainty is situated within the context of physicians’ clinical decision making and is primarily associated with decisions concerning diagnosis, treatment, and prognosis (Davis, 1960; Eddy, 1984; Waitzkin, 1985). Uncertainty is described as inherent in medicine, and is conceptualized as sources of uncertainty and responses to uncertainty.

Sources of Uncertainty

Renee Fox’s (1957) ethnographic research involving medical students’ training for uncertainty during the education and socialization process emphasized the importance of uncertainty in medical practice as a theoretical concept. Fox’s (1957) seminal essay entitled “Training for Uncertainty” portrayed uncertainty as an important characteristic of medical knowledge, skill development, and socialization, and has provided the foundation for theoretical and empirical study of the concept of uncertainty. Fox (1957) identified three basic types of uncertainty: (1) uncertainty from incomplete or imperfect knowledge of the area, (2) uncertainty due to limitations in available medical knowledge, and (3) the
uncertainties of distinguishing between the first two – the difficulty in distinguishing between personal ignorance and the limitations of current knowledge.

Building on Fox’s work, Light (1979) focused on medical residents and described five sources of uncertainty: relations with instructors, limitations of professional knowledge, diagnosis or analysis of problems, ambiguities of treatment and outcome, and the unpredictability of the client’s response. Light asserted that professional trainees learn to control uncertainty through strategies such as, striving to master knowledge (e.g., specializing), acquiring clinical experience, and gaining autonomy.

More recently, Beresford (1991) identified three sources of uncertainty: technical (e.g., insufficient information to adequately predict prognosis or the effect of interventions), personal (e.g., lack of knowledge of a patient’s wishes or concerns), and conceptual (e.g., application of general criteria such as guidelines to specific situations). Hall (2002) stated that Bereford’s conceptualization acknowledges the broader sources of uncertainty by recognizing that there are degrees of uncertainty, including an irreducible element in decision making, and as such, understanding responses to uncertainty are key to reducing undesirable effects (e.g., biases engendered by uncertainty) on decision-making processes.

*Physicians’ Responses to Uncertainty*

Physicians’ responses to uncertainty in the medical decision making and cognitive psychology literature focus on three domains: *cognitive responses* (thoughts), *affective responses* (feelings), and *behavioural responses* (physical actions). When the literature indicates responses to uncertainty it is also explicating coping strategies to manage uncertainty.
Cognitive Responses to Uncertainty

Cognitive responses to uncertainty have primarily been described as judgement or decision making under conditions of uncertainty (Lusted, 1984). Dowie (1993, cited in Thompson & Dowding, 2002) defined judgement as the weighing of options and assessment of alternatives, and decision making as a choice made among the alternatives. Lipshitz and Strauss (1997) contended that distinguishing between types of uncertainties, strategies, and tactics of coping is important because decision makers encountering different uncertainties respond differently. Medical decision making is frequently characterized by the need to make decisions in the face of incomplete knowledge of the patient’s condition and the therapeutic effect of a given management strategy (Kuipers et al., 1988), and physicians often rely on intuition under conditions of uncertainty (Dowie & Elstein, 1988). Physicians rarely reason using mathematical probabilities nor do they compute expected utilities (Moskowitz, Kuipers, & Kassirer, 1988).

Tversky and Kahneman (1974) described three heuristics individuals use under conditions of uncertainty, which serve to reduce the complex task of assessing probabilities and predicting values to simpler judgmental operations: representativeness, availability, and anchoring and adjustment; for example, the availability heuristic suggests that people estimate the probability of an outcome based on information the mind can recall: easily recalled events are given higher probability (Tversky & Kahneman, 1974) (e.g., matching medical cases). The anchoring and adjustment heuristic suggests that people also make estimates or predictions based on initial information (anchoring) and make revisions (adjustment) based on additional information. Tversky and Kahneman (1974) argued that in
general, these heuristics are quite useful, but they can cause bias in decision making and lead to errors.

The use of heuristics and biases in forming judgments and making decisions under uncertainty also stem from clinical decision makers’ inability to process large amounts of information (Rizzo, 1993). Information processing consists of gathering, distributing, organizing, and evaluating information (Anderson & McDaniel, 1992), and greater degrees of uncertainty generate higher information processing demands (Tushman & Nadler, 1978, cited in Anderson & McDaniel, 1992). The concept ‘bounded rationality’ emphasizes that there are limits to the human capacity for rational thought, largely due to the relatively small capacity of short-term memory, and that effective problem solving depends on the individual’s ability to adapt to these limitations to avoid information overload (Newell & Simon, 1972). Excessive data collection may impede the process of clinical decision making by overloading the capacity of one’s short-term memory (Elstein & Bordage, 1988). Factors that impact on human information processing capacity are: (a) “the amount of information to which an individual can attend at one time, and (b) factors which determine the clarity and accessibility of the information, either in the task environment or internal to the problem-solver” (Taylor, 2000, p. 847).

Hammond’s cognitive continuum theory (cited in Hamm, 1988) describes how the mode of cognition used (intuitive or analytical approach to decision making) depends on three task characteristics: complexity of the task (e.g., number of information cues and lack of complete information readily available), ambiguity of the task (e.g., familiarity of task content), and form of task presentation (e.g., time available to make a decision, ways in which information is presented). Hammond divided the task/cognition continuum into six
modes of inquiry, from rational (analytical) to intuitive judgment. For Hammond, the major determinants of whether an individual uses a rational or intuitive approach to decision making is largely determined by the position of the task on the continuum. For example, if a task is poorly structured, with a lot of information cues available and little time to make a decision, then intuition is likely to be used (Hammond, 1988). The number of cues present and the time available for exercising judgement will dictate what kinds of information and processing will be required to perform the task (Thompson, Foster, Cole, & Dowding, 2005).

**Affective Responses to Uncertainty**

Fox (1957) noted that the considerable stress resulting from a sense of ‘personal inadequacy’ was a prominent characteristic of medical students’ reactions to uncertainty, both adaptive and maladaptive. Katz (1984) claimed that physicians are reluctant to acknowledge Fox’s three kinds of uncertainties because they fear that doing so would undermine the patient’s perception of the physician’s authority and effectiveness, and they fear losing the patient’s confidence. For Katz, physicians’ defences against uncertainty (e.g., denial and avoidance behaviours) are more problematic than patients’ supposed intolerance of medical uncertainties. Katz argued that physicians’ disregard of uncertainty and psychological defences may be due, in part, to their medical training, which emphasizes conformity and orthodoxy. He maintained that denial of uncertainty makes action possible, as there are limits to living with uncertainty: it can paralyze action. Yet, he asserted that physicians have a propensity to resolve uncertainty by action rather than inaction (Katz, 1984).

Gerrity and colleagues’ (1990; 1992) conceptual model describes how physicians’ reactions to uncertainty influence their care-related behaviour. Components of their model include: the patient, the medical problem or illness, the physician, test and treatment
characteristics, and the organizational environment. According to their model, the medical problem and patients’ characteristics create uncertainty in the clinical encounter and physicians’ reactions to uncertainty vary by demographic and professional characteristics (e.g., age, specialty training). The decision outcome and the physician’s behaviour may be modified by patient and/or organization characteristics. Gerrity and colleagues (1992) broadly defined physicians’ affective reactions to uncertainty in patient care as: “the emotional reactions and concerns engendered in physicians who face clinical situations that are unfamiliar or not easily resolved, and the behaviours used by physicians to cope with those emotions and concerns” (p.726).

Though Fox’s (1957) research has long supported the notion that uncertainty creates considerable stress among physicians, researchers have only recently begun to develop and refine indices specific to physicians’ affective reactions to uncertainty (Gerrity et al., 1990; 1992; Gerrity, White, DeVellis, & Dittus, 1995). Gerrity et al. (1990) noted that previous studies in the medical literature aimed at measuring physicians’ affective reactions to uncertainty have focused on the concept intolerance of ambiguity and have relied on Budner’s (1962) intolerance of ambiguity scale, which was developed outside the context of patient care (e.g., DeForge & Sobal, 1989; Geller, Faden, & Levine, 1990; Geller, Tambor, Chase, & Holtzman, 1993; Merrill, Camacho, Laux, Lorimor, Thornby, & Vallbona, 1994; Sherrill, 2001).

Gerrity and colleagues (1990; 1992) developed the Physicians’ Reaction to Uncertainty (PRU) scale to measure physicians’ affective reactions to uncertainty and coping behaviours. They found that physicians’ reactions to uncertainty included two dimensions: Stress from Uncertainty (an emotional reaction) and Reluctance to Disclose Uncertainty (a coping
behaviour). Gerrity and colleagues (1990; 1992) reported that differences existed in how
uncertainty was handled and experienced within different specialities. They also found that
physicians who practiced longer felt less stressed from uncertainty than physicians who
practiced for a shorter time; however, physicians’ reluctance to disclose uncertainty did not
differ by years in practice.

Gerrity and colleagues (1995) later refined the PRU instrument to better represent the
multi-dimensional nature of uncertainty. They asserted that these measures could be used to
examine the relationship between physicians’ emotions, their cognitive processes, and their
coping behaviours under conditions of uncertainty.

Studies have used Gerrity and colleagues’ PRU scale to examine the effect of
physicians’ reactions to uncertainty on clinical decision making performance (Anderson, Jay,
Weng, & Anderson, 1995) and physicians’ expressions of uncertainty during patient
encounters (Gordon Joos, & Byrne, 2000). Anderson and colleagues (1995) reported that the
stress physicians experienced in dealing with uncertainty had a negative effect on their
clinical decision performance, and how they responded to uncertainty had both positive and
negative effects on their performance. Gordon et al. (2000) found that physicians who
reported greater reluctance to disclose uncertainty to patients made fewer uncertainty
expressions (e.g., “I don’t know,” “It’s not clear”) during patient visits. Physicians’ responses
to uncertainty have behavioural implications and these are described as information needs
and information seeking behaviour.

Cognitive/Behavioural Responses to Uncertainty

*Information needs.* According to Lipshitz and Strauss (1997), decision makers begin to
reduce uncertainty by gathering additional information. However, this first involves
acknowledging that there is a gap in knowledge and that information needs exist (Krikelas, 1983). Information needs have been conceptualized as: recognition of lack of information to carry out an action (Krikelas, 1983; Taylor, 1987) and conscious expressions (verbal or nonverbal) of a desire for more information (Forsythe, Buchanan, Osheroff, & Miller, 1992). From an information science perspective, recognition of information needs does not always lead to overt action (Krikelas, 1983; Wilson, 1997) and information needs can therefore be categorized as immediate or deferred on the basis of behaviour (Krikelas, 1983).

Gorman (1995) highlighted that attempts at quantitative estimates of physicians’ information needs have equated an information need with a clinical question about patient care, and thus information need has been operationalized as the number of questions asked (e.g., Abate, Jacknowitz, & Shumway, 1989; Chambliss & Conley, 1996; Cogdill, Friedman, Jenkins, Mays, & Sharp, 2000; Covell, Uman, & Manning, 1985; Dee & Blazek, 1993; Ely, Burch, & Vinson, 1992; Ely, Levy, & Hartz, 1999; Forsythe et al., 1992; Gorman, Ash, & Wykoff, 1994; Osheroff & Bankowitz, 1993; Ramos, Linscheid, & Schafer 2003; Timpka & Arborelius, 1990). Gorman (1995) categorized the following ‘states of information need,’ which have been studied by others: unrecognized (clinician is not aware of information need or knowledge deficit) (Williamson, German, Weiss, Skinner, & Bowes, 1989), recognized (clinician is aware that information is needed, which may or may not be articulated or pursued) (Abate et al., 1989; Cogdill et al., 2000; Covell et al., 1985; Dee & Blazek, 1993; Ely et al., 1992, 1999; 2000; Forsythe et al., 1992; Gorman & Helfand, 1995; Osheroff, Forsythe, Buchanan, Bankowitz, Blumenfeld, & Miller, 1991; Osheroff & Bankowitz, 1993; Ramos et al., 2003; Timpka, Ekstom, & Bjurulf, 1989; Timpka & Aborelius, 1990; Woolf & Benson, 1989), and pursued (information seeking occurs, but may or may not be successful)
(Covell et al., 1985; Ely et al., 1992; Gorman & Helfand, 1995; Osheroff & Bankowitz, 1993; Ramos et al., 2003; Timpka et al., 1989). For example, Covell et al. (1985) reported that physicians pursued only 30% of the questions arising from office practice and many did not know where to find the needed information.

Studies indicate that physicians need information related to patient care primarily for diagnosis and/or treatment decisions (e.g., Chambliss & Conley, 1996; Cogdill et al., 2000; Dee & Blazek, 1993; Ely et al., 1992; 1999; 2000; Gorman & Helfand, 1995; Haynes, McKibben, Walker, Ryan, Fitzgerald, & Ramsden, 1990; Lindberg, Siegel, Rapp, Wallingford, & Wilson, 1993; Osheroff & Bankowitz, 1993; Timpka & Arborelius, 1990; Timpka et al., 1989; Woolf & Benson, 1989). As a result of this observation, Ely et al. (1999; 2000) developed a taxonomy of generic clinical questions in primary care for questions such as “What is the drug of choice for condition X?” Ely and colleagues’ taxonomy suggested that the range of clinical decisions, questions, and forms of physician uncertainty are finite (Thompson et al., 2002).

Studies related to physicians’ use of evidence-based information (e.g., medical literature) indicated that the motivation for information seeking/seeking evidence was to support patient care decisions (Chambliss & Conley, 1996; Gorman et al., 1994; Haynes et al., 1990; Lindberg et al., 1993; Marshall, 1992; Osheroff & Bankowitz, 1993; Sackett & Straus, 1998; Urquhart & Hepworth, 1996; Westbrook, Gosling, & Coiera, 2004). Furthermore, key findings suggested that using evidence-based information improved medical knowledge (Verhoeven & Schuling, 2004), improved understanding of a patient’s condition (Urquhart & Hepworth, 1996), improved diagnosis and treatment decisions, assisted with initiating, confirming, or changing decisions concerning diagnosis (Haynes et
al., 1990; Lindberg et al., 1993; Marshall, 1992; Sackett & Straus, 1998; Urquhart & Hepworth, 1996; Westbrook et al., 2004), enabled more informed choice of appropriate therapy (Lindberg et al., 1993; Urquhart & Hepworth, 1996), and helped to avoid unnecessary tests or procedures (Marshall, 1992).

*Information seeking.* From an information science perspective, Krikelas (1983) conceptualized information seeking as any activity that is undertaken to satisfy an individual’s perceived information need. Kuhlthau (1993) asserted that uncertainty due to a lack of understanding or a gap in meaning initiates the process of information-seeking. Information-seeking is a process of searching, obtaining, and using information (Vakkari, 1999), a situation-sensitive, sense-making process (Dervin & Nilan, 1986), and a process of construction, with uncertainty and anxiety decreasing as understanding increases (Kuhlthau, 1993). The processes of decision-making and information-seeking are intertwined in recursive interaction (Kuhlthau, 1999). Kuhlthau (1991) suggested a model for information-seeking processes that incorporate three realms of activity: physical (actions taken), affective (feelings experienced), and cognitive (thoughts concerning both process and content). Information seeking is influenced by personal factors (e.g., motivation, information-seeking style), situational factors (e.g., time available), and organizational factors (e.g., resource accessibility) (Byström & Järvelin, 1995; Leckie, Pettigrew, & Sylvain, 1996; Wilson, 1997).

Studies have shown that physicians seek information from several sources, such as colleagues, journals, patients, patient record, and textbooks (Leckie et al., 1996). Studies in the medical literature indicated that colleagues remain the most preferred information resource, because they are familiar, reliable, give concise relevant information, are accessible, and provide immediate answers (Covell et al., 1985; Curley, Connelly, & Rich,
Gorman (1995) further noted that preference for human sources of information may result from a need for information such as confirmation, explanation, analysis, and feedback. Print materials were the next most commonly preferred source (e.g., textbooks, journals, reference guides; Covell et al., 1985; Curley et al., 1990; Ely et al., 1992, 1999; Forrest & Robb, 2000; Gruppen et al., 1987; Ramos et al., 2003; Timpka et al., 1989). Factors influencing physicians’ information seeking included the belief that a definitive answer existed and the urgency of the patient’s problem (e.g., answer needed before the patient left the office) (Chambliss & Conley, 1996; Gorman & Helfand, 1995; Timpka et al., 1989), and availability and clinical applicability (Connelly, Rich, Curley, & Kelly, 1990; Curley et al., 1990). Ramos et al. (2003) reported that physicians’ reasons for not pursuing some of their questions were because they did not feel that their questions were of immediate importance to the patient’s health, the patient was referred to another specialist, lack of time, or the physician planned further patient observation. Ely et al. (1999) found that answers to 64% of physicians’ questions were not immediately pursued primarily because physicians felt that they could rely on their own current knowledge. Studies also suggested that physician education and training (Forsythe et al., 1992; Gruppen, Wolf, Van Voorhees, & Stross, 1988; Osheroff et al., 1991; Woolf & Benson, 1989) and physician age (Gruppen et al., 1988) influenced their information seeking patterns. For example, Gruppen et al. (1988) found that having greater case-related experience and being younger led to greater willingness to proceed with treatment without seeking additional information.
Barriers to information seeking noted by physicians existed at both system and individual levels, including cost of resources (Chambliss & Conley, 1996; Curley et al., 1990; Gorman et al., 1994), lack of time (Bowden, Kromer, & Tobia, 1994; Chambliss & Conley, 1996; Covell et al., 1985; Dee & Blazek, 1993; Forrest & Robb, 2003; Shelstad & Clevenger, 1996; Timpka et al., 1989; Williamson et al., 1989), limited access to resources (Dee & Blazek, 1993; Forrest & Robb, 2003; Shelstad & Clevenger, 1996; Timpka et al., 1989; Woolf & Benson, 1989), poor organization of resources (Covell et al., 1985), and difficulty using resources (Bowden et al., 1994; Osheroff & Bankowitz, 1993; Williamson et al., 1989). Ely and colleagues (2002) identified 59 obstacles arising from physicians’ attempt to answer clinical questions with evidence. Among the most salient were inadequate time to search for information, failure of the resource to address the topic, and inadequate synthesis of multiple bits of evidence into a clinically useful statement. Savage (1996) identified an important gap in this body of literature as the impact of unmet information needs on provider and patient outcomes. It is not well understood what occurs should an information search prove unsuccessful; for example, does the provider defer the answer, or make a decision with missing information?

**Summary of Uncertainty in Medical Practice**

In medicine, uncertainty is described within a framework of physician’s decision making. What we know from the medical literature is that physician uncertainty stems from information deficiencies, resulting from both limited scientific knowledge in the profession and from physician-specific limitations (Fox, 1957; Rizzo, 1993). For physicians, uncertainty is primarily associated with clinical decisions concerning diagnosis, treatment/intervention, and prognosis. Medical students are trained to control uncertainty by acknowledging and
expressing their uncertainties as a way to gain medical confidence. In practice, physicians tend to cope with uncertainty by acknowledging and disclosing it, asking colleagues for information, or by denying and avoiding it. Physicians’ reactions to uncertainty include cognitive, behavioural, and affective responses, many of which indicate coping strategies to reduce uncertainty.

Uncertainty in Nursing Practice

*Theoretical Perspectives: Clinical Decision Making Theory*

The experience of uncertainty in the context of nursing practice has received considerably less attention than has the study of physician uncertainty. There is a body of literature on nurses’ cognitive processes in clinical reasoning and clinical decision making; however, it is difficult to isolate the concept of uncertainty from these studies. It may be that the concept of uncertainty in the nursing literature is obscured in studies examining nurses’ clinical decision making, and as a result, uncertainty requires further exploration. The study of clinical decision making in nursing has been influenced by studies examining the decision-making process in medicine. The nursing literature has classified clinical decision making frameworks into two research paradigms: the *rationalist perspective* (decision making derives from a logical sequence of cognitive processes) and the *phenomenological perspective* (e.g., intuition) (Tanner, 1987). Studies of nurses’ decision-making processes have addressed how nurses make decisions from normative (prescriptive) and descriptive approaches: normative models describe how individuals *should* make decisions (e.g., decision analysis and decision trees based on probability theory, utility theory and statistical decision theory), whereas descriptive models describe how individuals *actually* make
decisions (e.g., process of decision-making, intuitive judgement) (Boblin-Cummings, Baumann, & Deber, 1999).

The majority of nursing studies have applied the rationalist perspective, which is based on the notion that human behaviour is logical and consistent, and similar to physician studies, research has been based on decision analysis or information processing theory (Tanner, 1987). Information processing theory describes the cognitive behaviour of the decision maker (Fortier, Jagannathan, Michel, Dluhy, & O’Neill, 2002) and how individuals reason when making judgements and decisions (Thompson & Dowding, 2002). Derived from the field of cognitive psychology, researchers using information processing models have theorized that clinical decision making occurs by a hypothetico-deductive method characterized by: (a) cue recognition, (b) hypothesis generation, (c) cue interpretation, and (d) hypothesis evaluation (e.g., Cianfrani, 1984; Tanner, Padrick, Westfall, & Putzier, 1987; Westfall, Tanner, Putzier, & Padrick, 1986). The rationalist approach describes decision making activities in terms of diagnosing a problem, implementing a treatment, and evaluating the outcome (Bucknell, 2000). Nursing studies using this approach have predominantly used simulated patient management problems and have made comparisons between novice and expert nurses (e.g., Corcoran, 1986a, 1986b; Tanner, 1987).

In contrast, the phenomenological perspective describes the context of clinical decision making primarily using qualitative descriptions of decision making in the natural environment (Bucknell, 2000). Those who hold a phenomenological perspective contend that action precedes rational analytical thought (Benner, 1984). The author most attributed with the phenomenological perspective and developing the intuitive model is Benner, who defines intuition as understanding without a rationale (Benner, Tanner, & Chesla, 1996). Intuitive
judgement distinguishes the expert from the novice; aspects of intuitive judgement are pattern recognition, common sense understanding, skilled know-how, sense of salience, and deliberative rationality (e.g., adopting a new perspective on a situation) (Benner et al., 1996).

Benner (1984) described uncertainty in the context of clinical judgement and experiential learning. Benner and colleagues (1996) defined judgement broadly to include “the ways in which nurses come to understand the problems, issues, or concerns of clients/patients, to attend to salient information, and to respond in concerned and involved ways” (p. 2). Clinical judgement is considered “judgement” because certainty is missing (Benner, Hooper-Kyriakidis, & Stannard, 1999, p. 24). Benner (1984) and colleagues (1996; 1999) described uncertainty in the context of nurses’ skill acquisition from novice to expert and as a clinical grasp of the situation. Benner and colleagues’ work suggests that nurses’ experience of uncertainty and response varies with stages of clinical expertise. Benner et al. (1996) contended that clinical grasp of the patient’s situation is a perceptual skill that enables the clinician to recognize when s/he does not have a good grasp of a clinical situation. Skilled know-how and knowing the patient contribute to the nurse’s response to a particular situation, which is continuously modified on the basis of the patient’s response or changing condition (Benner et al., 1996). For example, advanced beginners, by virtue of an inexperienced grasp of the situation, must depend on others’ perspectives and dampen their emotional anxiety concerning personal insufficiencies in order to act in the situation (Benner et al., 1996). This description is similar to conceptualizations of uncertainty as discussed by Fox (1957) and Katz (1984) who described feelings of personal inadequacy (Fox, 1957) and the paralysis or inaction (Katz, 1984) that can occur with high levels of stress and anxiety in uncertain situations.
What Benner’s theory contributes to the understanding of clinical uncertainty is that both novices and experts experience uncertainty and nurses attempt to reduce uncertainty by gaining a grasp of the clinical situation. Benner suggests that expert nurses, through their experience, have greater cognitive repertoires to rely on than do novice nurses (e.g., through pattern recognition). Benner also implied that clinical uncertainty is situation or task specific; for example, expert nurses experience uncertainty in ambiguous situations such as new and unfamiliar situations. If the situation is frequently encountered, then pattern recognition is sufficient to identify the problem. However, others have argued that in an unfamiliar situation, experience is of little help and provides a false sense of certainty (Thompson et al., 2002).

Similar to the physician decision making literature, the nursing decision making literature suggests that complex decision situations create uncertainty and in these situations, nurses tend to rely on heuristics (cognitive short cuts to simplify complex situations), based on their own experience or intuitive judgement (Benner, 1984; Botti & Reeve, 2003; Cioffi & Markham, 1997; Hicks, Merritt, & Elstein, 2003; Rew, 2000). Cioffi (1997) maintained that cognitive decision making strategies, such as heuristics, applied to the clinical judgements of nurses may contribute to developing an adequate conceptual basis for the decision-making processes of nurses. Cioffi and Markham (1997) contended that for midwives, patient assessment is an uncertain decision making situation, because patient information is usually incomplete. They found that nurses (midwives) adapted their decision making strategies by using heuristic techniques, such as availability heuristics or representativeness heuristics.

Thompson and Dowding (2002) noted that both rational and intuitive approaches to nurse decision making have been described as strategies used to cope with uncertainty.
However, they asserted that sources of uncertainty may not be completely acknowledged, as individuals may not be aware of the cognitive boundaries and limiting strategies (heuristics) they are subject to in relation to decision tasks. The literature suggests that decision analysis (e.g., mathematical linear models) enables decision makers to make explicit the data on which a decision choice is based (Baumann & Deber, 1989), but these models may not adequately describe complex decision-making processes or be appropriate for all decisions, particularly when there is a lack of mutually exclusive alternatives, or when the relationship between intervention and outcome is unclear (Baumann & Deber, 1989).

Thompson (1999) contended that the rational and intuitive approaches outlined in Hammond’s cognitive continuum each have something to offer and that in their theoretically pure states they represent ideal frameworks for analysis. This view of a cognitive continuum in relation to clinical decision making is supported by Hamm (1988). For Hamm, practitioner cognition is neither purely intuitive nor purely analytical, but rather it is commonly located at some point in between. Thompson (1999) noted that Hamm’s analysis (though based in medicine), may equally apply to nursing practice.

O’Neill, Dluhy, Fortier and Michel (2004) developed a theoretical framework to describe how nurses make decisions and how novices develop clinical reasoning skills. They used this framework to develop a prototype point-of-care system to make relevant patient information available to acute care nurses. The framework consisted of two models: (1) a clinical decision making model grounded in information processing theory, and (2) a model of novice nurse clinical reasoning development (a process by which the novice nurse develops working knowledge). Similar to Benner’s (1984) theory, O’Neill et al. (2004) described the novice’s anxiety and knowledge limitations and limited perception of the
situation. They contended that novices’ cognitive processing is rule driven, but with repeated practice experiences, the novice begins to develop a complex system of organized clinical patterns that form the foundation of working knowledge (O’Neill et al., 2004). The model included factors in the practice situation that promote the development of working knowledge, such as the availability of experienced nurses and supportive leadership. Also similar to Benner’s theory, O’Neill and colleagues implied that uncertainty is a result of a limited grasp of the clinical situation.

Although there is a substantial literature on nurse’ cognitive decision-making processes, and an emerging literature on the types of decisions nurses make in practice, theories explicitly describing nurses’ clinical uncertainty in practice remain largely absent. The primary theoretical perspective in the nursing literature addressing the experience of uncertainty is Mishel’s theory of uncertainty in illness (e.g., 1984, 1988, 1990). There is an extensive body of knowledge around patients’ experience of uncertainty in an illness episode (acute and chronic) based on Mishel’s work. Though the medical literature described uncertainty broadly in the context of professional training and socialization to include the field of nursing (e.g., Fox, 1957), there is little theoretical and empirical literature to describe and explain the experience of uncertainty from the nurse’s perspective, with the exception of studies investigating nurses’ perceived environmental uncertainty (an organizational concept) and the recent work by Thompson and colleagues from the UK (e.g., 2001a, 2001b; 2002; 2004).

Thompson and colleagues (2001a, 2001b) described clinical uncertainty in the context of nurses’ decision making, and asserted that there is only preliminary work that explicates the kinds of decisions and associated clinical uncertainties nurses face in practice. Similar to
definitions from the organizational literature and decision theory (e.g., Duncan, 1972; Luce & Raffia, 1957), Thompson and Dowding (2002) defined uncertainty as the inability to accurately predict the outcome of a decision. Thompson and Dowding (2001) contended that where uncertainty in clinical situations arise, how nurses identify issues which can be sources of uncertainty, and the characteristics of uncertainty in practice remain to be explored. Thompson and Dowding (2002) maintained that uncertainty differs according to the nature of decisions faced. For them, key areas to examine are, how nurses make decisions when faced with uncertain clinical situations, what information nurses find useful for reducing the uncertainty associated with clinical decisions, and what nurses do with uncertainty that cannot be reduced with information. Information seeking is only one of several possible responses to clinical uncertainty (Thompson, Cullum, McCaughan, Sheldon, & Raynor, 2004).

**Uncertainty Measures in Nursing**

There is little existing research specifically examining nurses’ clinical uncertainty. Therefore, studies addressing nurses’ uncertainty will be described using the following themes: (1) studies explicitly exploring or measuring nurses’ uncertainty, (2) studies reporting findings indicating nurses’ uncertainty, and (3) studies examining nurses’ information needs and information seeking as responses to clinical uncertainty.

Gray-Toft and Anderson (1981) acknowledged the stressful nature of uncertainty by including a subscale related to uncertainty in their measurement of hospital nurses’ job stress: *uncertainty concerning treatment (of patients)*. The subscale is part of a larger instrument designed to measure the frequency with which hospital nurses perceive certain nursing situations as stressful. Recent studies using this scale have found that second to workload
(e.g., staffing and scheduling issues), ‘uncertainty concerning treatment’ was considered a frequent source of stress for Australian nurses across the continuum of care (Healy & McKay, 2000), but was among the least frequent source of stress for primary care nurses (Lee, 2003), hospice nurses (Payne, 2001), and rural psychiatric nurses (Pinikahana & Happell, 2004). Inconsistent results yielded by these studies are likely due to the various samples and settings used, and based on the scale items uncertainty is largely focused around physicians’ activities.

Three studies were located that developed and used a scale to measure nurses’ level of certainty/uncertainty concerning decision tasks (Baumann, et al., 1991; Brannon & Carson, 2003; Tabak, Bar-Tal, & Cohen-Mansfield, 1996). Baumann et al. (1991) described uncertainty as characteristic of the decision-making process, and contended that uncertainty exists at individual and aggregate levels. They described uncertainty as micro-uncertainty (level of confidence expressed by an individual about his or her decision, or individual variation) and macro-uncertainty (the extent to which these decisions vary across individuals, or practice variation). They asserted that decision makers are often more comfortable if they can reduce or eliminate micro-uncertainty, and that such feelings of uncertainty are “assuaged by feeling confident about one’s ability to make accurate decisions” (p. 173). In their study addressing overconfidence and uncertainty among ICU nurses, nurses were provided with vignettes that described critical care situations, and they were asked to develop interventions and a plan of care. Among other questions, nurses were asked to state how certain they felt that their initial plan was the right thing to do (on a scale from 1=not at all certain to 4=very certain) and what percentage of nurses they thought would have done something different.
They found that almost every nurse selected a different sequence of actions, and there was considerable variation as to the timing of even the commonly selected interventions. Nurses disagreed as to what the appropriate interventions would be (macro-uncertainty), and the experts differed in their ratings about the quality of particular interventions. However, all felt moderately or very certain that their initial choice would be the right thing to do (micro-uncertainty). The authors reported that many ICU nurses did not appear to perceive that this macro-uncertainty existed.

Two studies measured the impact of information consistency on level of certainty in a diagnostic task. Tabak et al. (1996) rated novice (students) and expert nurses’ decisional difficulty and certainty levels in reaching a diagnosis for two scenarios: one including information (set of symptoms) consistent with the diagnosis, and the other including information (set of symptoms) that was partly inconsistent with the diagnosis. Nurses were asked to indicate their level of certainty in percents (100%=absolute certainty in correctness of diagnosis and 0%=absolute certainty that it was incorrect). Findings indicated that expert nurses were less certain when their decision was based on symptoms that were inconsistent with the diagnosis than were students. Student nurses were less likely to recognize the implications of disconfirming information than experienced nurses. The authors concluded that the effect of nurses’ expertise on their certainty and ease in decision making was moderated by information consistency.

Using similar methods, Brannon and Carson (2003) examined the influence of nursing expertise and information structure on certainty of diagnostic decision making. Participants read patient scenarios either high in information structure (consistent diagnostic information) or low in information structure (inconsistent diagnostic information). Using the same
certainty rating scale as Tabak et al. (1996), participants rated their certainty about the potential diagnosis. They found that expert and novice nurses were more uncertain when (diagnostic) information was inconsistent.

Though these studies provide insight into how nurses’ degree of certainty in a decision task is measured, there is considerable variation in how uncertainty has been defined. Baumann et al. (1991) defined uncertainty broadly in the context of confidence and practice variation, and the other two studies lacked a clear definition of uncertainty (Brannon & Carson, 2003; Tabak et al., 1996).

**Study Findings that Indicate Nurses’ Uncertainty**

Ten studies were located that explored various aspects of nursing practice and reported findings that indicated nurses’ clinical uncertainty. These studies explored nurses’ feelings about technology and its impact on their roles (Wichowski, 1994), methods nurses used to stay current with new technological procedures (Wichowski & Kubsch, 1995), the application of the nursing process in acute care settings (O’Connell 1998, 2000), nurses’ experiences of calling medical emergency assistance (Cioffi, 2000), nurses’ constructed meaning of nursing in a community context (Carr, Bell, Pearson, & Watson, 2001), critical care nurses’ decision making activities (Bucknall, 2000), environmental influences on critical care nurses’ decisions (Bucknall, 2003), how nurses make intervention decisions (Hedberg & Larrson, 2003), and nursing students’ experience of preceptorship in the mental health setting (Charleston & Happell, 2005).

Study findings suggested that collegial verification and confirmation of information gathered was a form of corroboration to reduce nurses’ uncertainty (Bucknall, 2000; Cioffi, 2000; Hedberg & Larrson, 2003). For example, Cioffi (2000) found that nurses experienced
uncertainty from being unsure if the patient met the criteria for calling the medical emergency team. Some nurses lacked confidence in their judgements and were unsure that they were making the right decision, and they sought confirmatory opinions from their peers. Additionally, they found that decision uncertainty contributed to nurses’ feelings of nervousness and anxiety about what was happening to the patient, and what would be expected of them when the medical team arrived.

Knowing what to expect was also identified in the nursing literature as a way to reduce uncertainty (Charleston & Happell, 2005; Hedberg & Larrson, 2003; O’Connell, 1998, 2000). Hedberg and Larrson (2003) found that nurses described strategies of ‘being one step ahead’ for an anticipated situation (e.g., preventive measures) to reduce their feeling of uncertainty and enabled them to act independently during the decision-making process. Charleston and Happell (2005) found that students described anticipatory anxiety regarding the uncertainty of what to expect from the mental health setting, and that preceptor support helped nursing students cope with uncertainty. O’Connell (1998) found that as a result of working under fluctuating and uncertain working conditions, nurses experienced a state of “unknowing” (a state of uncertainty that occurred as a consequence of several conditions that collectively hindered nurses from knowing what to expect within the context of a daily shift, their role as nurses, and their patients’ care needs). Examples of such conditions included an increase in: patient acuity, use of agency and casual staff, movement of nurses across wards, and patient turnover. As a result, nurses were unable to deliver patient care using the nursing process structure. In an additional report on this study, O’Connell (2000) indicated that to work through this obscurity and uncertainty, nurses used a basic social process of “enabling care,” by making sense of the situation (e.g., knowing the patient and what to expect,
collecting and integrating information about patient care, and sustaining communication) and minimizing uncertainty (e.g., adapting work practices, such as listing assessment data in the care plan, juggling/prioritizing tasks).

Bucknall (2003) found that lack of familiarity, lack of confidence, and uncertainty with patient problems generally slowed nurses’ decision-making processes. For example, unusual patient situations made nurses less confident. Carr et al. (2001) found that uncertainty was an important factor in the practice constructions by qualified nurses, however, this aspect of practice did not constitute a significant element of the clinical curriculum, and students displayed a limited appreciation of the concept of uncertainty. Wichowski (1994) and Wichowski and Kubsch (1995) reported that current knowledge followed by clinical expertise were considered the most effective methods for reducing uncertainty related to unfamiliar technology.

Studies reviewed that address nurses’ uncertainty (either directly or indirectly) are largely descriptive. However, it is difficult to synthesize and draw meaningful conclusions from this literature due to the inconsistency of the use of the concept, lack of a clear definition to describe nurses’ clinical uncertainty, and lack of a description of theoretical perspectives used to guide the studies. Although these studies provide some insight into how nurses cope with uncertainty in their practice, the majority of this research does not have the investigation of nurses’ uncertainty as a study purpose, and as such, studies have not resulted in a comprehensive understanding of the phenomenon of nurses’ uncertainty.

Nurses’ Information Needs and Information Seeking

Information needs

Studies in the nursing literature have indicated nurses’ information needs and information seeking strategies as responses to uncertainty. Studies exploring nurses’ information needs
have found that for direct patient care nurses need *patient-specific* information (Blythe & Royle, 1993; Bunyan & Lutz, 1991; Corcoran-Perry & Graves, 1990; McKnight et al., 2002; Nicholas, Williams, Smith, & Longbottom, 2005) in particular, patient diagnosis, medications, test results (Cogdill, 2003; Corcoran-Perry & Graves, 1990; McKnight et al., 2002; Rasch & Cogdill, 1999; Spath & Buttlar, 1996; Urquhart & Davies, 1997), *institution-specific* information (e.g., policies, tracking equipment) (Corcoran-Perry & Graves, 1990; McKnight et al., 2002) and *domain-specific* knowledge (information from nursing and related disciplines, such as drug information, disease information) (e.g., Corcoran-Perry & Graves, 1990; Cogdill, 2003; McKnight et al., 2002). Nurses expressed that their greatest information need was for accurate and concise reference sources (Blythe & Royle, 1993; Royle, Blythe, DiCenso, Boblin-Cummings, Deber, & Hayward, 2000) and they sought information to gain an accurate picture of the patient’s current condition (Blythe & Royle, 1993; Corcoran-Perry & Graves, 1990). Blythe and Royle (1993) reported that non-routine questions arising from patient care were more complex than routine questions and required multiple information sources (e.g., reference manual, laboratory reports).

Similar to physician studies, some studies quantified information needs (Cogdill, 2003; Corcoran-Perry & Graves, 1990). Cogdill (2003) found that 72% of nurse practitioners’ information seeking instances occurred during the patient encounter, and close to 30% of information needs were unresolved at the end of the patient encounter, the majority of which pertained to diagnosis. Cogdill (2003) found that nurse practitioners with more education perceived information needs more frequently. Corcoran-Perry and Graves (1990) collected 175 instances of supplemental information seeking over a two-hour period.
McCaughan (2002) suggested that uncertainty is present in the kinds of decisions nurses faced. Thompson, McCaughan, Cullum, Sheldon, and Thompson (2000, cited in Thompson & Dowding, 2002) examined the types of decisions nurses make in practice and found that the majority of decisions pertained to the effectiveness of treatments or interventions and the interpretation of cues in the process and delivery of care. These authors and others argued that decision-based uncertainties could be translated into focused clinical questions and amenable to an evidence-based approach to care (Flemming & Fenton, 2002; Johnston & Fineout-Overholt, 2005). Johnston and Fineout-Overholt (2005) highlighted that the most difficult step in an evidence-based approach to care is getting students and clinicians to recognize and admit uncertainties. They argued that the challenge is having clinicians achieve a comfort level so that they can embrace uncertainties as opportunities for problem solving and clinical decision making. Training nurses to express uncertainties as focused clinical questions may change information seeking perceptions and behaviour (Flemming, 1998; Flemming & Fenton, 2002; Thompson et al., 2001a).

Information seeking

Information seeking is an attempt to resolve a recognized information need (Rasch & Cogdill, 1999) and helps to reduce the uncertainties nurses face by providing some detail about how likely the different outcomes are to occur (Cioffi, 2000; Thompson & Dowding, 2002). MacIntosh-Murray and Choo (2005) reported that nurses’ information seeking is often not triggered because information needs are not recognized nor knowledge gaps identified, and they suggested that being caught up in the daily routines and tasks combined with a lack of critical thinking skills, can create obstacles to recognizing information needs and can impede information seeking and use. As a result, information needs can be latent and may
need to be revealed to workers. They further stated that workers may not be as competent in critical thinking and information skills as might be assumed and required for their positions. They found that several nurses talked about situations in which they were afraid or unwilling to ask questions or admit that they might need help because if they did, they might be seen as incompetent. Thus, information needs and seeking may be suppressed or avoided. This finding is similar to the medical-sociology literature that described physicians’ denial and avoidance behaviours (Katz, 1984), reluctance to disclose uncertainty (e.g., Gerrity et al., 1990), and feelings of personal inadequacy (Fox, 1957).

Estabrooks, Rutakumwa, O’Leary, Profetto-McGrath, Milner, Levers, et al. (2005a) argued that to gain a full understanding of knowledge sources in clinical practice, we need to understand strategies that facilitate the most appropriate selection of knowledge sources under conditions of uncertainty. Like physicians, nurses value and prefer informal interactions with colleagues as sources of information primarily because they are accessible and viewed as credible (e.g., Blythe & Royle, 1993; Bunyan & Lutz, 1991; Cogdill, 2003; Corcoran-Perry & Graves, 1990; Estabrooks, Chong, Brigidear, & Profetto-McGrath, 2005b; Fakhoury & Wright, 2000; McKnight et al., 2002; Royle et al., 2000; Thompson et al., 2001a, 2001b).

Nurses perceived human sources of information as free from common barriers to information resources, including lack of availability or access (Bawden & Robinson, 1997; Blythe & Royle, 1993; Corcoran-Perry & Graves, 1990; Thompson et al., 2001a), and lack of time (Bunyan & Lutz, 1991; Corcoran-Perry & Graves, 1990; McKnight et al., 2002; Royle et al., 2000). Human sources of information are considered the fastest and easiest way to obtain concise information (Dee & Stanley, 2005). However, some authors have highlighted
that information provided by colleagues might not always be accurate (e.g., Corcoran-Perry & Graves, 1990).

Nurses also rely on personal experience to meet information needs (e.g., Estabrooks et al., 2005b; Fakhoury & Wright, 2000; McCaughan, Thompson, Cullum, Sheldon, & Raynor, 2005; Taylor, 2002; Thompson et al., 2001a, 2001b) and use different strategies for information seeking (Blythe & Royle, 1993; Cianfrani, 1984; Gordon, 1980; Taylor, 2002). Taylor (2002) found that experience plays a role in how information is accessed and used. Taylor (2002) found differences in how expert and novice nurses accessed information about patients: experts regarded handover information as a more important source of information than did novices, and expert nurses were more likely to access multiple sources of preparatory information.

Print materials such as books and journals were used less often than were verbal sources of information (e.g., Estabrooks et al., 2005b). There was less use of electronic databases (e.g., Medline, CINAHL) (e.g., Dee & Stanley, 2005; Gosling, Westbrook, & Spencer, 2004; Pravikoff, Tanner, & Pierce, 2005; Pyne, Newman, Leigh, Cowling, & Rounce, 1999), which was largely attributed to nurses’ perceived lack of skills needed to access the information. Time constraints were also a factor; for example, Royle et al. (2000) found that nurses often had to interrupt their Internet searches to attend to their patients’ needs.

In summary, what we know from the nursing literature concerning nurses’ clinical uncertainty is that nurses tend to cope with uncertainty by using heuristics or intuition, and rely on experience and decision support from colleagues. Findings related to nurses’ information needs and seeking are similar to physician studies in that one way of dealing
with uncertainty is through verbal communication with colleagues. Thompson et al. (2001b) maintained that to be useful and relevant to nurses, information should incorporate some of the advantages of colleagues as information sources, such as accessibility and promptness of response. Researchers also suggested that expressing clinical uncertainties as information needs can help guide information seeking and retrieval and reduce uncertainty (Flemming, 1998; Flemming & Fenton, 2002; Thompson et al., 2002). However, information needs are not always recognized and as a result, information needs may be latent or suppressed (MacIntosh-Murray & Choo, 2005). The nursing literature addressing nurses’ uncertainty and their information needs and information seeking has been summarized as a review paper (Cranley, Doran, Tourangeau, Kushniruk, & Nagle, 2009).

To date, there is a large body of literature around nurses’ decision-making processes, which have grown from studies in psychology and medicine. However, largely absent from the nursing literature is a comprehensive theoretical understanding of how nurses experience uncertainty, such as the meaning of uncertainty from their perspective, and how nurses respond based on these meanings.

A conceptual definition of clinical uncertainty is offered, and is adapted from the definition of uncertainty proposed by Penrod (2001a), as it describes the concept of clinical uncertainty based on the literature reviewed thus far: *uncertainty* is a dynamic, perceptual state experienced by a nurse relative to the condition of a patient that may create cognitive, affective, and/or behavioural responses leading to coping strategies all of which may impact nurse and patient-related outcomes.
Related Concepts

The concept of uncertainty has been associated in the literature with similar but distinct concepts. These include environmental uncertainty, ambiguity, and task complexity. What follows is a description of these concepts and how each is related to the concept of uncertainty.

Environmental Uncertainty

There is a body of research on environmental uncertainty in the organizational theory literature, where, as noted by Geddes, Salyer, and Mark (1999), it has been conceptualized as an attribute of the environment (e.g., Terreberry, 1968; Thompson, 1967; Tosi, Alday & Storey, 1973), an attribute of the individual (e.g., Downey & Slocum, 1975; Duncan, 1972; Gifford, Bobbitt, & Slocum, 1979; Huber, O’Connell, & Cummings, 1975), and as an interaction between the individual and the organizational environment (e.g., an individual’s perceptions are affected by personal attributes and the objective stimuli of the situation; Lorenzi, Sims, & Slocum, 1981). Uncertainty as an attribute of the environment refers to the objective characteristics, or the state of, organizational environments (Milliken, 1987). Objective measures of environmental uncertainty include environmental characteristics (e.g., complexity, dynamism, volatility), which are viewed as antecedents of the perception of uncertainty because they render the environment less predictable (Milliken, 1987). Allred and colleagues (1994a) noted that both external and internal factors comprise an organization’s environment. The organization’s external environment includes factors outside the organization’s boundaries (e.g., customers, suppliers, competitors), whereas the internal environment includes aspects within the organization’s physical boundaries (e.g., departments in the hospital) (Duncan, 1972).
As an attribute the individual, environmental uncertainty is a perceptual, subjective phenomenon (perceived environmental uncertainty or PEU) and has been defined and measured as: (1) an inability to assign probabilities as to the likelihood of future events (Duncan, 1972, cited in Milliken, 1987), (2) a lack of information about cause-effect relationships (Duncan, 1972; Lawrence & Lorsch, 1967, cited in Milliken, 1987), and (3) an inability to accurately predict the outcomes of a decision (Downey & Slocum, 1975; Duncan, 1972, cited in Milliken, 1987). Milliken (1987) labelled these three above definitions as state, effect, and response uncertainty, respectively, and suggested that the common theme in these conceptualizations is the lack of available information required for decision making or action. In this manner, environmental uncertainty is defined as an individual’s perception of a lack of critical information about the environment and as a result, s/he is unable to predict changes within the environment (Milliken, 1987).

Environmental uncertainty in the nursing administration literature is based on organizational theory, described in the context of turbulent, rapidly changing nursing practice environments. Environmental factors include resources, information, and relationships found external to the nursing unit (e.g., community referral services) and internal to the nursing unit (equipment, number of patient admissions) and deemed critical to nursing care (Allred et al., 1994b). Environmental uncertainty has been operationalized as objective measures of the hospital unit, such as the number of admissions, discharges, and transfers in and out of a unit in a 24-hour period (Garrett & McDaniel, 2001; Salyer, 1995) and the daily change in unit patient acuity and unit occupancy (Salyer, 1995). The term PEU has been used to describe an individual response to stimuli in the internal and external environment, and nursing studies addressing PEU are primarily concerned with designing effective nursing care delivery.
systems to support nursing practice (Allred et al., 1994a; 1994b; Callaghan et al., 1997; Salyer, 1995, 1996).

When environmental uncertainty is described and investigated by researchers as an individual perceptual phenomenon (as a result of both personal and environmental factors and in the context of an organization’s internal or task environment), the concepts PEU and clinical uncertainty are conceptually similar. For example, Allred et al. (1994b) illustrated PEU with reference to a nurses’ uncertainty related to a patient’s response to a particular nursing intervention. However, when the organizational literature describes environmental uncertainty as an objective phenomenon with reference to the organization’s external environment (e.g., factors outside the organization’s boundaries), the concepts PEU and clinical uncertainty are conceptually distinct; for example, the concept clinical uncertainty as it is portrayed in the health care literature, does not address issues related to the broader health care system, such as revenues, competitors, or suppliers.

In summary, environmental uncertainty is an organizational concept, described as an attribute of the environment, an attribute of the individual, and an interaction between the individual and organizational environment. Uncertainty is commonly described as a perceptual phenomenon, with perceptions driven by objective environmental conditions (Begun & Kaissi, 2004) and subject to individual interpretations (Allred et al., 1994b). Environmental complexity and dynamism are two key inputs into an individual’s perception of environmental uncertainty (Allred et al., 1994a; 1994b; Begun & Kaissi, 2004; Duncan, 1972), and individual differences have been shown to influence the perception of environmental uncertainty (e.g., Callahan et al., 1997; Downey & Slocum, 1975; Salyer, 1995).
Ambiguity is conceptualized in the psychology literature as an attribute of the task or situation, which creates a stimulus perceived by the individual. Norton (1975) contended that a stimulus is described in degrees of ambiguity in two ways: the variability in the degree of structure inherent in the physical stimulus (e.g., task) and the variability in the interpretations of, or responses to, the stimulus made by the perceiver. While ambiguity is sometimes used interchangeably with uncertainty, ambiguity refers to the nature and structure of cues, whereas uncertainty refers to an individual’s state of mind (e.g., confusion) created by ambiguity or ambiguous stimuli (Budner, 1962; Lazarus & Folkman, 1984; Norton, 1975).

Budner (1962) defined an ambiguous situation as “one that cannot be adequately structured or categorized by the individual because of the lack of sufficient cues” (p. 30), and he identified three ambiguous situations as: a novel situation (new situation in which there are no familiar cues); a complex situation (great number of cues to be taken into account); and an insoluble situation (a contradictory situation in which cues suggest different structures). Budner (1962) defined ‘intolerance of ambiguity’ as the tendency to perceive ambiguous situations as sources of threat and he stated that ambiguous situations can produce feelings of discomfort in those with a low tolerance of ambiguity, thus contributing to avoidance behaviour.

In his review of the literature, Norton (1975) identified eight common categories of the uses of the term ambiguous, including: (1) multiple meanings, (2) vagueness, incompleteness, or fragmented, (3) a probability, (4) unstructured, (5) lack of information, (6) uncertainty, (7) inconsistencies or contradictions, and (8) unclear. Norton (1975) added that lack of clarity, lack of structure, uncertainty, inconsistency, or indistinctness is not a
necessary condition, although it may be a sufficient condition, to warrant labelling something ambiguous (e.g., a person may clearly see, understand, and appreciate both interpretations of a stimulus and still label it ambiguous). According to McLain (1993), the common feature of any ambiguous stimulus is lack of information. Lazarus and Folkman (1984) contended that when the information necessary for appraisal is unclear or insufficient, the environmental configuration is ambiguous. The greater the ambiguity, the more influence personal characteristics (e.g., beliefs, experience) have on an individual’s interpretation of the situation. Ambiguity, then, refers to attributes of the situation, task, or event, while uncertainty refers to an individual’s perception of the situation, task, or event, which may or may not include ambiguity.

In the nursing literature, Benner (1984) implied that clinical uncertainty is situation or task specific; for example, expert nurses experience uncertainty in ambiguous situations, similar to those outlined by Budner (1962), such as new and unfamiliar situations. Additionally, in the decision making literature, Hammond’s cognitive continuum theory suggests that ambiguity of the task (e.g., familiarity of task content) determines the individual’s cognitive approach to decision making (e.g., intuitive or analytical).

Task Complexity

In the organizational behaviour literature, Hackman (1969), Wood (1986), and Campbell (1988) theorized task complexity. Hackman (1969) contended that objective task properties and behavioural responses to these stimulus conditions enable researchers to examine the effects of tasks and task characteristics on behaviour. For Wood (1986), task complexity represents the relationship between task inputs (required acts and information cues) and performance, by the demands it places on the knowledge, skills, and resources of the decision
maker (e.g., complex tasks place greater behavioural and information processing demands on
the task-doer). In a similar manner, Campbell (1988) proposed that objective task
characteristics that increase information load, information diversity, or rate of information
change, and number of probabilistic pathways for achieving multiple outcomes contribute to
complexity.

Task complexity in this literature has largely been described and studied as an objective
task characteristic (Campbell & Gingrich, 1986; Earley, Lee, & Hanson, 1990; Taylor, 1987;
Wood, Bandura, & Bailey, 1990). However, a few researchers have studied task complexity
as a subjective experience (Gardner, 1990; Mangos & Steele-Johnson, 2001; Maynard &
Hakel, 1997) and as an interaction between task and person characteristics (Campbell &
Gingrich, 1986; Earley et al., 1987; Jimmieson & Terry, 1999). Studies have indicated that
increases in complexity of a decision situation result in a decision makers’ use of heuristics
or simplifying strategies to reduce cognitive strain (Olshavsky, 1979; Paquette & Kida, 1988;
Payne, 1976). Mangos and Steele-Johnson (2001) asserted that subjective task complexity is
an important construct to consider when individuals are learning a new task, and they report
that task complexity is perceived highest early in skill acquisition.

Information science literature conceptualizes task complexity in terms of perceived a
priori determinability of task inputs (information requirements), procedures for performing
the task, and the outcomes of the task (Byström & Järvelin, 1995; Byström, 2002; Kuhlthau,
1991; Vakkari, 1999). Uncertainty within this context is described as task uncertainty, where
uncertainty arises from an individual’s recognition of a lack of knowledge concerning a task
and the perceived requirements for task performance (Byström & Järvelin, 1995; Culnan,
1983; Tiamiyu, 1992). Thus, task complexity creates uncertainty produced by an individual’s
recognition that s/he does not know enough about the task and requirements of the task to perform it (Byström & Järvelin, 1995). The greater the task complexity, the greater is the uncertainty associated with the task (Kuhlthau, 1999). Task complexity is considered subjective when individuals’ understanding of the task is the basis for interpretation of information needs and the promising actions for satisfying them (Byström & Järvelin, 1995; Vakkari, 1999). Vakkari (1998) noted that if we can claim that uncertainty means experienced indeterminability of task elements, in this manner, the concepts are similar.

Uncertainty has been viewed as a mediator between task complexity and information source use (Culnan, 1983), and studies suggest that task complexity affects information seeking and use: as task complexity increases, the greater the need for more information types (Byström & Järvelin, 1995; Byström, 1997, 2002; Kuhlthau, 1999), the more sources used (Byström & Järvelin, 1995; Byström, 1997, 2002; Culnan, 1983; Tiamiyu, 1992), and the greater the use of peers as sources of information (Byström, 1997, 2002; Culnan, 1983; Tiamiyu, 1992).

In the context of nurses’ work, task complexity is defined as characteristics of the decision making task that increase demands on nurses’ information processing (Corcoran, 1986a; 1986b; Gordon, 1980; Lewis, 1997), and involves activities that define the nursing process (Lewis, 1997). Studies were located in the nursing literature that measured task complexity associated with nurses’ clinical decision making. These studies involved a problem solving, planning, or diagnostic task (e.g., using simulated clinical problems) in which task complexity was operationalized as: presence of disconfirming information (Botti & Reeve, 2003; Lewis, 1997), number of information cues or interrelation of problems (Cianfrani, 1984; Corcoran, 1986a, 1986b; Cioffi & Markham, 1997; Gordon, 1980; Hicks et
al., 2003; Hughes & Young, 1990; Westfall et al., 1986), extraneous, irrelevant or inconsistent clinical information (Cianfrani, 1984; Cioffi & Markham, 1997; Cioffi, 2000; Corcoran, 1986a, 1986b; Gordon, 1980; Hicks et al., 2003; Hughes & Young, 1990; Lewis, 1997; Westfall et al., 1986), and level of patient acuity (Henry, 1991). Dependent variables included criterion measures such as, diagnostic accuracy (Botti & Reeve, 2003; Cianfrani, 1984; Gordon, 1980; Hicks et al., 2003) and decision making consistency (Hicks et al., 2003; Hughes & Young, 1990).

Findings from nursing studies support those from the organizational behaviour research that information processing or cognitive approaches to decision making vary as a function of task complexity (Botti & Reeve, 2003; Cianfrani, 1984; Cioffi & Markham, 1997; Cioffi, 2000; Corcoran, 1986a, 1986b; Gordon, 1980; Hughes & Young, 1990; Lewis, 1997; Westfall et al., 1986). For example, the greater the complexity, the more frequently heuristics or experience is used to make diagnostic judgements (Botti & Reeve, 2003; Cioffi & Markham, 1997; Hicks et al., 2003). Studies have also demonstrated that nurses diagnostic accuracy or identification of patients’ health problems decreases with the use of increased amounts of data (Cianfrani, 1984; Gordon, 1980) and irrelevant data (Cianfrani, 1984). Botti and Reeve (2003) found that overall, nursing students lacked the ability to recognize the need for additional information in solving decision tasks, and their diagnostic accuracy was poor.

In summary, task complexity is defined as an objective task feature (e.g., determined by characteristics of cues) that affects the way in which individual’s process and use information. As a perceptual variable, the concept of uncertainty reflects how an individual appraises objective properties of task complexity. In this manner, task complexity is similar to uncertainty in that both are experienced as a subjective response.
Summary: Definitions of Concepts

Uncertainty

Uncertainty is defined in the literature as a dynamic state in which there is a perception of being unable to assign probabilities for outcomes (Penrod, 2001a; Thompson & Dowding, 2002), with perceptions driven by objective environmental conditions (Begun & Kaissi, 2004). Uncertainty is a cognitive state due to a lack of understanding or a gap in meaning, which commonly causes affective symptoms (Kuhlthau, 1993). When uncertainty is placed in the context of the health care work environment, it is referred to as clinical uncertainty.

Based on the review of the literature, a revised conceptual definition of clinical uncertainty is proposed and will be used to guide the development of research questions: Clinical uncertainty is a dynamic, perceptual state experienced by a nurse relative to the condition of a patient that may be influenced by environmental, task, and patient characteristics, and is moderated by nurse attributes. The experience of uncertainty may create cognitive, affective, and/or behavioural responses leading to (or comprising) coping strategies, all of which may impact nurse and patient-related outcomes.

Information Need

An information need is defined as the recognition of lack of information to carry out an action (Krikelas, 1983) and the conscious expressions (verbal or nonverbal) of a desire for more information (Forsythe et al., 1992). Information needs may be recognized (Krikelas, 1983) or latent (MacIntosh-Murray & Choo, 2005).

Information Seeking

Information seeking is defined as any activity that is undertaken to satisfy an individual’s perceived information need (Krikelas, 1983), a process of searching, obtaining, and using
information (Vakkari, 1999), a situation-sensitive, sense-making process (Dervin & Nilan, 1986), and a process of construction, with uncertainty and anxiety decreasing as understanding increases (Kuhlthau, 1993).

*Environmental Uncertainty*

Environmental uncertainty is defined as an individual’s perception of a lack of critical information about the environment and as a result, s/he is unable to predict changes within the environment (Milliken, 1987).

*Ambiguity*

Ambiguity is defined as an attribute of a situation, task, or event that creates a stimulus (e.g., physical stimulus, response) perceived by the individual (Budner, 1962; Lazarus & Folkman, 1984; Norton, 1975).

*Task Complexity*

Task complexity is defined as objective task features characterized by the number of information cues to process (e.g., Campbell, 1988; Campbell & Gingrich, 1986; Cianfrani, 1984; Corcoran, 1986a, 1986b), intercorrelations between information cues (Campbell, 1988; Cioffi & Markham, 1997; Corcoran, 1986a, 1986b), and irrelevant, inconsistent, or extraneous information (e.g., Cianfrani, 1984; Hicks et al., 2003; Hughes & Young, 1990), which may contribute to an individual’s perception of uncertainty (e.g., Byström & Järvelin, 1995; Culnan, 1983) and increase demands on information processing (e.g., Corcoran, 1986a; 1986b; Lewis, 1997).

**Summary and Conclusions from the Review of the Literature**

While existing research has advanced the body of knowledge regarding the role of uncertainty in decision making, this has been largely from the physician’s viewpoint, and in
the nursing literature, from the patient’s perspective. In medicine, uncertainty is described within a framework of physicians’ decision making and is conceptualized as sources of uncertainty and responses to uncertainty. What we know from the physician literature is that physicians’ uncertainty stems from information deficiencies and is associated with clinical decisions concerning diagnosis, treatment/intervention, and prognosis. Physicians’ reactions to uncertainty include cognitive, behavioural, and affective responses, many of which include coping strategies to reduce uncertainty, such as gathering additional information, fostering physician-patient relationships, using heuristics, and shared decision making. Physicians also cope with uncertainty by acknowledging and disclosing it, or by using defences against uncertainty (e.g., denial, avoidance behaviours).

In the nursing literature, the concept of uncertainty in the context of nurses’ practice has received less attention. Penrod (2001b) highlighted that research into the nurse’s experience of uncertainty in practice is noticeably absent and not a significant trend in the nursing literature. It may be that the concept of uncertainty is embedded in studies examining nurses’ clinical decision making. In the medical and nursing literature, uncertainty is described as a characteristic of the decision-making process (e.g., Baumann et al., 1991; Gerrity et al., 1990; 1992; Thompson & Dowding, 2002). However, to fully understand nurses’ uncertainty, studies need to move beyond the concept, to understanding uncertainty as a phenomenon in nurses’ practice. The majority of studies reviewed in the nursing literature have not theorized or explored uncertainty, but reported findings indicating nurses’ uncertainty in their practice. Several studies have examined information needs and information seeking as responses to clinical uncertainty. However, because few studies directly examined nurses’ uncertainty in this context, it is difficult to draw meaningful conclusions from this literature, and there are
inconsistent conceptualizations of uncertainty. However, studies with findings related to uncertainty suggest that nurses tend to cope with uncertainty by using heuristics or intuition, and relying on experience and collegial support (similar to findings in the physician literature).

The nursing literature further indicated that expressing clinical uncertainties as information needs can help guide information seeking and retrieval and reduce uncertainty (Flemming, 1998; Flemming & Fenton, 2002; Thompson et al., 2002). However, others have argued that it is difficult to get clinicians to recognize and admit uncertainties (Johnston & Fineout-Overholt, 2005; MacIntosh-Murray & Choo, 2005). A key finding from studies investigating nurses’ information behaviour is that information needs are not always recognized and may be latent (MacIntosh-Murray & Choo, 2005).

There are key findings from the physician literature that are not explored in the nursing literature that are relevant for guiding investigations about nurses’ uncertainty, and these findings are based on the work by Gerrity et al. (1990; 1992; 1995). Gerrity and colleagues developed and tested a model to explain physicians’ affective reactions to uncertainty and behavioural implications. Uncertainty in the nursing literature has not been theoretically derived or empirically studied in this manner.
**Concept Map of Uncertainty**

Based on the review of the literature, a concept map of uncertainty is depicted to summarize what is known about the concept of uncertainty (see Figure 1). A concept map is a tool for organizing and representing knowledge (Novak, 1991). The map shows antecedents to uncertainty (on the left hand side of the map), and coping responses and decision making, shown as consequences of uncertainty (right hand side of the map). The literature suggests that uncertainty involves a process, which includes a recognition phase (e.g., recognition of information needs, perceived uncertainty), a response or coping phase (e.g., cognitive, behavioural, affective), and a decision making phase. Because the purpose of Figure 1 is to illustrate a summary of the literature, dashed lines indicate that relationships are not hypothesized. The figure represents how I had summarized and organized the literature based on this review. What is suggested by the concept map based on the literature reviewed is that uncertainty can be studied beyond that of a concept. It can be studied as a phenomenon and from a process-oriented perspective.

**Antecedents**

Identification of the antecedents of a concept includes the events or phenomena that are generally found to precede an instance of the concept (Rodgers, 1989). The literature suggests factors influencing the perception of uncertainty as, nurse attributes, the patient encounter, patient characteristics, task characteristics, and work environment characteristics.

**Nurse attributes**

Nurse attributes include years of nursing experience, level of domain knowledge, and new and unfamiliar situations. The nursing literature indicated that nurses with more years of experience have greater cognitive repertoires from which to draw upon to inform decisions
and to reduce uncertainty (Benner, 1984). Fox (1957) highlighted that when a perceived lack of knowledge exists it elicits the perception of uncertainty; for instance, using unfamiliar equipment (Wichowski & Kubsch, 1995), and not knowing the patient and what to expect.

**Patient encounter**

The patient encounter is described here as the patient-nurse relation during a patient’s episode of care. The patient encounter is described broadly to include the patient-nurse relationship, the patient’s perspective concerning his/her needs and the patient situation, the nurse’s role in nurse-patient interactions and nurse interactions with the patient’s family, including both the patient’s and the family’s active role in the patient’s care.

**Patient characteristics**

Patient characteristics are depicted in the literature in the context of the patient’s condition, (e.g., uniqueness of the patient problem), and are associated with task characteristics and environmental conditions (patient turnover, access to information resources).

**Task characteristics**

Nursing tasks are described in the literature as patient related decision tasks, such as developing a care plan or evaluating the effectiveness of interventions. Task properties that render tasks more complex than others are primarily related to the nature and structure of information, and create difficulty in gaining an understanding of the patient’s condition. Patient acuity is typically described in the literature as a patient characteristic. However, patient acuity is considered an organizational characteristic because it is commonly associated with resources needed for patient care (e.g., information, staff). Henry (1991) operationalized patient acuity as high or low, and reported that in (simulated) situations where patients represented a high level of acuity (e.g., a ventricular tachycardia arrhythmia),
nurses collected fewer data before intervention in the more acute situation. Task complexity is commonly defined as an objective task feature that may act as a stimulus to the perception of uncertainty, and influences an individual’s information-processing and decision making. In the organizational behaviour and nursing literature, the most frequently cited factors that comprise task complexity are: the number of information cues, intercorrelations between information cues, extraneous, irrelevant, or inconsistent information. Described in the context of the patient, examples representing these factors are: predictability of relationships between signs and symptoms (Cioffi & Markham, 1997), complexity of medical history (Hicks et al., 2003), complexity of the diagnosis (Westfall et al., 1986), and number of potential clinical problems (Hughes & Young, 1990).

Work environment characteristics

The work environment is described here as the internal environment of a hospital unit where nursing care is delivered and includes factors such as, supplies and equipment, policy procedures, time available for care, number of patient admissions, and patient acuity (Allred et al., 1994b), which are generally outside of an individual’s control. Environmental factors are described in the nursing administration literature as: patient turnover, staff nurse turnover, and availability of information resources.

At the hospital unit level, patient turnover has been measured as the number of admissions, discharges, and transfers on/off a unit in a 24-hour period (Salyer, 1995). Scholars have argued that when patient turnover is high, nurses will more frequently be confronted with new admissions, a fluctuating census, and changing patient assignments (Geddes et al., 1999; O’Connell, 1998; Salyer, 1995).
Staff nurse turnover is a component of both reengineering of care delivery and workload (Geddes et al., 1999), and includes the use of supplemental staff from outside agencies, casual nurses (Geddes et al., 1999; O’Connell, 1998), or reassigning nurses to units other than their ‘home unit’ (Geddes et al., 1999) and has been described in the context of fluctuating and uncertain working conditions (O’Connell, 1998).

When information needed to make a clinical decision is unavailable uncertainty may persist (e.g., Bucknall, 2000; Covell et al., 1985; Thompson et al., 2001a). A key factor motivating information seeking is the perceived availability of information (Connelly et al., 1990; Curley et al., 1990), because information seeking is time consuming (Chambliss & Conley, 1996).

**Consequences**

Consequences are the events or incidents that follow an occurrence of the concept (Rodgers, 1989). The literature suggests consequences of uncertainty (after perceiving uncertainty) as recognition of information needs, coping responses, and decision making.

**Recognition of information needs**

From an information seeking perspective, Kuhlthau (1991) suggested that once an individual perceives uncertainty, information needs may or may not be recognized. When an individual first becomes aware of a lack of knowledge or understanding, feelings of uncertainty are common and the individual’s task is to recognize a need for information (Kuhlthau, 1991). However, an individual may not consciously recognize a need for information (Botti & Reeve, 2003; Fox, 1957; Kuhlthau, 1991; MacIntosh-Murray & Choo, 2005; Williamson et al., 1989) and information needs become latent (MacIntosh-Murray & Choo, 2005).
Coping responses

The literature portrayed coping responses as cognitive, affective and behavioural responses, such as information seeking, the use of heuristics or intuition, stress, anxiety, and avoidance behaviours (e.g., Gerrity et al., 1992).

Information seeking

Information seeking is any activity that is undertaken to satisfy an individual’s perceived information need (Krikelas, 1983) and is portrayed in the literature as a behavioural response to perceived uncertainty (e.g., Blythe & Royle, 1993; Covell et al., 1985; Ely et al., 1992; Thompson et al., 2001a). Collaboration with colleagues was a commonly reported strategy to obtain information for decision making (e.g., Bucknall, 2000; Cioffi, 2000; Ely et al., 1999; Thompson et al., 2001b). However, the literature indicated that to initiate the process of information-seeking, information needs must first be recognized by the individual (Kuhlthau, 1991, MacIntosh-Murray & Choo, 2005; Williamson et al., 1989) or at least be revealed to them (MacIntosh-Murray & Choo, 2005).

Use of heuristics or intuitive judgement

Studies indicated that intuitive judgements or heuristics (cognitive shortcuts used to simplify decision making) are used to make decisions under conditions of uncertainty (Benner, 1984; Cioffi & Markham, 1997; Tversky & Kahneman, 1974).

Affective responses

An individual may recognize uncertainty but not admit and disclose uncertainty, which has been associated with fear of personal inadequacy or fear of being perceived by others as incompetent. Avoidance behaviours, such as reluctance to disclose uncertainty, have been described as coping responses (Fox, 1957; Gerrity et al., 1990; 1992; 1995), and have been
associated with a fear of personal inadequacy (Fox, 1957). Perceived stress and anxiety are described in the literature as affective responses to uncertainty (e.g., Cioffi, 2000; Charleston & Happell, 2005; Fox, 1957; Gerrity et al., 1992; Gray-Toft & Anderson, 1981), both adaptive and maladaptive (Katz, 1984).

Decision-making process

Decision making involves comparing alternatives. Uncertainty has been described as the critical link between information and decision making (Ingwersen, 1992, cited in Kuhlthau, 1993) and as a characteristic of the decision-making process (e.g., Baumann et al., 1991).
Figure 1. Concept map of uncertainty.
Figure 2 outlines the scope or initial focus of the study. The perspective taken in this study viewed uncertainty through an information behaviour and decision making lens. The focus of the study was to explore nurses’ experience of clinical uncertainty and how this influenced their information behaviour (e.g., recognition of information needs and information seeking).

When nurses perceive uncertainty concerning a clinical or patient situation, how does this influence their recognition of information needs? Are nurses aware of their information needs or do their information needs go unrecognized, and if so, why? Are information needs latent and need to be revealed by others? What helps nurses to recognize their information needs? How does uncertainty influence nurses’ decisions to act (or not to act) on the recognition of information needs? How does the experience of uncertainty influence nurses’ information seeking? What does this process look like? The following research questions will address these areas of inquiry.

**Research Questions**

1. How do medical-surgical ICU nurses experience uncertainty in their daily practice?
2. How do medical-surgical ICU nurses respond to uncertainty in their daily practice?
   (a) In general (e.g., cognitive, affective, behavioural responses)?
   (b) In particular, how does uncertainty influence recognition of information needs?
   (c) In particular, how does uncertainty influence decisions to seek additional information?
Figure 2. Initial scope of the study.
CHAPTER 3: METHODOLOGY

This chapter details the qualitative methodology used to conduct this study including a general definition of theory, description of the grounded theory research design, data collection and analysis, criteria for evaluating a grounded theory, and ethical considerations.

Definition of Theory

It is important to preface what is meant by theory in general (and non-discipline specific) terms because it has been described and classified in different ways. For instance, theories have been classified in terms of purpose (e.g., explanation, prediction), level of abstraction (e.g., formal, middle-range, situation-specific), scope, and applicability (Meleis, 1997; Strauss, 1995). Meleis (1997) provides a useful general definition of theory as, “an organized, coherent, and systematic articulation of a set of statements related to significant questions in a discipline that are communicated in a meaningful whole” (Meleis, 1997, p. 12). “It is a symbolic depiction of aspects of reality that are discovered or invented for describing, explaining, predicting, or prescribing responses, events, situations, conditions, or relationships; theories have concepts that are related to the discipline’s phenomenon” (Meleis, 1997, p. 12). “A phenomenon is an aspect of reality that can be consciously sensed or experienced” (Meleis 1997, p. 11). Concepts relate to each other to form theoretical statements (Meleis 1997).

Charmaz (2006) highlighted that prevalent definitions of theory tend to derive from positivism. Positivist definitions of theory include statements of relationships between abstract concepts and constructing operational definitions of concepts for hypothesis testing; the objectives of theory are to explain and make predictions (Charmaz, 2006). As summarized by Charmaz (2006), “positivist theory seeks causes, favours deterministic
explanations, and emphasizes generality and universality” (p. 126). On the other hand, interpretive definitions of theory emphasize understanding; theoretical understanding is abstract and interpretive (Charmaz, 2006). Interpretive theory “assumes emergent, multiple realities, indeterminacy, facts and values as linked, truth as provisional, and social life as processual” (Charmaz, 2006, p. 126).

**Grounded Theory**

A grounded theory is inductively derived from empirical data. Strauss and Corbin (1998) maintained that it is the overall unifying explanatory scheme that raises findings to the level of theory. Strauss and Corbin (1998) defined theory as a set of well-developed categories (e.g., themes, concepts) that are systematically interrelated through statements of relationship to form a theoretical framework that explains some phenomenon. Charmaz (2006) contended that Strauss and Corbin’s (1998) view of theory includes both positivist and interpretive traditions. For instance, Charmaz noted that their view of theory emphasizes relationships among concepts; however, their stance toward constructing theories acknowledges interpretive views. Theory provides a common language (e.g., set of concepts) through which others can discuss and exchange ideas, and provides insight and understanding (Strauss & Corbin, 1998).
Research Design

A grounded theory approach guided the study as outlined by Strauss and Corbin (1998). Grounded theory is an emergent design that uses a set of procedures to develop a theory about complex phenomenon, which is provisionally verified through systematic data collection and analysis (Strauss & Corbin, 1998). The goal of this study was to develop a substantive theory. A substantive theory is one that is inductively derived from the study of a phenomenon in a specific situational context (Strauss & Corbin, 1998).

Grounded theory was used to address the study research questions because we do not have a well-developed theoretical understanding of the phenomenon of uncertainty in nurses’ practice. Grounded theory methodology was used to understand uncertainty from the perspective of nurses working in adult medical-surgical intensive care units (MSICU). Grounded theory emphasizes the importance of perception, meaning, action/interaction, and context involved in understanding a phenomenon, and my goal was to develop a theory that explained how nurses experienced and responded to uncertainty arising from patient care situations and how this influenced their information seeking behaviour.

Symbolic Interactionism

This study was guided by an interpretive approach. Grounded theory has its origins in the interpretive tradition of symbolic interactionism (Benoliel, 1996). Symbolic interactionism is both a theory about human behaviour and an approach to inquiring about human conduct and group behaviour (Chenitz & Swanson, 1986). In the interpretive tradition, knowledge is relative to particular historical, temporal, cultural, and subjective circumstances and “exists in multiple forms as representations of reality” (Benoliel, 1996, p. 407). Theory grounded in reality provides an explanation of events as they occur and is concerned with social processes
within context (Strauss & Corbin, 1998). Grounded theory is based upon assumptions that both knowledge and people are dynamic and that context facilitates, hinders, or influences human goals and social psychological processes (Benoliel, 1996).

Symbolic interactionism rests on three fundamental premises: (1) that humans act toward things (e.g., persons, situations) on the basis of the meanings that those things have for them, (2) the meaning of those things is derived from social interactions with others, and (3) the individual modifies these meanings through an interpretive process (Blumer, 1969). Thus, human behaviour is a result of an interpretive process in which people assign meaning to the events and situations in which they encounter (Baker, Wuest, & Stern, 1992). The symbolic interactionist perspective focuses on dynamic relationships between meaning and actions (Charmaz, 2006). Meaning of the situation is created by people and leads to action and the consequences of action (Chenitz & Swanson, 1986). Chenitz (1986) outlined implications that the symbolic interactionist perspective has on research: the meaning of the event must be understood from the participants’ perspective, and behaviour must be understood at the symbolic and behavioural levels and examined in interaction.

Social interactions and the sociocultural environment in which they exist also influence interpretations of a situation (Benoliel, 1996). Hutchinson (1993) contended that people make sense of their environment, although their world may appear disordered or nonsensical to observers; she noted that people sharing common circumstances, such as ICU nurses, experience shared meanings and behaviours that constitute the substance of grounded theory.

This study was situated within processes of human behaviour in the social context and culture of MSICU nurses’ work environment. Inquiry from the symbolic interactionist perspective was particularly relevant for the study of how nurses interacted and engaged in a
process in response to patient situations characterized by uncertainty; for example, nurses’ actions were explored based upon meanings derived from interactions and relations with others (e.g., collegial interactions, nurse-patient interactions), their environment, and how specific cues gave rise to cognitive, affective, and/or behavioural responses. Particular attention was given to the symbolic meanings and metaphors that participants used in their language to describe uncertainty and the work environment (context) within which they practiced.

Research Context and Procedures

Setting

The study settings were two adult MSICUs within two acute care teaching hospitals. Purposive sampling was used to select the two study hospital sites. These hospitals were chosen because of their geographic locations and because of their reputations as being committed to both quality patient care and to research. Furthermore, I had not been employed at these hospitals. General MSICUs were selected rather than specialized units such as burn units, because it was important to maintain a certain amount of consistency to develop a substantive theory, that is, a theory pertaining to one particular area of inquiry (Strauss & Corbin, 1998). The use of more than one setting was used to facilitate sample recruitment. It was anticipated that there would be some variation within each hospital’s MSICU in terms of practice patterns, policies, procedures and patient population. In these units, nurses worked twelve hour shifts and practiced using a primary care model of delivery, where nurses are assigned to care for the same one or two patients during their scheduled shift rotation.

Patients in study MSICUs were those who required medical or general surgery acute care, such as those with vascular conditions, and those who required specialized services
such as dialysis, haematology and sepsis services, or complex mechanical ventilation. One hospital site MSICU had 14 beds and employed approximately 80 registered nurses. The other MSICU had 24 beds and employed approximately 130 registered nurses.

Sample

Nurses invited to participate were those who: (1) were MSICU staff registered nurses working full-time or part-time hours at one of the study hospital sites, and (2) provided written informed consent. Agency nurses were excluded from the study because they were not directly affiliated with a participating hospital. Nurses with different levels of experience were included in the sample to provide variation. Multiple perspectives add insight, richness, depth, and variation to a phenomenon (Strauss & Corbin, 1998). One nurse working casual hours was included in the study. This nurse had just changed to casual status from working full-time in the unit for several years.

Nurses who met the study inclusion criteria, volunteered, and consented to participate were interviewed. A total of 14 nurses participated in the study. The average age of nurses was 36.5 years. Eleven nurses were female and three were male. Fifty percent of study nurses held a baccalaureate in nursing degree. Five nurses held a nursing diploma and two nurses held a master of nursing degree. Nurses had on average 10.9 years of nursing experience, 6.8 years experience working in an ICU, and 4.8 years experience working in their current unit. Eleven nurses worked full-time, two worked part-time, and one nurse worked casual (see Table 1 for sample characteristics).
Table 1. Sample Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean in years (range)</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>36.5 (24 – 47)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years experience as an RN</td>
<td>10.9 (2 - 21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years experience in ICU</td>
<td>6.8 (0.5 - 16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years in current ICU</td>
<td>4.8 (0.5-16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>11</td>
<td>78.6%</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>3</td>
<td>21.4%</td>
</tr>
<tr>
<td><strong>Highest Level of Nursing Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RN diploma</td>
<td>5</td>
<td>35.7%</td>
<td></td>
</tr>
<tr>
<td>Baccalaureate degree</td>
<td>7</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Masters</td>
<td>2</td>
<td>14.3%</td>
<td></td>
</tr>
<tr>
<td><strong>Non-nursing education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>1</td>
<td>7.1%</td>
<td></td>
</tr>
<tr>
<td>Baccalaureate degree</td>
<td>3</td>
<td>21.4%</td>
<td></td>
</tr>
<tr>
<td>Masters</td>
<td>1</td>
<td>7.1%</td>
<td></td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>11</td>
<td>78.6%</td>
<td></td>
</tr>
<tr>
<td>Part-time</td>
<td>2</td>
<td>14.3%</td>
<td></td>
</tr>
<tr>
<td>Casual</td>
<td>1</td>
<td>7.1%</td>
<td></td>
</tr>
</tbody>
</table>
Sample Recruitment

Prior to submitting the study proposal to ethical review committees, I contacted each hospital’s nursing administrator by telephone (Vice President of Nursing/Chief Nursing Executive) to introduce the study, to determine their interest, to inquire about other studies or procedures currently being implemented that might interfere with conducting this study, and to arrange a face-to-face meeting to further discuss this study. These in-person meetings were conducted at each hospital site prior to seeking ethical approval. At one hospital site, this meeting took place in the nursing administrator’s office and involved myself, the nursing administrator, the MSICU manager, and the clinical nurse specialist. At the other hospital site, the meeting took place in the MSICU manager’s office, and involved myself, the unit manager, and the nursing administrator.

This study received ethical approval from the University of Toronto Health Sciences I Research Ethics Board and each hospital’s Research Ethics Committee. Permission was obtained from the MSICU managers to recruit potential participants at staff meetings and during change of shift. Recruitment for individual interviews was conducted over a 10 month period, between November 2006 and September 2007.

Recruitment Procedure- Interviews

Upon receiving ethical approval to approach potential study participants, dates and times were arranged with each MSICU manager to conduct information sessions and to invite nursing staff to volunteer to participate. Liaising with the MSICU managers was ongoing throughout the recruitment period. The study was advertised via a flyer with information containing the nature and purpose of the study and my office telephone number. The flyer was displayed at each unit’s front desk and in the staff lounge (see Appendix A). Information
sessions were conducted with MSICU nursing staff at each hospital site. Assistance was sought from a graduate student at the Faculty of Nursing, University of Toronto to help with recruitment. Initially I had planned to explain the study to nurses in the unit through a short powerpoint presentation, using the laptop provided by each hospital site. However, this was not feasible for two reasons. At one hospital site, the time to present was limited to a short timeslot during staff meetings, and some sessions occurred individually with nurses. The second reason was that at the other hospital site, it was difficult to gather nurses together at the same time. Because nurses arrived to where I was located at the nursing station (front desk) 2 or 3 at a time, I repeated the presentation several times during recruitment information sessions. In doing so, as many nurses as possible were provided with the opportunity to attend the information sessions and to ask questions. Refreshments were provided for nurses during recruitment sessions (with permission from each hospital’s MSICU manager).

During each recruitment session, I described the study in detail including the background, purpose, consent process (e.g., risks and benefits, privacy and confidentiality), and the interview procedure. Each nurse in attendance received a letter of explanation about the study (Appendix B) and an interview consent form (Appendix C) in a large stamped and addressed return envelope. I offered to conduct the interview at a time and location of their convenience, including their home. For nurses indicating that they wanted to schedule the interview during their shift break, I stated that I would book a room off the unit. I also informed nurses that if they were not interested in participating in the interview, they could participate in the member check focus group to provide feedback on the mid-analysis or final study findings.
Those interested in participating in the study were asked to either provide me with their contact information after the information session (a contact information sheet was given to each nurse requesting their name and phone number, separate from the consent form), or to call me at the number on the consent form indicating interest, or to mail back the contact information sheet or signed consent form in the stamped addressed envelope provided. Nurses were informed that they could change their minds at any time, regardless of whether they signed the consent form. Nurses were also asked to call me with any questions regarding the study.

At one hospital site, I visited the unit nine times to recruit nurse participants. Recruitment took place on the unit, primarily during afternoon staff meetings at the front desk. Generally, about 6-8 nurses attended each staff meeting that I attended (range 3-11 nurses). The unit manager was present during information sessions and introduced me as a guest. The manager had encouraged nurses to participate, highlighting the wealth of experience nurses collectively had on the unit. One information session was cancelled because the unit was busy. Instead, the unit manager suggested that I speak with nurses individually at their desks. Two information sessions occurred during the early evening on nightshift. For one of these sessions, I described the study at the front desk with a small group of nurses. On the second evening session, I spoke with nurses individually because it was not feasible to assemble as a group due to the busy work shift. Some nurses indicated that they had heard me introduce the study previously and did not take another envelope. Initially, it was difficult to determine which nurses had already attended the information sessions, although these sessions were timed to reach different shift rotations.
I visited the second hospital site eight times to recruit nurses. Recruitment occurred primarily in the morning during change of shift so that I would have the opportunity to speak with nurses from both nightshift and dayshift. The resource nurse facilitated these information sessions, by arranging dates and times and by introducing me to the nursing staff. There were a few times where I had to reschedule recruitment sessions because the unit was very busy. For example, at this hospital, a code blue was initiated in the unit just as I had arrived.

Several nurses showed immediate interest in participating in the study during recruitment. For example, one nurse who was finishing a nightshift stated that she would be back that night for another shift and requested that I conduct the interview during that shift (which I did). Another nurse wished to be interviewed right after a morning information session, so we sat in a quiet room off the unit and the interview was conducted then.

Throughout the recruitment period, twelve nurses had provided me with their name and phone numbers immediately following information sessions and two nurses had returned their information in the mail. One nurse who expressed interest in participating during the information session stated that she had changed her mind when I called to schedule an interview time. Nurses had been informed that they could change their minds about participation at any time. Participants were asked to sign a copy of the consent form at the beginning of their interview and were given a copy of their signed consent form.

*Recruitment Procedure- Member Checking*

When seeking informed consent for the interview, prospective participants were also asked if they would be interested in participating in a 30-45 minute focus group to provide feedback on the data analysis (mid-analysis) or final study findings. Prospective participants were
asked to indicate their interest in participating in or learning more about the focus group, by checking the “Yes” box on the bottom of the interview consent form. Those who checked the “Yes” box on the consent form or who verbally indicated interest during interview information sessions were provided with an information letter (see Appendix D- focus group information letter). Eight of eleven nurses (who had been interviewed at this point) indicated interest in participating in the mid-analysis or final member check interview.

Data Collection

Data were collected through individual face-to-face interviews using a semi-structured interview question guide (see Appendix E- original/initial interview question guide). Fourteen individual interviews were conducted between December 2006 and October 2007. Member check interviews were also conducted, at two different periods during data collection and analysis. This included mid-analysis member check (follow-up) interviews (conducted in September 2007) with three nurses who participated in the individual interviews and a final member check interview (conducted in December 2008) with another three nurses who had participated in the individual interviews.

Data collection proceeded on the basis of theoretical sampling. Theoretical sampling means sampling on the basis of emerging concepts from the data. The aim of theoretical sampling is to develop and saturate theoretically relevant categories in terms of their properties (characteristics) and dimensions (range), uncovering variations, and identifying relationships between concepts (Strauss & Corbin, 1998). Data collection and analysis proceeded simultaneously in an iterative, cyclical process. Thus, data collection was analysis-driven and based on the sampling of concepts. Data collection and analysis were systematic and sequential (Corbin & Strauss, 1990), beginning with data collection, followed by
analysis, followed by more data collection until categories reached ‘saturation’ (Strauss & Corbin, 1998). Theoretical sampling involved reviewing existing transcript data, collecting new data on concepts with subsequent interviews, and collecting data through member checking interviews. Using a summary technique adapted from MacIntosh-Murray (2003), a schematic representation of the initial data collection and analysis plan is appended (see Appendix F).

*Interview Guide Pilot Test- Advanced Practice Nurses*

Prior to interviewing staff nurses, a pilot test of the interview guide was conducted with a total of six experts, including five advanced practice nurses (1 educator, 2 unit managers, 1 clinical nurse specialist, 1 resource nurse) and one content expert (in the critical incident technique). Feedback was sought from these individuals because of their nursing knowledge and experience. The purpose of the pilot test was to evaluate the feasibility, clarity, and appropriateness of the semi-structured interview question guide. These initial interview questions were derived based on the literature reviewed.

Advanced practice nurses (APN’s) were emailed an invitation to participate in a pilot test of the interview guide. The invitation letter explained the purpose of the research study, the procedure for pilot testing the interview guide, and the type of feedback sought (see Appendix G- invitation letter for pilot test of interview guide). All six invited experts agreed to participate in the pilot test. No identifying information was collected from these individuals. The content expert (not employed by one of the study hospitals) was contacted and provided feedback via email. The other five APN’s worked in one of the two study hospitals and participated in a 30-45 minute individual face-to-face meeting. Meetings were arranged via email and were held in each APN’s office. One meeting was held in a classroom
booked by the APN. Each APN was reminded of the purpose of the study, and was asked to read each question of the interview guide and to provide feedback in terms of: clarity of the questions, types of questions asked, ordering of the questions, language and terms used, and feasibility and relevance of the questions to clinical practice within a MSICU. During each meeting, I took notes directly on the interview guide as each question was evaluated.

The content expert evaluated the interview guide in more general terms, rather than each question individually. This expert suggested employing a more open-ended questioning approach that enables the participant to expand the discussion in his/her own direction, thereby remaining consistent with grounded theory. This finding supported feedback from the APNs, particularly around the first question on the interview guide:

1. Tell me about a time during a shift within the past 6-12 months when you had to make a decision concerning your patient’s care and you felt unsure/uncertain about how to provide the most effective nursing care.

Example of a probe question: Please describe as completely as you can what you consider a positive experience and a negative or unfavourable experience for which you had to make a patient care related decision for which you felt unsure about.

This first question and related probe generated the most feedback and discussion, particularly in terms of feasibility and appropriateness of the question. Their feedback suggested that it might not be feasible to ask participants to describe both a positive and a negative situation for which they had to make a patient care decision and felt uncertain. This was observed by four APNs, who felt that it would be more appropriate to pose a broader question by asking participants to describe one situation or experience, thus enabling greater detail and depth. It was suggested by two experts that by asking participants to describe a
situation or experience, positive and negative aspects of the situation would be implied in the question. This would also allow participants to describe their experience from their own frame of reference and based on their own evaluation of the experience. Because recalling an experience is largely dependent on the memories of respondents and their ability to recollect situations, I had included a timeline using the recent past (6-12 months) to the first question to minimize recall bias. One APN suggested that nurses would likely provide recent examples of uncertainty. Feedback on the remainder of the interview guide indicated that overall the questions were clearly written, feasible, and appropriate.

Based on results of the pilot study, I decided to not include the critical incident technique as a questioning tool. In using the critical incident technique, one would consistently and systematically ask each participant to describe both a positive and negative patient care situation for which s/he felt uncertain. A decision was made to leave questions more unguided and with less direction, particularly the first question, which would enable the participant to elaborate on one situation in greater depth. This decision was supported by evidence reported from this pilot study. Findings suggested a broader line of questioning, more consistent with a grounded theory approach.

Interview Guide Pilot Test- Nurse Participants

A second pilot testing of the interview guide was conducted concurrently with the first three nurse participants interviewed. The purpose of the pilot study was to evaluate the feasibility, clarity, and appropriateness of the questions from the semi-structured interview guide. Nurses from both hospital sites were represented in the pilot test. Written informed consent was obtained from participants prior to the individual interviews. After each individual face-
to-face interview was conducted, each participant was asked whether the questions were clearly worded and easy to understand.

Two participants suggested changes to the first question on the interview guide, which after making revisions based on the pilot test with APNs, now read:

1. *Tell me about a time during a shift in the past 6-12 months when you had to make a decision about some aspect of your patient’s care for which you felt uncertain.*

One participant suggested asking for “*one situation*” rather than “*a time.*” This same participant agreed with the manner in which the first question started out broad and the topic was then narrowed with the use of probing questions. Another participant suggested that question one be rephrased to include the word “*individual,*” in terms of the nurse’s individual actions related to the patient situation. Based on this feedback, the word *situation* was used to replace *a time.*

**Interview Procedure**

Semi-structured interviews were scheduled for one hour to accommodate nurses who wanted to be interviewed during their one hour meal break. However, nurses were informed that they could continue to talk past the hour if they wished. Length of interviews ranged from 30-60 minutes. Each nurse was called the day of the interview to determine whether it was feasible to conduct the interview at the scheduled time. A few interviews were rescheduled because nurses became too busy during their shift (e.g., receiving a new admission from the emergency room).

Interviews took place at a location of the participant’s choice and convenience. The majority of interviews were conducted in a quiet room outside (but nearby) the MSICU that was pre-booked, such as an education room. Two interviews were conducted outside of the
hospital at the nurse’s request. Of these, one interview was conducted in the nurse’s home and another was conducted in a classroom at the faculty of nursing at the university.

Prior to each interview, participants were reminded about the study purpose, confidentiality, and that their participation was voluntary. All interviews were audio-recorded (digitally) with written consent, which was obtained prior to each interview. Immediately following each interview, nurse participants were asked to complete a demographic questionnaire for the purpose of describing the study sample (see Appendix H- demographic questionnaire). Interviews were transcribed verbatim by a transcriptionist. I had transcribed one interview myself due to excessive background noise (the interview conducted in the unit at the front desk). Each transcript was checked for accuracy by concurrently listening to each audio recording and reviewing the hard copy of the transcript.

Mid-Analysis Member Check Interview Procedure

A mid-analysis member check was conducted after the first eleven interviews. At this point, I had been analyzing transcript data for eight months. The purpose of member check interviews was to obtain feedback on my analysis thus far in terms of accuracy of interpretation and to seek participants’ reactions to the (preliminary) findings. Nurses who indicated on their interview consent form that they were interested in participating in the member check interview were contacted by telephone. My initial plan was to conduct a mid-analysis focus group with a small sub-sample of interview participants (e.g., 4-6 nurses) approximately six months into the study to seek feedback on a summary of preliminary findings. However, this proved difficult when arranging a date and time that participants would be available to meet as a group. After several attempts at arranging a date and time over the phone with nurse participants, I decided (in consultation with my doctoral
supervisor) to conduct individual interviews with three nurses who were available to meet within a two-week period, so as not to delay further analysis. I had contacted those who were interested in participating in the member check but who were unavailable at this time, and indicated that I would contact them for the final member check at a later date. Three nurses who were available were interviewed. Nurses from both hospital sites were represented in the member check.

The procedure was the same as for their individual interviews (e.g., written consent was obtained, audio-recorded, private room). These participants were given a signed copy of the focus group consent form (see Appendix I-focus group consent form). These interviews ranged in length from 30-40 minutes (see Appendix J - focus group/member check question guide). The research assistant was present for the first member check interview and had taken notes, with permission from the participant. These three nurses were shown descriptive preliminary findings of four main areas of analysis: (1) types of conditions or patient situations that nurses’ felt uncertain, (2) how nurses felt (e.g., emotionally) when uncertain in these types of situations, (3) how nurses defined or described clinical uncertainty, and (4) strategies nurses used to address their uncertainty (see Appendix K- preliminary findings for member check). Nurses were informed that this was an overview of preliminary findings and that it might not capture everything stated, but were key themes emerging from the data. Nurses were asked to comment on the accuracy of the findings in terms of their experience of uncertainty in the MSICU setting. Nurses were encouraged to provide honest feedback. I had indicated the importance of their feedback in facilitating data analysis. While reviewing the types of situations contributing to uncertainty, nurses were asked if any situations/conditions stood out to them more than others (in terms of relevance or significance in their practice).
Nurses were also asked to elaborate on the following emerging categories: (1) advocating for the patient or family, (2) decision making autonomy, (3) knowing parameters for care (e.g., scope or standards of practice), (4) following up with the patient situation, and (5) providing comfort care versus medically aggressive care. I was particularly interested in gaining greater understanding of these developing categories. The mid-analysis member check provided the opportunity to clarify concepts, refine categories and to begin to develop tentative relationships among categories. For example, following up on a conceptual lead, nurses were asked to clarify their role as patient advocate in the context of uncertainty.

**Final Member Check Interview Procedure**

A final member check was conducted with interview participants. The purpose of the final member check was to validate the theory by determining how well the findings (now abstract interpretations) resonated with nurses’ experiences of uncertainty in the ICU. A decision was made not to include non-study participants as originally planned. Because Strauss and Corbin’s procedures for developing a grounded theory were employed in this study, their validation strategies were followed. In their most recent book, Corbin and Strauss (2008) contended that a theory is validated by presenting it to respondents for their reactions. They stated that “a theory that is grounded in the data should be recognizable to participants and the larger concepts should apply to each case even if some of the details specific to their case are missing or don’t seem to fit” (p. 115).

Nurses who indicated on their interview consent form that they were interested in participating in the member check interview were contacted by telephone. Those nurses who were not involved in the mid-analysis member check were contacted first, so as to provide other interested nurses an opportunity to review the study findings. Three nurses who were
not involved in the mid-analysis member check agreed to participate in a short interview. My original plan was to conduct a focus group however, this was not feasible because eligible nurses were not working the same shift or were not available at the same time. Informed consent was obtained prior to interviews and nurses were given a signed copy of the focus group consent form (see Appendix I-focus group consent form). One interview was conducted in the unit, and the other two were conducted in rooms off the unit.

I presented the categories that emerged from the study (see Table 2, Table 5, and the outcome categories- learning opportunity, resolved uncertainty, and lingering doubt). I described each category in further detail during the interviews. Nurses were asked how well the study findings resonated or reflected their experiences of uncertainty in the unit, and whether anything seemed inconsistent with their experiences (see Appendix J- focus group/member check question guide). I had not audio-recorded the first interview because of background noise in the unit. Instead, notes were taken during the interview. The other two interviews were audio-recorded with nurses’ consent. These interviews ranged in length from 15-20 minutes.

Data Analysis

Grounded theory uses the constant comparison method of analysis. Analysis is based on asking questions and making theoretical comparisons, two essential operations for theory development (Strauss & Corbin, 1998). The coding process followed Strauss and Corbin’s (1998) techniques of open coding to discover categories, axial coding to further develop and relate the categories, and selective coding to integrate and refine the theory. These three coding techniques are not necessarily sequential analytic steps (Strauss & Corbin, 1998). For example, open and axial coding overlapped and were iterative as categories were developed...
and refined, and axial and selective coding overlapped as categories were related and integrated into an explanatory theory. These coding techniques facilitated analysis as I progressed to higher and more abstract theorizing moving from theoretical description to conceptual ordering and then to an explanatory scheme. Alternating data collection with analysis provides a sense of direction, promotes greater sensitivity to data, and enables the researcher to redirect and revise interview questions as the analysis proceeds; it enables the researcher to follow up on, validate, and develop concepts (Corbin & Strauss, 2008).

Each transcript was read several times to gain an overall understanding of the content. I developed interview summaries outlining the storyline to get a sense of how participants described their experience of uncertainty and to maintain the “storied quality of the data” (Coffey & Atkinson, 1996). This was also conducted to maintain the context of each participant’s description of uncertainty and to maintain the chronological order of events and sequences of actions, which was important when coding for process. A process is a sequence of actions and interactions pertaining to a phenomenon as they evolve over time (Strauss & Corbin, 1998).

Sampling became more purposeful with each additional interview because questions (i.e., interview, theoretical, and analytical questions) were more focused on relevant concepts as categories were refined (Strauss & Corbin, 1998). In this manner, theoretical sampling was systematic and cumulative (Strauss & Corbin, 1998). Conceptual leads were investigated in subsequent interviews. For example, the concept ‘support on standby’ generated from the first interview was more fully investigated by asking the next participant about this concept. What follows is a detailed description of how the three coding techniques (i.e., open, axial,
selective) were used in this study, as well as other tools used to facilitate analysis (e.g., coding paradigm, diagramming, memo writing) as outlined by Strauss and Corbin (1998).

**Open Coding- Discovering Categories**

The purpose of open coding was to identify codes in the data and to begin to discover categories and their properties and dimensions. During open coding, data were broken down into discrete parts (e.g., words, sentences, paragraphs), closely examined, and compared for similarities and differences (Strauss & Corbin, 1998). Open coding began with the first interview by doing line-by-line analysis. Line-by-line analysis involved highlighting *in vivo codes* (words used by participants) and noting them in the margins of the transcript, and coding sentences and paragraphs. Codes (labels) of key words, short phrases or expressions that seemed significant or that I found interesting were noted in the margins of each transcript. Sentences and paragraphs were analyzed to determine themes (patterns in the data), by asking “What is going on here?” (Strauss & Corbin, 1998). Questions were asked of the data to facilitate constant comparison, such as “What makes the description of this incident similar or different from previous ones?” For instance, with the in vivo code “stepping back,” I questioned why was this nurse stepping back? Was this a strategy? What was this in response to? Did other nurses use this language of “stepping back?” How were descriptions of stepping back the same or different from other nurses’ descriptions? Codes identified through line-by-line analysis of the first interview transcript led to the development of initial concepts and themes. Constant comparisons were used to facilitate discovery of both variation (i.e., diversity and ranges of properties) and general patterns in the data (Strauss & Corbin, 1998).
Coding progressed to increasing levels of abstraction from identifying codes and themes to developing and naming categories. Constant comparisons between interview transcripts facilitated the grouping of several codes into categories. Writing memos on themes emerging from the data and reflecting on how codes were being combined into categories advanced my analytical thinking as I began asking theoretical questions of the data. Throughout analysis, the techniques of constant comparisons and asking questions were used. Creating categories involved considering meanings in context and coding and reflecting on all the data related to them. Incoming data were constantly compared with previous interviews and modifications or additions were made to categories based on these comparisons. Codes of events, incidents, or actions and interactions found to be conceptually similar (related meanings or pertaining to similar phenomenon) were grouped into categories (Strauss & Corbin, 1998). Categories represent a higher abstraction than codes. Categories are concepts that stand for phenomena and subcategories are concepts that pertain to a category, giving it further clarification and specification (Strauss & Corbin, 1998). For example, the category feeling caught off guard comprised two subcategories that further delineated the category’s properties and dimensions: patients’ whose “condition changes really quickly” and patients who “throw you off clinically.” Category names were based on what represented the event or happening when examining data comparatively in context and from in vivo codes (participants’ own words). Themes evolved into several different categories by coding text segments relevant to the category, while other themes pertaining to the category became subcategories. Categories remained provisional until further verified with the data. As analysis progressed, each read through transcripts became more focused
and specific as data were theoretically sampled for indicators, properties, and dimensions of emerging categories.

**Axial Coding- Relating Categories**

The purpose of axial coding is to further develop categories and relate categories to their subcategories to allow a more complete explanation about the phenomenon (Strauss & Corbin, 1998). Strauss and Corbin’s (1998) coding paradigm was used as an analytic tool to organize the data conceptually and to identify relations between and among categories and their subcategories. The coding paradigm focuses on three aspects of the phenomenon: conditions, which answers the why, when, how come, and where the phenomenon occurs; actions/interactions of the people in response to what is happening in the situations (answers by whom and how); and consequences of the action taken or inaction (answers what happens as a result of those actions/interactions). The focus of analysis became one of purposefully looking at action/interaction and noting sequences and changes and how these evolved in response to changes in conditions. For example, in thinking about conditions, I asked questions such as: Under what conditions did nurses not seek additional information? In thinking about consequences, I asked questions such as: “What happens when nurses feared asking a stupid question?” The coding paradigm stimulated thinking about how nurses conceptualized uncertainty, the conditions and context surrounding uncertain patient situations, strategies nurses engaged in, and consequences of how uncertainty was managed.

The coding paradigm was further used as a guide to integrate structure (conditional context of phenomenon) with process (sequences of action/interaction over time). Integrating structure with process is key to developing theory (Strauss & Corbin, 1998). Theoretically defining each category and making theoretical statements facilitated identifying relationships
among categories and relating structure with process. Strauss and Corbin (1998) outlined types of questions to ask the data when analyzing for process, such as: “What conditions combine to create the context in which the action/interaction is located?” (p. 168).

Hypotheses were generated from the data and continually revised with incoming data. For instance, an early hypothesis was that selectively seeking particular colleagues to ask questions was context-dependent (e.g., amount of time available, the patient’s status, availability of colleagues). Another line of questioning useful for coding for process was asking temporal questions (e.g., frequency, duration, rate, timing; Strauss & Corbin, 1998).

**Diagramming**

Drawing diagrams was an analytic tool that facilitated moving up from the descriptive details of the data and thinking more abstractly. Diagramming enabled depth and insight into the data, bringing interview text to its full analytic potential. For example, one diagram illustrated how a nurse used forward reasoning when uncertain about a patient’s readiness for transfer to another floor. This diagram provided greater analytic depth and enriched the findings. Diagramming also facilitated thinking about relationships between categories and how categories were related to one another theoretically (Strauss & Corbin, 1998). For instance, placement of arrows in a diagram stimulated thinking about how concepts might be related. Sharing diagrams with my doctoral supervisor and committee members throughout analysis facilitated thinking about relationships among categories and subcategories.

Diagrams were hand drawn and/or generated in word documents and were dated and placed in folders. Diagrams became more abstract as I considered relations between categories and interpreting nurses’ descriptions.
Paying attention to participants’ language

Paying attention to participants’ use of language was also a valuable analytic tool used during open and axial coding to develop categories. Particular attention was paid to the symbolic meanings and metaphors that participants used in their language to interpret and describe their experience of uncertainty. Examination of such aspects of language use illuminated how individuals organized, conveyed meaning, and expressed their experiences (Coffey & Atkinson, 1996). For example, one nurse described how she felt a lack of control and lack of support in a patient situation using a dream as a metaphor. This metaphor also stimulated theoretical ideas and analytical thinking about how lack of control might be related to lack of support and how these are related to uncertainty. Metaphorical expressions generated theoretical and analytical questions that were used for comparisons to understand the social and cultural context of the MSICU and how nurses interacted in an uncertain patient situation. During open coding, a recurrent pattern of nurses’ use of the term “as opposed to” was noticed when describing their experiences of uncertainty. The significance of nurses’ use of this contrastive rhetoric (Coffey & Atkinson, 1996) is that it not only provided a source for making theoretical comparisons, but it enabled development of dimensions or ranges of category properties, leading to further detail and understanding of what was being described. For example, one nurse stated: “I just wanted to be prepared for my shift, as opposed to trying to get a grasp over what it is that I’m dealing with so I can do a better job during the shift.” This led to further questioning of the data, for instance, what does ‘being prepared’ for the shift entail, how does one go about preparing, and when does it occur? Are there different levels (dimensions) along which ‘shift preparation’ ranges?
Exploring the data for notions of temporality and related language (e.g., “being unsure of the course of your care” and “making the right choice at that point in time”) facilitated coding for process, such as sequences of action over time. For instance, one nurse described a sequence of actions of how she sought information when uncertain in terms of who she turned to first and what followed next. Particular attention was given to the language nurses used to describe uncertainty. Coding how nurses described uncertainty using their own words provided a way of thinking about how nurses conceptualized uncertainty and revealed indicators and dimensions of uncertainty. For example, nurses talked about uncertainty using descriptors such as: “iffy,” “waffling,” “not clear-cut,” and “second-guessing.” Nurses also dimensionalized uncertainty through their use of words such as: “huge,” “a little bit,” “continuous,” and a “short period of time.” These words facilitated locating properties of uncertainty along a range.

**Selective Coding- Integrating and Refining the Theory**

Selective coding is the process of integrating and refining the theory by interrelating categories into a larger theoretical scheme (Strauss & Corbin, 1998). Through the concurrent process of data collection, analysis and writing the storyline, ten categories were developed, refined and interrelated by systematically integrating concepts through statements of relationship. The first step in integration was deciding on a core category, that is, a central concept. The central concept was labelled: **recognizing and responding to uncertainty**. Recognizing and responding to uncertainty was a conceptualization that fit the data and offered a logical interpretation of what the research was about. It has analytic power in its ability to capture the data completely, under which all the other categories could be subsumed to form an explanatory whole (Strauss & Corbin, 1998). Recognizing uncertainty
and responding to uncertainty were two concepts that consistently emerged in the data that interrelated to explicate nurses’ uncertainty in their practice.

Selection of the core category was based on six criteria outlined by Strauss (1987, cited in Strauss & Corbin, 1998): (1) all other major categories can be related to it, (2) it must appear frequently in the data, (3) the explanation that evolves by relating the categories is logical and consistent, (4) the phrase or concept used to describe the central category should be sufficiently abstract, (5) as the concept is refined analytically through integration with other concepts, the theory grows in depth and explanatory power, and (6) the concept is able to explain variation as well as the central idea of the data; that is, when conditions vary, the explanation still holds, although the way in which the phenomenon is expressed might look somewhat different.

Labelling the core category facilitated integration as it enabled me to think in terms of process. Techniques used to facilitate the process of integrating findings included diagramming, memoing, and writing and rewriting the storyline. For instance, diagramming was a useful tool in considering the logic of relationships. Refining the theory involved reviewing the scheme for internal consistency and gaps in logic and validating the scheme against incoming data (Strauss & Corbin, 1998). The coding paradigm of conditions, actions and interactions, and consequences outlined by Strauss and Corbin (1998) facilitated integrating the emerging theory and defining relationships between categories. The ten main categories of antecedent, actions/interactions, and consequences were interrelated through temporal and causal statements of relationship. Nurse, patient, and contextual factors were linked through patterns of conditions and intervening relational statements.
Theoretical Sensitivity

Theoretical sensitivity is the ability to recognize what is important in the data and give it meaning. It means having insight into the data, derived through what the researcher brings to the study as well as through immersion in the data during data collection and analysis (Strauss & Corbin, 1998). Sensitivity to theoretically relevant concepts is central to recognizing indicators (properties) of those concepts in the data (Strauss & Corbin, 1998). Theoretical sensitivity was gained during the initial literature review, which provided conceptual clarity of concepts that might be relevant to nurses’ uncertainty (e.g., task complexity). However, concepts from the initial literature review merely suggested a starting point for data collection and analysis. Whether these concepts were included in the theory was premised on what emerged from the data (Strauss & Corbin, 1998). Strauss and Corbin maintained that it is impossible to know prior to the investigation what theoretical concepts will emerge and what is relevant.

Becoming increasingly theoretically sensitive during analysis was a process that occurred through prolonged engagement with the data and through feedback with others. Ongoing feedback and questions concerning the data and analysis from my doctoral supervisor and committee members challenged me to think differently about the data, to consider alternative interpretations, and to see concepts in new ways.

In writing the findings, I realized that some subcategories within a category were better developed than others in terms of their properties and dimensions and I returned to the data to further develop these subcategories. For example, when writing the findings, I realized that the category seeking evidence included both sources of information/resources and motivation. These subcategories were specified and further clarified with the data.
Reaching Theoretical Saturation

The criterion for judging when to cease sampling is theoretical saturation – the point in category development at which no new properties, dimensions, or relationships emerge during analysis (Strauss & Corbin, 1998). The concern is with representativeness of concepts and how concepts vary dimensionally (Strauss & Corbin, 1998). Thus, saturation is a function of theoretical completeness (Baker et al., 1992). The decision that theoretical saturation had been reached was guided by the following criteria outlined by Strauss and Corbin (1998): (1) no new relevant data emerged regarding a category, (2) categories are well developed in terms of their properties and dimensions demonstrating variation, and (3) relationships among categories are well established and validated (e.g., with the data, with participants through member checking). Additionally, the decision that saturation had been reached was based on the research questions having been answered and integrated into a theory.

Data Management

The computer software program NVivo 7® was used to manage data including storing and organizing files as well as indexing and searching data. For example, document folders were maintained in NVivo, such as interview transcripts, field notes, and interview summaries. NVivo facilitated constant comparison analysis of transcript data through features such as free nodes, tree nodes, annotations, and ‘see also’ links.

Creating Free Nodes, Tree Nodes, and Annotations

During open coding where line-by-line analysis was conducted, codes written in the margins of transcripts were indexed in NVivo as a running list of codes and as free nodes for data management. Creating free nodes (codes) enabled selection of interview text pertaining to a
particular code and showed frequencies with which these concepts were expressed. For example, the free node “figuring out a plan” showed 5 sources (5 nurses had described this concept in their interview) and showed 15 different references (those same 5 nurses made reference to this concept 15 times in total). Thus, free nodes enabled selection of all the text within interviews pertaining to a concept that I had labelled during open coding and review all the different ways that nurses described this concept. This led to the development of a code book of concepts and theoretical definitions. Free nodes were continually revised with incoming data.

Annotations of thoughts and ideas pertaining to segments of text were also recorded. Annotations are housed ‘behind’ the text of each document (Richards, 2005). Annotations were useful during open coding because it enabled me to comment on sections of the text, which NVivo highlighted in blue for ease of reference. “See also” links were created to enable constant comparisons across interview transcripts. These were ‘live’ links because they take you directly to that section in the text of interest (Richards, 2005). For example, creating a ‘see also’ link for the subcategory “getting everyone on the same page” enabled me to compare how others described this and to compare it with other situations and contexts where this might happen, at the transcript level.

Creating tree nodes in NVivo enabled me to organize categories and subcategories hierarchically. For example, an early category, selective information seeking, had two main subcategories: sources of information/resources and motivation for information seeking. Coding data at the tree node level stimulated analytical thinking about how categories and subcategories might relate, thereby facilitating axial coding.
Memoing

Memos were written and maintained in NVivo, such as methodological (operational), theoretical, and analytical memos (Strauss & Corbin, 1998). For instance, analytical memos contained thoughts and ideas about what I was seeing in the data, and decisions concerning themes and categories as they developed and continued to emerge and evolve.

Methodological memos were written on decisions such as theoretical sampling (e.g., conceptual leads to follow up with in subsequent interviews). Memos were dated and titled and were sorted into different folders. A folder entitled: “Monthly analytic ideas” stored memos for each month of that year to keep track of my ideas, thoughts, and progress. For example, in a June 2008 memo folder, I noted the revisions I had made to the findings chapter based on committee feedback. Another folder entitled: “Memos on categories” contained memos on each developing category. Though descriptive initially, these memos became more conceptual and abstract as I learned more about each categories’ characteristics, dimensions, and indicators. Theoretical memos were written on areas such as participants’ use of metaphors, diagram ideas, theoretical questions, and later, provisional hypotheses of how categories might relate.

A reflexive journal was maintained in a book separate from NVivo and contained entries about my thoughts and feelings about the research process (e.g., thoughts about analysis, how I might be influencing interpretation of data based on my nursing experience and knowledge of the literature).
Criteria for Establishing Trustworthiness

Lincoln and Guba (1985) described four criteria that can be used to establish trustworthiness of naturalistic inquiry: *credibility*, *transferability*, *dependability*, and *confirmability*. They also proposed several techniques within each criterion. Supplementing these, Strauss and Corbin (1998) advanced criteria that serve to judge the adequacy of the research process and to evaluate the analytic logic used by the researcher in theory-building research. McCann and Clark (2003) summarized these criteria as: sample selection, what categories emerged, evidence supporting the categories, theoretical sampling, formulation and validation of hypotheses, modification of hypotheses, and emergence of a core category.

To evaluate the empirical grounding of findings, Strauss and Corbin (1998) proposed a separate set of criteria. As summarized by McCann and Clark (2003) these criteria include: concept generation, relationship of concepts, concept and category linkage and density, theory variation, conditions for theory variation, account for process, and significance of theoretical findings.

Though Strauss and Corbin (1998) indicated that these criteria are meant as guidelines only, they are useful for evaluating the credibility and quality of the theory. As well, these questions assisted in developing analytic, theoretical, and methodological memos throughout data collection and analysis, comprising the study’s audit trail. For instance, memos were maintained that described directions for theoretical sampling, hypotheses pertaining to conceptual relations, and processes that emerged from the data. A discussion of how specific strategies used to ensure trustworthiness were applied in this study can be found in Chapter 6.
Ethical Considerations

Protection of Human Subjects

This study was guided by five ethical principles: (1) respect for human dignity, (2) respect for free and informed consent, (3) respect for privacy and confidentiality, (4) respect for justice and inclusiveness, and (5) balancing harms and benefits (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council of Canada, *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*, 1998, with 2000, 2002, and 2005 amendments). The ongoing process of free and informed consent ensured that prospective subjects were given adequate opportunities to discuss and contemplate their participation and assurance that they were free not to participate and had the right to withdraw at any time without penalty (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council of Canada, *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*, 1998, with 2000, 2002, and 2005 amendments). Participants were informed of their rights as a study participant, including potential harms and benefits of participating in the study. Participants were informed that they may decline to answer any of questions during the interview, and that they were free to ask questions about the study at any time. Written informed consent was obtained from all study participants (including member check interviews). All participants received a copy of their signed consent.
Confidentiality and Privacy

Information obtained during the study was held in strict confidence. Interviews were conducted in a private room or area. A study number was used to identify participants and no identifying information will be used in any publications of study findings or other scholarly dissemination activities. Anonymity was maintained by giving each participant a pseudonym (fictitious name) that was used when quoting participants in the findings chapter. Code numbers were also used during analysis that represented the interview number and study hospital. Consent forms were secured in a locked file cabinet. Audio-recordings, transcripts, and other data collected over the study period were kept in a password protected computer and will be destroyed after 5 years. The study protocol was submitted to the Research Ethics Boards at the University of Toronto and each of the hospital’s research ethics committees, and was renewed annually until study completion.
CHAPTER 4: FINDINGS

The purpose of this study was to develop a theory to explain how nurses experience and respond to uncertainty in their practice. The research questions were:

1. How do medical-surgical ICU nurses experience uncertainty in their daily practice?
2. How do medical-surgical ICU nurses respond to uncertainty in their daily practice?
   a) In general (e.g., cognitive, affective, behavioural responses)?
   b) In particular, how does uncertainty influence recognition of information needs?
   c) In particular, how does uncertainty influence decisions to seek additional information?

Study findings are presented in two chapters. In Chapter 4 the findings are presented and in Chapter 5, the theoretical scheme is further highlighted. Chapter 4 is divided into two sections: the experience of uncertainty and responding to uncertainty. Though two distinct questions, there is overlap, with responses to uncertainty further revealing the experience of uncertainty.

In part one of Chapter 4, the experience of uncertainty is described under the following headings: (1) uncertain patient care situations, (2) nurses’ conceptualizations of uncertainty, and (3) recognizing uncertainty. In part two of Chapter 4, nurse responses to uncertainty are described under the following headings: (1) physiological and affective responses to uncertainty, (2) managing uncertainty, (3) contextual factors influencing uncertainty, and (4) consequences of managing uncertainty. The chapter ends with a definition of uncertainty and a schematic representation of the theory that emerged from the data: recognizing and responding to uncertainty.
The Experience of Uncertainty

Research Question 1:

How do medical-surgical ICU nurses experience uncertainty in their daily practice?

It is important to preface what is meant by the term *experience* used in this study. The term experience comprises how uncertainty is characterized and understood by nurses, what makes nurses uncertain, and how it manifests in practice. The term experience encompasses feelings, perceptions, and the conceptual structure of uncertainty.

*Uncertain Patient Care Situations: “A Web of Factors”*

At the beginning of the interviews, nurses were asked to describe a situation within the past year when they had to make a decision about some aspect of patient care for which they felt uncertain or unsure. The terms uncertainty and patient care were left open to the nurse’s interpretation. Patient care/situations that nurses perceived as uncertain comprised three main categories: (1) feeling “caught off guard,” (2) encountering unfamiliar or “unique orders,” and (3) navigating the “grey areas of practice.” These patient situations ranged across several aspects of care, such as a task, decision, or the goals of care. The nature of uncertainty was different for nurses. What one nurse considered uncertain another nurse might not; for instance, a situation might be perceived as uncertain if the nurse had not previously had that experience. Or, a familiar situation might be considered uncertain if there are complex factors involved, such as an ethical dilemma. Nurses’ uncertainty arose during patient assessment and problem identification, the planning of patient care, treatment/intervention decisions, and evaluation.
**Feeling “Caught Off Guard”**

In this category, six nurses described uncertainty about the patient’s physiological condition. Nurses described situations that were non-routine: unexpected or unpredictable change in the patient’s condition, uniqueness of and unfamiliarity with the patient condition, or not knowing what was going on with the patient clinically. Feeling “caught off guard” included two sub-categories: (i) patients’ whose “condition changes really quickly;” and (ii) patients who “throw you off clinically.”

*Patients whose “condition changes really quickly.”* Of the six nurses who indicated feeling caught off guard, three described feeling uncertain when a patient’s condition suddenly changed or quickly and unexpectedly became unstable. Nurses’ decisional uncertainty was largely associated with identifying the patient problem and stabilizing the patient. Though it is often anticipated that patients in the ICU may become unstable, nurses’ uncertainty stemmed from patients whose status deteriorated at an unusually fast pace. Nurses described these as “stressful situations” and felt “caught off guard.” When a patient’s condition deteriorated quickly it limited the amount of time to figure out what was wrong with the patient. Kerry, who has 16 years experience as a registered nurse and 16 years in the ICU, indicated:

> She came from the maternity floor, so she had been deteriorating on the floor, but became very quickly deteriorating, and I’ve never seen it before in my life. That’s why it stands out very quickly….Everything wasn’t cut and dry….I hadn’t seen things deteriorate that quickly before.

Elaine, who has 21 years experience as a registered nurse and 9 years experience in the ICU, stated that when the patient’s “condition changes really quickly you’ve got to reassess the whole thing from head to toe. And it’s like, restart all over again.” Cheryl, who has 10 years experience as a registered nurse and 6 years experience in the ICU, similarly stated: “So
things have drastically changed very quickly. So sometimes in the process you’re thinking, Oh, he’s getting worse….or you don’t know what is triggering all the illnesses, what’s going on.” The uncertainty was in identifying the new patient problem or issue, or stabilizing the patient.

Patients who “throw you off clinically.” Of the six nurses describing feeling caught off guard, five also described unfamiliar illnesses or unusual circumstances surrounding a patient situation that they had not previously encountered. These were unusual or atypical patient admissions considered “flukes” that “throw you off clinically” and were unfamiliar to nurses because they rarely occurred. These nurses described feeling “anxious” or “nervous” in unfamiliar situations. For example, one nurse described caring for a patient diagnosed with malaria, which was an unusual patient admission in the unit compared with the typical MSICU patient population. Dena, who has 19 years experience as a registered nurse and 16 years in the ICU, stated:

We had somebody in with malaria. And I had never seen a patient with malaria. So I’m unsure of the course of care that this patient will require, you know, the course of the disease process, I wasn’t too sure of. So I had to get more information on that.

Larry, who has 13 years experience as a registered nurse and 7 years in the ICU, described caring for a patient with transverse myelitis where he was uncertain about the course of care. Nurses were uncertain about aspects of care for unusual patient cases because often this was the first time caring for a patient with a particular condition or illness. Nurses described having insufficient knowledge in areas such as disease processes and treatment.

Nurses also described unusual patient admissions that had a series of events or circumstances that contributed to their uniqueness. For example, George, who has 9 years experience as a registered nurse and in the ICU, described how a drug overdose patient had
several circumstances that contributed to its uniqueness, such as the young age of the patient, the different types and amount of medications taken, and the long length of time that had passed since ingestion. Elaine described how a typical airlifted patient admission from another hospital became atypical when the patient arrived on the helipad in “full-blown arrest” and she was not certified to go onto the helipad to meet the patient. For uncertain situations involving unique or rare circumstances, specific information or resources on how to deal with them was not always available (e.g., policies and procedures). Nurses used language such as there was “no textbook for that one” or there was “no policy in place to deal with that.”

To summarize, nurses described feeling caught off guard when they were uncertain about infrequent or unusual patient admissions (e.g., unusual illness), identifying the patient problem or issue, or stabilizing the patient. Attributes of these uncertain situations were unfamiliarity, unexpectedness, complexity, challenging and/or unpredictability, and nurses felt uncertain because they had insufficient information or clinical knowledge.

*Encountering Unfamiliar or “Unique Orders”*

In this category, six nurses indicated that they were uncertain about physicians’ orders for medications, treatments or procedures that were unique, complex, unfamiliar or atypical, and/or seemed counterintuitive. Counterintuitive orders were treatments that nurses perceived as contradicting the patient’s status or counteracting other treatments prescribed. Unique physician orders were treatments that were typically prescribed for other conditions or for other uses, such as ordering insulin to be used as a Vasopressor, complete bowel irrigation to treat an overdose patient, or Methylene Blue for reasons other than for tissue dye. Unfamiliar or complex orders were treatments nurses had not encountered or administered before, or
were procedures nurses felt inexperienced with, such as caring for patients requiring Extra Corporeal Membrane Oxygenation (ECMO) or high-frequency oscillatory (HFO) ventilation. Mary, who has 2 years experience as a registered nurse and 1 year in the ICU, indicated: “We rarely get those patients, ECMO patients, we rarely get them. And it’s not a skill that we have.” Barb, who has 2 years experience as an RN and 6 months experience in the ICU and identified herself as being “fairly new in the ICU,” questioned whether the medication ordered and the route and procedure required to administer it was within her scope of nursing practice. She stated:

And I just felt really uncertain of, you know, what is my role? Am I even able to give it….Is it an advanced nursing competency, and if it’s safe, is it safe for you know, as far as being exposed to body fluids?

Cheryl, in a follow-up (member check) interview, explained how it was difficult for nurses to know standards of practice in their entirety. She used the example of pronouncing an expected patient death as a standard of practice that she observed some MSICU nurses were not aware they could do.

While a few nurses were uncertain about rationale for orders, nurses were generally more unfamiliar with the procedural aspects of carrying out the order. Because the orders were unique, infrequent, or unfamiliar, nurses described having insufficient information, knowledge, or skills experience. Cheryl also stated in a follow-up interview, that “the uncertainty comes with how many times you actually have to do something. If you’ve never come across it, never done it then you think…huge uncertainty.” Larry described how “you’re always learning something new.” He explained that there were always new treatments and procedures being introduced in the unit to learn. Nurses were uncertain about
the technology, were inexperienced with skills required for the treatment or procedure, or there was no policy or procedure for a specific physician order.

Navigating the “Grey Areas” of Practice

Eight nurses described uncertainty around providing end-of-life care, which manifested as an ethical dilemma. Nurses described ethical aspects of uncertainty and experienced decisional uncertainty around planning and providing patient care. The category of navigating the “grey areas” of practice consisted of three sub-categories: (i) differing perspectives on level and goals of care, (ii) leaving things “up in the air,” and (iii) advocating for the patient’s best interests with limited autonomy.

Differing perspectives on level and goals of care. Of the eight nurses indicating ethical uncertainty, six nurses described differing perspectives on level and goals of care. Nurses were uncertain when there were ethical decisions around patient care. Nurses described “keeping bodies alive” with technology in ethical patient situations and feeling “ethically torn,” “conflicted,” and frustrated in the care they provided. They questioned if they (as part of the team) were doing the right thing and making the proper decisions, and they were uncertain about how to give the best care. They indicated that there was often disagreement between the medical and nursing staff about the appropriateness of the level of care for patients with a poor prognosis. Nurses were uncomfortable providing care that they perceived was “ineffective.” Joanne, who has 3 years experience as a registered nurse and 3 years experience in the ICU, stated:

I think that’s where a lot of the uncertainty is with regard to if it’s the care we provide, is it appropriate or not to certain patients….Being the person that’s providing the care that’s keeping them alive….But I think the division is that a lot of times you see the medical staff will do things absolutely full steam ahead whereas the nursing staff feel like at this point it’s more appropriate for comfort measures.
Cheryl further illustrated this point:

And everyone was just rushing around. It was very busy that day. Everyone was rushing around thinking this was the best thing to do. Take him back to the OR….and then put him on dialysis….And I thought, the guy’s 80 years old. And everyone thought it needed to be done right away, and I thought differently.

These ethical situations were described as “emotionally draining,” “challenging,” contradictory or conflicting, and “difficult,” involving many members of the health care team and the patient’s family members. Nurses felt uncertain and uncomfortable when they were providing care that they believed was not in the best interest of the patient; it seemed only to prolong the patient’s death. This challenged nurses’ moral/ethical values. Nurses were providing “medically aggressive care” as ordered, though they considered “comfort measures” more appropriate.

Nurses further described uncertainty around how best to approach these ethical issues with the team or other co-workers. Joanne highlighted:

My biggest thing was I didn’t want to offend anybody by bringing them [ethicist] into the picture. Like, is that right? Do we do that? Like, I was very uncertain whether or not that’s even something that it was okay for me to do. Or, when do we utilize them?

In this category, nurses were uncertain about treatment goals for patients and how best to approach the team and co-workers with ethical concerns around the plan of care. Nurses questioned the appropriateness of the level of care being provided and the goals of care.

*Leaving things “up in the air.”* Four nurses described the concept *leaving things up in the air.* In addition to perceived differences between medicine and nursing treatment goals, there were perceived differences among physicians or between physicians and residents. Here, nurses were uncertain about the plan of care because with rotating medical staff, it changed, as did the consistency of care. Nurses were uncertain when the plan of care
changed, and they felt that there was no clinical picture or clear direction and had difficulty planning the best care options for the patient. Cheryl indicated:

> Sometimes you have some people [physicians] and there’s no picture. So you’re at a struggle. What’s right? What’s wrong? What’s the best? What are we left with? What are our options? And that’s where some of the difficulty is.

Similarly, Irene, who has 2.5 years experience as a registered nurse and in the ICU, stated: “I know that in the morning I was trying to figure out the plan, because I always want to know what’s the plan for this patient….where are we going with this?” Nurses described treatment orders that lacked clear direction. These situations were the “vague,” “sketchy,” “inconsistent,” and “grey areas” around end-of-life care. Joanne stated:

> So at that point we were still running Levophed and others, and there was no order or any sort of guidance given whether or not we were to increase those if his blood pressure was falling or that sort of thing. So, I found it especially difficult because you know, of the lack of direction and what are we doing when we know what the outcome’s going to be.

Nurses were also uncertain when there was a lack of clear direction with the patient’s code status. There were situations where the patient’s code status lacked clarity or remained full code until a code status could be obtained from the patient’s family (acting as substitute decision-makers). Anna, who has 6.5 years experience as a registered nurse and 2.5 years experience in the ICU, stated:

> …she was obviously trached and she had a steep decline. And just with cultural and religious reasons, the family wasn’t able to come to a code status. So we were really at a dilemma, because physiologically she was really fragile….and we did have some pre-code situations even just with like suctioning….and that was very difficult because the family couldn’t come to a decision.

Patients’ family members could reverse the code status from do not resuscitate (DNR) to full code. Nurses were uncertain around the care plan for patients whose code status was being
decided upon, or when the level of care changed from comfort measures to providing acute medical treatment, and they felt uncomfortable providing care for these patients.

**Advocating for patients’ best interests with limited decision making autonomy.**

Eight nurses described advocating for their patients’ best interests. Nurses perceived themselves as advocates for their patients, they were “being the patient’s voice.” In this subcategory, nurses’ uncertainty was less about the patient situation than it was about speaking on behalf of the patient. Here, nurses were uncertain about how to advocate for their patients’ best interests to physicians and family members, with limited autonomy or influence over treatment decisions. Nurses described feeling “stuck in the middle” of the communication process between physicians and patients’ family members. Although nurses described having input into decisions and being “part of the team,” they also indicated that they would like to have more input and influence in decisions throughout care planning. Nurses further indicated that the physician and family members made final decisions concerning patient care when the patient was unable to. Fay, who has 15 years experience as a registered nurse and 13 years experience in the ICU, stated:

> We see everything. We stay longer with the patient. There are times when you know, I feel like our input should be taken and looked at because we know….we see them [patients] more often I think than the doctors. So it can be frustrating at times.

Here, uncertainty was about how to deal with competing interests and limited decision making autonomy in ethical dilemmas. Although nurses indicated that they were advocating for their patients, they explained that uncertainty manifested when they felt that they were not acting on the patient’s behalf. Kerry, in a follow-up (member check) interview, explained:

> The uncertainty arises when the patient has specifically said I do not want any heroics done, and the uncertainty is why are we doing inotropes [e.g., medications that
increase the force of cardiac contraction]? The uncertainty is, I’m not comfortable because this is not what the patient wanted. So I’m feeling that uneasiness, that helplessness because I’m not being an advocate for the patient….If you’re advocating for the patient and no one’s listening, that’s when you’re feeling the uncertainty and the frustration and the lack of control and what are we doing here. And you feel uncomfortable.

When speaking on behalf of their patients in ethical and challenging situations, nurses were uncertain about how best to advocate for treatment and care decisions that were in the patient’s best interest in the face of limited decision autonomy.

In summary, nurses’ uncertainty in navigating the grey areas of practice comprised ethical situations that were “sketchy,” “vague,” and not “clear-cut.” Though ethical dilemmas are common or typical in adult MSICU’s, nurses explained that they were uncertain about the treatment goals for the patient or the plan of care, the appropriateness of the level of care, and how best to act as patient advocate when there are competing interests of those involved (i.e., medical team, family members) and a perceived lack of decision making autonomy.

Navigating the grey areas of practice revealed that in familiar situations such as ethical dilemmas, there is uncertainty and unknowns because each patient and family situation is different from the next.

**Summary of Uncertain Patient Care Situations**

Nurses’ uncertainty in patient care situations represented three categories: (1) feeling caught off guard, (2) encountering unfamiliar or unique orders, and (3) navigating the grey areas of practice. These categories revealed various dimensions of uncertainty: decisional uncertainty, procedural (task) uncertainty, and ethical uncertainty. Feeling “caught off guard” illustrated decisional uncertainty that nurses experienced in patient care situations that were characterized as unexpected, unpredictable, complex, challenging, unfamiliar, and/or atypical. Encountering unfamiliar or “unique orders” illustrated procedural uncertainty
around unfamiliar physician orders. Navigating the “grey areas” of practice exemplified ethical aspects of uncertainty. Nurses faced dilemmas around end-of-life situations and uncertainty around advocating for their patients’ best interests and providing care that they perceived as inappropriate or futile. These situations were described as challenging and lacking direction, emotional, and complex, involving many members of the health care team and the patient’s family members. Table 2 summarizes categories and subcategories of patient situations. Frequencies of their observation are appended (see Appendix L). Frequencies reflect the number of observations representing or indicating a category. In this study, frequency does not suggest or equate significance. Rather, significance was present in nurses’ insight and descriptions of their uncertainty experiences. Frequency counts are provided to complement and enhance the narrative (Morse, 2007; Olson, 2000, cited in Sandelowski, 2001). Table 3 provides a typology of uncertain patient situations.
<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling caught off guard</td>
<td>Patients’ whose condition changes really quickly</td>
</tr>
<tr>
<td></td>
<td>Patients who throw you off clinically</td>
</tr>
<tr>
<td>Encountering unfamiliar or</td>
<td></td>
</tr>
<tr>
<td>unique orders</td>
<td></td>
</tr>
<tr>
<td>Navigating the grey areas</td>
<td>Differing perspectives on the level and goals of care</td>
</tr>
<tr>
<td>of practice</td>
<td>Leaving things up in the air</td>
</tr>
<tr>
<td></td>
<td>Advocating for the patient’s best interests with limited decision autonomy</td>
</tr>
</tbody>
</table>
Table 3. Typology of Uncertain Patient Situations

<table>
<thead>
<tr>
<th>Type of Situation</th>
<th>Example from the data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying the patient problem and/or stabilizing the patient</td>
<td>Patient admitted with uncontrollable seizures and high temperature</td>
</tr>
<tr>
<td></td>
<td>Patient quickly deteriorating and cause could not be determined</td>
</tr>
<tr>
<td>Infrequent or unusual patient admission</td>
<td>Teenage overdose on several cardiac medications</td>
</tr>
<tr>
<td></td>
<td>Caring for a patient diagnosed with malaria</td>
</tr>
<tr>
<td>Unique or unfamiliar medications, treatments or procedures</td>
<td>Administering chemotherapy via naso-gastric tube</td>
</tr>
<tr>
<td></td>
<td>Patients requiring extracorporeal membrane oxygenation</td>
</tr>
<tr>
<td>Ethical dilemmas</td>
<td>Family indecision on code status</td>
</tr>
<tr>
<td></td>
<td>Disagreeing with the appropriateness of the level of care provided for patients with a poor prognosis</td>
</tr>
</tbody>
</table>
Nurses’ Conceptualizations of Uncertainty

What meaning do nurses give to uncertainty? What does it mean to say that one is uncertain? How is uncertainty understood by nurses? Towards the end of the interviews, following nurses’ descriptions of their uncertainty experiences, nurses were asked how they would describe or define uncertainty based on their practice. Uncertainty was not defined for nurses, but instead the question was left open to their interpretation. Nurses characterized uncertainty in a variety of ways. Their descriptions revealed how integral uncertainty was to nurses’ practice and highlighted its multi-dimensional and complex nature. Nurses described uncertainty as a state of being unsure of something or not knowing what or how to do something concerning an aspect of patient care/situation. Nurses’ conceptualizations of uncertainty were categorized into four interrelating themes: (1) assessing to get a “clear picture,” (2) “reflecting on your own knowledge and experience,” (3) “questioning” self and others’ judgements,” and (4) predicting what’s “going to happen.”

Assessing to Get a “Clear Picture”

Five nurses conceptualized uncertainty as assessing to get a “clear picture” of how the patient was presenting clinically. Nurses characterized their uncertainty as more of an information problem than insufficient knowledge. Uncertainty was conceptualized as not having a clear picture largely because information needed to make or evaluate a decision was lacking, inconsistent, or unavailable. Nurses described feeling like they were “missing something” and things were not “clear-cut.” Nurses were piecing the clinical picture together, but the picture was not making sense. For example, Kerry described a patient that was quickly deteriorating. She used a puzzle analogy to illustrate not having an understanding of the situation: “We have every piece of the puzzle, the pieces don’t fit. That’s kind of an
interesting analogy, so we’ve got all the pieces, but they don’t fit.” When nurses did not
know what was happening or did not have a clear picture of what was occurring with the
patient clinically, they described feeling helpless and having a lack of control. Kerry also
used a dream metaphor to describe her feeling of lack of control when uncertain:

It was one of these, I felt like I was in a dream, and it was out of control, and you
were by yourself, and there was no one there to come in and help. That’s how,
because no one knew what was going on.

Joanne articulated her uncertainty in a similar manner, as “a very foggy day.”

Assessing to get a clear picture revealed the concept of shared uncertainty, where “no
one knew what was going on.” There were social aspects to uncertainty. Uncertainty was
experienced among members of the health care team when everyone was uncertain. Nurses
described how physicians and other healthcare team members did not always know what was
going on with the patient. There was uncertainty about the patient’s diagnosis. Information
that revealed the patient’s condition or matched the patient’s symptom presentation was
lacking, inconsistent, or missing. What was missing was “concrete evidence,” which was
something tangible that would help in gaining an understanding of the clinical picture of how
the patient was presenting. Nurses described feeling “stuck in the assessment phase” of the
nursing process because they did not know how to proceed with planning care. Elaine stated:

Uncertainty is, like you don’t know what’s going on with the patient. Or it seems like
no one knows what’s going on with the patient, I guess. Nobody in the healthcare
team….So I guess uncertainty is a lack of not knowing what to do, and not knowing
what’s happening, and feeling you’re not effective in your care. And not knowing
how to plan, because I think you kind of get stuck in the assessment phase when
you’re in the uncertainty. You’re always stuck in the assessment phase, because you
can’t, you don’t know what’s going on, so you’re just assessing, assessing, and
assessing.

Nurses were stuck in the assessment phase because there was no diagnosis made to guide
care. Continual assessment occurred as nurses tried to gain an understanding of the situation.
“Reflecting on Your Knowledge and Experience”

Nine nurses described uncertainty as insufficient knowledge and/or experience with a patient situation or an aspect of patient care. Nurses described inexperience as having the theoretical knowledge, but not having had encountered the situation before or the opportunity to practice a particular skill. Nurses described reflecting on their knowledge and experience and feeling uncertain about what course of action to take. Dena indicated:

Uncertainty is reflecting on your knowledge and experience and still at that point, being unsure of the course of your care….So, something that I guess you haven’t experienced before, so even though you can draw on similar experiences….you still might need to explore for, get more knowledge, um, more information.

Kerry indicated that:

You feel confident in the decision as a nurse that you’re making, but in this situation there were too many variables going on, and I didn’t feel like I had the clinical knowledge to put it all together, to be aggressive enough to say to the resident, and even the [medical] staff, we didn’t know what was going on.

Elaine indicated that uncertainty pertained to a lack of clinical experience, based on her observations and experiences working with newer nurses in the unit. Elaine stated:

I find a lot of the nurses are not very experienced…they don’t have many years of the floor experience. I think they experience a lot more uncertainty. You see that a lot more…The seniors definitely notice that…Like for example, this one nurse, she’s only worked one year as a nurse. She had no idea how to sedate her patient…And she was kind of like, overwhelmed. Because she’s just uncertain. She doesn’t know what to do. She’s not familiar. She hasn’t had enough experience.

“Questioning” Self and Others’ Judgements

Six nurses characterized uncertainty as feeling a lack of self-confidence in their nursing skills and abilities, judgements, decision making, and/or actions concerning patient care. Nurses questioned if they were “making the right decision” or if they were “doing the right thing.” For instance, nurses’ level of confidence (self-questioning or self-doubt) was reflected upon during reasoning and judgement processes but prior to making a decision. Nurses evaluated
the degree to which they trusted their own reasoning processes or knowledge base to guide
them in making the right decision. Nurses’ self-questioning was revealed in their expressions
about making a decision (e.g., being indecisive), such as: “second-guessing,” “waffling,”
“feeling iffy,” “hesitating,” “debating,” “doubting,” and “feeling conflicted.” Joanne
indicated how uncertainty was characterized as a lack of self-confidence:

I think it’s [uncertainty] when you feel, when you question your own ability and
judgements, and the knowledge and experience that you’ve had in the past of whether
or not your, I guess I’ll say experiences, to take all those things in, meaning
knowledge and everything, if that’s going to guide you in making the right decision.
It’s just questioning, I think, everything you’ve learned, everything you know and for
future decisions. And even right at the very moment. I think sometimes it just
happens, I don’t think it’s not a level of knowledge thing. It could be a confidence
thing. You don’t have the confidence in yourself to know that you’re going to make
the right choice at that point in time.

Uncertainty typified as self-questioning was less about insufficient knowledge than about a
lack of trust in oneself to make the right decision or choice in the best interest of the patient.
Level of confidence was also reflected on after information and resources were accessed and
a decision had been made. Nurses’ described feeling “uncomfortable” or “insecure” and
feeling “uneasy” with their decisions or actions. Barb stated:

Uncertainty, I would say…to me, is accessing available resources and still not feeling
that you’re certain in your actions, that you’re comfortable in your actions….when
you’re questioning and feeling insecure about your actions after you’ve accessed all
your resources.

Dena stated: “…I felt more uncertain about my decision and why I was coming to that
decision. I was a bit more uncertain of why I was feeling reluctant just to send him, I think.”

Nurses’ characterized uncertainty as questioning their decisions and actions both prior to
making a decision and after a decision had been made.

Of the six nurses that described engaging in self-questioning when uncertain, three
nurses also described questioning aspects of the situation, such as the appropriateness of
physician orders. In this context, questioning meant nurses’ level of trust in others’ judgments (e.g., medical team, answers to questions from nursing colleagues). For instance, Nick, who has 14 years experience as a registered nurse and 4 years experience in the ICU, indicated that he would “question medical staff over certain procedures” if they did not seem beneficial for a patient with a poor prognosis. He stated:

If they say, well let’s go for three CT scans and do those, then I think I would question it. I would say is it going to change our minds from…is it going to make any benefit for the patient, and I’d question it.

Nurses described how they would question patient care that conflicted with their own (moral) values and beliefs or attitudes concerning what they considered appropriate care for the patient.

*Predicting What’s “Going to Happen”*

Six nurses characterized uncertainty as not knowing what was “going to happen.” Three nurses described difficulty foreseeing outcomes (or predicting impact) of nursing actions (interventions), and three nurses described difficulty foreseeing patient outcomes (e.g., prognosis). Nurses described not knowing what’s going to happen in terms of the “cause and effect” of their nursing actions and trying to prioritize what was more important in planning patient care. Cheryl stated:

Uncertainty to me is not knowing all the cause and effect of something that’s going to take place….struggling with what’s more important. Is it the blood pressure that’s more important? Or do we worry about the vascular part of it, so we can get the circulation going?....So for me, it’s a cause and effect of a particular, um, intervention.

Uncertainty was further characterized as nurses’ actions having an effect opposite to what was expected based on their knowledge, experience, or nursing education. Elaine stated:

“And sometimes, you know, you do a nursing action, and it has the opposite effect. Or you
give a drug and it has the opposite effect. Like, things don’t go the way that you were educated.” Irene articulated her uncertainty as the “what if factor”:

The oral-gastric tube was in there, and the doctor had asked me to take it out, but I was uncertain because I’m like, I know his swelling has gone down. He was intubated for that swelling. I know that it’s gone down, but what if he can’t swallow his pills?...But there is always the what if factor….And I think nurses sometimes we want just in case, because you never know what’s going to happen.

Three nurses described the ability to foresee patient outcomes as a skill acquired through clinical experience with a variety of patient conditions and situations. Joanne stated: “as you become more experienced you see outcomes. That, of course, affects what you think is the right and wrong decision to make in any sort of situation.” Not being able to foresee patient outcomes made decision making about what was in the best interest of the patient more difficult. Joanne further stated:

There’s been times where it’s happened that in my mind, I’ve said this is kind of a little bit excessive, that it [life supporting measures] should stop at some point. Where I’ve felt this and then the patient has turned around and gotten better…. That kind of makes you question your thinking, I guess, and say obviously I shouldn’t have been thinking that, because it’s come with a better outcome at the end.

Two nurses who indicated that they had years of clinical experience, described how they had a greater ability to think ahead and anticipate potential patient problems or foresee the patient’s prognosis based on their experience. They described “catching things on time” before they became an issue. Kerry stated that “I think of all the issues, what could be the negative outcomes, what do I need to address today so these issues don’t occur.” There was a notion of a patient care trajectory or predictable patient response. Nurses had a set of expectations about how patients responded to care (e.g., treatments, procedures). Difficulty foreseeing outcomes highlighted the unpredictability of patient situations.
Summary of Nurse Conceptualizations of Uncertainty

Nurses’ conceptualizations of uncertainty encompassed four main themes: (1) assessing to get a “clear picture,” (2) “reflecting on your knowledge and experience,” (3) “questioning” self and others’ judgements, and (4) predicting what’s “going to happen.” These themes revealed the multi-dimensional nature of uncertainty or the “layers of uncertainty.” Though distinct, these themes have overlapping attributes. Perceptions of personal limitations in clinical knowledge and experience were present (in varying degrees) in each of the four main themes. Nurses’ conceptualizations of uncertainty illustrated that uncertainty occurred at all levels of nursing experience. These conceptualizations also highlighted the temporal nature of uncertainty; there were patterns of assessing, reflecting, questioning, and/or predicting occurring throughout the clinical decision-making process. Assessing highlighted how nurses experienced continuous assessment of the patient when faced with inadequate information (e.g., lacking, inconsistent), which interrupted the planning of care. Reflecting described how nurses engaged in appraising one’s level of knowledge and experience and determining whether a gap existed. Questioning occurred pre-decisional (e.g., am I making the right choice) and post-decisional, after a decision was made (e.g., did I make the right choice), and involved questioning others’ judgements. Predicting described nurses’ perceived level of ability in anticipating patient problems or prognosis, and foreseeing the impact of nursing actions on patient outcomes. Uncertainty occurred throughout the nursing process of assessment, diagnosis/problem identification, intervention, and evaluation (see Figure 3).

Figure 3 illustrates the cognitive-affective processes of assessing, reflecting, questioning, and predicting involved in experiencing uncertain patient situations. Each of these four processes was described as occurring throughout the nursing process (at any stage). For example,
though assessing appears to be placed over diagnosis and intervention it is meant to be shown across the nursing process; assessing could occur during assessment, diagnosis, intervention, and/or evaluation in an uncertain patient situation. The overlapping circles represent the recursive nature of the processes of assessing, reflecting, questioning, and/or predicting involved in recognizing uncertainty. Table 4 provides a summary of the four conceptualizations of uncertainty with examples from the data, including frequency of their observation.
Figure 3. Nurse conceptualizations of uncertainty across the nursing process.
Table 4. Summary of Nurses’ Conceptualizations of Uncertainty

<table>
<thead>
<tr>
<th>Concept</th>
<th>N</th>
<th>Excerpt from the data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessing</td>
<td>5</td>
<td>“You’re always stuck in the assessment phase, because you can’t, you don’t know what’s going on, so you’re just assessing, assessing, and assessing.”</td>
</tr>
<tr>
<td>Reflecting</td>
<td>9</td>
<td>“Uncertainty is reflecting on your knowledge and experience and still at that point, being unsure of the course of your care.”</td>
</tr>
<tr>
<td>Questioning</td>
<td>6</td>
<td>“It’s just questioning, I think, everything you’ve learned, everything you know and for future decisions. And even right at the very moment….you don’t have the confidence in yourself to know that you’re going to make the right choice at that point in time.”</td>
</tr>
<tr>
<td>Predicting</td>
<td>6</td>
<td>“There is always the what if factor….And I think nurses sometimes we want just in case, because you never know what’s going to happen.”</td>
</tr>
</tbody>
</table>

Note. N=frequency indicated by nurses.
Recognizing Uncertainty

Uncertainty was a subjective experience that was perceived by the nurse relative to a patient care situation. Interpreting a patient care situation as uncertain was based on the nurse’s personal characteristics (i.e., knowledge and clinical experience, values, attitudes and beliefs, cognitive styles). For example, what one nurse interpreted as uncertain, another nurse did not because the nurse had had the experience with that particular patient situation (e.g., caring for a patient requiring Extra Corporeal Membrane Oxygenation). Recognition occurred through the cognitive-affective processes of assessing, reflecting, questioning, and/or predicting. These four interrelating concepts (sub-processes) formed the process of recognizing uncertainty. Nurses could go through some or all of these cognitive-affective processes when recognizing uncertainty, in any sequence or simultaneously; for instance, questioning during predicting. Nurses perceived uncertainty when they were cognitively aware that a gap existed. They did not know or understand some aspect of the patient situation (see Figure 4). This gap in knowledge, information, or understanding represented the point at which nurses realized that they were uncertain. For instance, nurses described reflecting on their clinical knowledge and experience and realizing that the situation exceeded their knowledge base.

Larry indicated:

Uncertainty is when you’re unaware of what to do and you already acknowledged all your thinking. So now you have become in an unknown area of care. That to me is uncertain…You already maximized what you know, now what…so my uncertainty is I don’t know after that.

Nurses recognized that they were uncertain in unusual or new situations and familiar situations. Recognizing uncertainty initiated a process of deciding how to respond to it. Figure 4 depicts the cognitive-affective processes (assessing, reflecting, questioning, predicting) that occur when nurses are faced with an uncertain patient situation. These
processes are recursive and overlap in that nurses might use some or all of these processes when uncertain. Whether nurses’ use assessing or questioning processes when uncertain, or predicting and questioning, or any other combination of these processes is influenced by nurses domain knowledge and clinical experience, cognitive/thinking style, values, attitudes, and beliefs and feelings, and emotions experienced from uncertainty.
Figure 4. The process of recognizing uncertainty.
Summary of the Experience of Uncertainty

Uncertainty involves a process of recognizing, a cognitive-affective awareness, through assessing, reflecting, questioning, and/or predicting aspects of the situation in relation to the nurse’s personal characteristics (e.g., knowledge and experience), information available, and understanding. Uncertainty is characterized by patient care situations that are unexpected, unpredictable, (un)familiar, challenging, and/or complex (in varying degrees) and evokes feelings of discomfort, uneasiness, and frustration. Uncertainty is multi-dimensional. It manifests as decisional, procedural, and ethical aspects of the patient situation, and occurs throughout the process of patient assessment, diagnosis/problem identification, intervention, and evaluation.
Responding to Uncertainty

Research Question 2:
How do medical-surgical ICU nurses respond to uncertainty in their daily practice?

a) In general (e.g., cognitive, affective, behavioural responses)?

b) In particular, how does uncertainty influence recognition of information needs?

c) In particular, how does uncertainty influence decisions to seek additional information?

It is important to preface what is meant by the term respond used in this study. This question is distinct from the first research question exploring nurses’ experience of uncertainty, because here the focus of the question is on how nurses respond to uncertainty: How do nurses react when uncertain? How do they manage uncertainty? and What are the consequences or outcomes of how they managed uncertainty? Although separate questions, it is important to highlight that what nurses do about uncertainty (responses) further revealed the nature of uncertainty and how nurses conceived of uncertainty (experience).

This chapter section is divided into the following four sections: (1) physiological and affective responses to uncertainty, (2) managing uncertainty, (3) contextual factors influencing uncertainty, and (4) consequences of managing uncertainty.
Physiological and Affective Responses to Uncertainty

Nurses commonly described emotional responses to uncertainty as feeling uncomfortable, frustrated, uneasy, and stressed in the situation. Three nurses also described how their level of stress or anxiety from being uncertain manifested physiologically (e.g., stress response). Nurses’ physiological responses affected how they reacted to uncertainty, such as thinking processes and being more focused when dealing with uncertainty. Kerry described the stress response when uncertain. She stated:

Feeling like, knotted stomach, anxiety, stress….uncertainty, I’m going to add, is a stressful situation. Yeah, I don’t like that feeling and I don’t think anyone does because I think internally, we really, bad hormones, and you’re sweating, you’re breathing quickly. You’re just, get me out of this. You’re cold and clammy.

The impact of physiological responses on managing uncertainty varied depending on the nurse’s level of stress. While nurses described observing some of their colleagues appearing overwhelmed from uncertainty, others described how they became more focused. Kerry described thinking clearer when uncertain in situations involving a less complex patient, because she felt less stressed. She indicated:

I think because there was only one issue going on with this gentleman, it’s a clearer, methodical thinking. Whereas she was so complex, it was every system. Where he, to me, was only one system so far that was going wrong. So I think you feel, the uncertainty’s there, but you feel not as stressed, or not as anxious as you do in another situation where everything seems to be interrelated, and if you do one thing, something else will be affected.

Mary stated that her anxiety from uncertainty kept her awake at night. She described feeling scared all the time and did not sleep, but indicated that over time, it got easier. Cheryl described how she was anxiously driven to find the answer when uncertain. She stated:

I feel anxious [when uncertain], but I feel anxiously triggered, like driven. It makes me more focused….I get more involved as opposed to just throwing ideas out and seeing….I’m pushed to find the answer, find the solution.
In a follow-up (member check) interview, Anna further highlighted feeling more focused when stressed:

Fear is a good thing when you’re trying to learn the right direction, I don’t think we should ever not be fearful….otherwise you will make mistakes, because you’re just so doubtful in your own ability….You’ll think, I can do this. Fear keeps you focused.

Four nurses also described feeling emotionally drained from uncertainty in ethical situations, particularly if the uncertain patient situation remained over the course of several shifts. For instance, Joanne stated that she was very “emotionally involved” in the situation and that it was “quite the rollercoaster.”

Managing Uncertainty

Nurses’ responses to uncertainty highlighted cognitive-behavioural strategies for managing uncertainty. Strategies were deliberate, purposeful actions that nurses planned and carried out to manage their uncertainty. All nurses described engaging in some type of response to uncertainty. This included the decision not to act immediately, that is, a delayed action is a response to uncertainty. Strategies revealed how uncertainty occurred in both an individual context and a social context involving interpersonal processes. Categories of strategies to manage uncertainty included: (1) “figuring it out myself,” (2) collaborating with nursing colleagues, (3) “working as a team,” and (4) seeking evidence.

“Figuring it Out Myself”

Nurses used several cognitive strategies during the decision-making process to manage their uncertainty, which involved using critical thinking and reasoning skills, and intuition. The category *figuring it out myself* included the following sub-categories: (i) critically “thinking through the situation,” (ii) “going on instinct,” and (iii) keeping an “open mind.”
Critically “thinking through the situation.” Seven nurses described how they would take a “step back and look at the overall picture,” critically “think through the situation,” “continually reflect on it,” or “prioritize.” Nurses described trying to understand the uncertain situation, by reassessing the patient or rethinking strategies. Nurses described how they needed to “just try and think about it.” For example, George stated:

I thought the person was going to code on me at one particular time, and I had to really sit there and think, Okay, what do I need to do to remedy this situation?.... I really had to think out in my head what was going on with the person and what I needed to do to remedy it....Definitely I had some uncertainty for a short period of time there until I figured out what I wanted to do and why I needed to do it. But I didn’t need to consult or read up on it. I needed to think about it myself and try and think through the situation, and that was what I did.

Nurses would sometimes go home and think about it and continue to reflect on it. Cheryl illustrated this point:

If you haven’t figured it out, you come back the next day....you come back to the same patient so you might want to go home and think about steps that you had taken to see if you could come in and provide something differently.

Prioritizing care was a strategy nurses used to bring some structure and organization to the uncertain situation to make it more manageable. Mary described how she had asked the doctor to prioritize his orders in terms of what was most important. Nick described how he used his critical thinking skills and prioritized when uncertain:

Uncertainty is questioning....you’re unsure of what’s happening then that uncertainty of what you’re doing you become nervous, but then it also makes you think, and critically think clinically as well you know, what to do, that’s what you go to....I think when you become uncertain, it’s to prioritize really. What you know and what you think is the right thing to do in that time.

“Going on instinct.” Four nurses described figuring things out on their own as using their intuition to guide their assessments and decision making. Intuition was described as “going on instinct,” using “gut feelings,” and something that comes from having “a
connection with the patient.” Nurses also described thinking ahead of the effects of their actions as intuitive, unconscious reasoning. Kerry used a driving analogy to illustrate this point:

I’m thinking five steps ahead. It’s like you’re driving….I’m thinking of the effects of what I’m doing….Your actions all have consequences, so you have to be thinking ahead of what you’re doing….So, that kind of thinking, I think. I don’t do it, like it comes natural.

Keeping an “open mind.” Two nurses described how being “open-minded” was a way to think differently about the uncertain situation. Larry contrasted open-mindedness with having “tunnel vision” or being task-oriented. He described how having “tunnel vision” is when you “become uncertain.” Being open-minded meant respecting different values, beliefs, perspectives or ideas. For example, it meant being open to different ideas from the team and the family in an uncertain situation. Nick stated: “…different cultures and diverse ideas….for me to open my mind up to different ways of thinking.”

The category figuring it out myself described the cognitive approaches nurses used to manage their uncertainty, which included analytical reasoning skills and intuitive skills. Figure 5 is a flow diagram that depicts an example of the reasoning process when figuring out an uncertain situation on one’s own. It is a narrative scheme showing thought sequences, using the nurse’s own language. In this example, the nurse is trying to figure out the best order to wean and titrate several inotropes (cardiac medications) for an atypical overdose patient, by critically thinking through the situation. Because the patient was an unusual overdose admission (e.g., young age), this nurse also described a “mental preparation” for the shift, which was included as an additional step in the reasoning process under uncertainty.
Figure 5. Figuring it out myself: reasoning process under procedural uncertainty.

1. Wean and titrate several IV drips
2. Mental preparation
3. What is the best order to wean?
4. Consult resources or think through the situation?
5. Think it through and plan order of wean
6. Is the patient stable?
   - Yes: Continue to wean as tolerated
   - No: Rethink strategy

Process
Preparation
Decision options
Sequence
Initiator/terminator
Nursing Colleagues: “First Line of Collaboration”

A second category that described strategies nurses used to manage uncertainty was collaborating or consulting with nursing colleagues. Nurses described asking their nursing colleagues for information, knowledge, and/or support (e.g., decision support, emotional support, help, advice, feedback). Nurses indicated that they sought particular colleagues for information and support to manage their uncertainty. They explained that they asked nursing colleagues who met any of the following criteria: (i) had cared for the same patient previously or had experienced a similar situation, (ii) were experienced, knowledgeable, and practiced according to guidelines and protocols, (iii) were approachable, (iv) were close to their patient assignment at the bedside, and (v) could provide emotional and social support.

Seeking nurses who recently cared for that patient or experienced a similar situation.

Three nurses indicated that when they were uncertain, they searched for a nurse who had recently cared for the same patient to get more information, particularly if the patient was ventilated or unresponsive. Cheryl indicated: “And I was fortunate that day, I said, Did anybody ever have this gentleman? And I found one person.” Nurses also asked their colleagues if they had experienced a similar situation to learn how they had responded and to know what to expect in a newly encountered situation. For instance, Fay stated: “I’ll ask my colleagues if they’ve ever encountered something….been in the same position. So I guess it’s asking, just finding out what they did in a situation like that.” Anna, in a follow-up interview, highlighted how nurses wanted to anticipate what to expect: “If you can speak to some colleagues to say okay, generally what happened [in the situation], at least you know some steps to look forward to…”
Seeking experienced, knowledgeable nurses. Four nurses described approaching colleagues who were experienced, knowledgeable, and practiced according to guidelines and protocols. Nurses who practiced according to hospital or unit protocols were considered knowledgeable, safe practitioners. Experienced and knowledgeable nurses were those with clinical expertise and who could “think quickly” in an uncertain critical situation. New graduates were considered to have current knowledge. Cheryl, in a follow-up (member check) interview, described knowing who can help you out. She stated that “you’re sort of like, okay, who’s here, who’s working? Who can sort of help you through the process.” Nurses wanted help through the decision-making process when uncertain. Elaine stated, “you kind of figure out who’s good at what that you’re working with, and I usually go to them about it.” Resource nurses/clinical nurse specialists were commonly called upon for information, knowledge, advice, and decision support. Irene indicated, “I will try and utilize the resource nurses, because to me I just assume that they’ve got, and they do. They’ve got more of a broader knowledge of things.” These nurses did not have a patient assignment. Their role was to provide assistance to staff nurses in the unit.

Asking approachable nursing colleagues. Four nurses mentioned asking for help from their colleagues who they considered to be approachable. Approachable nursing colleagues were those considered: “not inconvenienced,” “easy to ask questions to,” “respected,” “receptive,” “trusted,” and “looked up to.” Barb indicated that “…it’s nurses that I have respect for, the way they take care of their patients. It’s people that I respect on a personal level also, like I’m very careful about who I ask information from.” Resource nurses were also considered approachable colleagues whom nurses asked information and decision support from.
Nurses described seeking approachable nursing colleagues because they did not want to look incompetent in front of their peers. This was described as “fear of the stupid question.” When nurses were uncertain concerning an aspect of patient care for which they felt they should know or were expected to know, it influenced how they responded to uncertainty. They felt embarrassed and fearful to say they did not know something. Irene illustrated this point:

Sometimes you are scared to ask because you don’t want to sound stupid….Some things you are supposed to know, but you don’t know….So there’s that fear of looking silly, dumb for being uncertain….I probably subconsciously seek out the ones who I know will be more receptive….And it’s inevitable there are some nurses that you’re a little bit more wary about approaching. If I approach them, even though they might make me feel stupid, in the end I’d rather ask than have not asked.

Fear of the stupid question influenced nurses’ choice of who to approach, and how they articulated their uncertainty (e.g., wanting to do the right thing). Having a good reputation or image and professional standing (e.g., trustworthiness) was important. Mary stated:

…other people that are working within the unit, you think I don’t want them to think I’m an idiot, like, you worry so much about what everybody thinks of you too…Like, look at me, there’s certain nurses I trust…

Figure 6 depicts a path of interaction taken by a nurse who expressed a “fear of the stupid question.” It is an example of a nurse who, despite being afraid of sounding stupid, asked a colleague for information when she was uncertain. This nurse’s fear of looking stupid stemmed from feeling that her question might be something that she was expected to know. This nurse was balancing risk to patient safety with imposing on colleagues and appearing incapable. The interaction pathway comprised information, communication, and decision-making processes involved in asking an approachable colleague a question, and the decision to get over the fear of the stupid question in the interest of patient safety. The flow diagram is a narrative scheme of these processes, using the nurse’s own language.
Figure 6. Fear of the stupid question: asking an approachable nursing colleague.

1. Fear of the stupid question
2. Wanting to do the right thing and not jeopardize anything
3. Seek an approachable colleague or go find the answer?
4. Seek nursing colleague and acknowledge to colleague that this might be a stupid question
5. Ask the question
6. Over time
7. Get over the fear of the stupid question

Process
Decision options
Sequence
Initiator/terminator
“Asking nurses who are next to me.” When nurses were uncertain, they also asked their neighbouring colleagues questions because they were convenient and accessible, particularly when nurses did not want to leave their patients’ bedside for any length of time. However, deciding which neighbouring nurse to ask also depended on that nurse’s knowledge and experience level, and approachability. For example, Joanne illustrated this point:

I think my first line of defence is always the people who are next to me, especially if they are more experienced than I am, I always tend to go to them first, if it’s somebody I feel that I can easily go and ask a question to, even if it’s a stupid question. And then usually tend to seek out the resources nurses, even before charge nurses or anything….Certainly I think the colleagues, the other bedside nurses are the first line of collaboration. And from there it’s still nursing. Then once you go through all those measures is when I end up going outside of it [nursing].

Seeking emotional and social support from nursing colleagues. Five nurses (including those who expressed a fear of the stupid question) described seeking emotional and social support from their nursing colleagues to deal with their feeling of uncertainty. Mary indicated:

…with the HFO [high frequency oscillator] guy, that was a really good, I was uncertain, and I was scared because I’ve never had that experience but I knew I had enough support…. it’s like having a safety net….then you feel a bit more confident….and they [charge nurse] put a nurse beside me that was very experienced and who has helped me in the past and who I trust, who was like, if you need anything, just let me know.

Nurses who feared being seen as stupid by colleagues when they were uncertain not only wanted support through the decision-making process (“walk me through it”), but reassurance to build their confidence; however, they did not want other nurses to take over the situation. George observed:

When some people are showing uncertainty, they don’t take them aside and reassure them, or help them through the decision-making process. They just kind of make them feel like an idiot, and maybe take over as opposed to helping them work through
it themselves. Not too good for the confidence. And I have seen people, confidence is very poor, and that's because they’ve never been allowed to, or helped to make decisions themselves….I think that's the only thing I would say about uncertainty in the workplace is, not such a good support system to help you work through it.

George continued:

But if you show confidence in your practice, then people generally will leave you alone as opposed to taking over. Because I think it’s a process that happens too. If you show uncertainty, then sometimes nurses lose their confidence in your ability to perform the job, and then it just snowballs and things go, they get worse…they’ll start to question your decisions because they don’t feel you’re a competent practitioner. And it just goes on.

Mary further described a code blue situation where she received emotional and social support only after the uncertain situation occurred. She described her experience of another nurse taking over during a code blue situation. She stated:

…she [nurse in the room] sort of pushed me out of the way and started taking over and I remember, I remember feeling like I was just a body that was in the way, and I was so upset….so I came out of the room and they’re [other nurses] like, you know, do you understand what happened, and they sort of walked me through everything and they’re like, how are you feeling, and do you feel like you need to cry or do you need to take a break, and I was like, no, I want to stay right here and I want to know what’s going on…

Nurses also sought reassurance and the “opinions of others” because they did not want to be the “lone voice in the situation” or alone in their thoughts and feelings around uncertainty in a patient situation. Fay expressed, “It just helps you vent some frustration, and you realize, Oh, I’m not the only one that felt like that.” Nurses sought “validation” from their colleagues that their thinking was on the “right track” and that they were “doing the right thing,” particularly in uncertain ethical situations. Joanne stated:

…there was a lot of support. Knowing that it wasn’t just you. Am I totally off side here? Is it just my viewpoint that’s different?....I think then talking to my nursing colleagues kind of helped validate where I was going with regards to that, and was I appropriate in feeling this way. It helped validate that.
In summary, nurses collaborated with their nursing colleagues for decision support, information support, emotional support, and social support (e.g., advice, feedback) to manage their uncertainty. Nurses sought particular colleagues to help them through the decision-making process and to provide reassurance when uncertain. They sought a specific network of colleagues for different types of support when uncertain. Knowledge and experience were valued attributes in colleagues when nurses sought support through the decision-making process, and approachable colleagues were relied on for both decision and emotional support by nurses who feared asking a stupid question.

“Working as a Team”

A third category, “working as a team,” described how nurses managed their uncertainty by collaborating with the team, such as medical and other interdisciplinary team members (e.g., physiotherapist, respiratory therapist, pharmacist), and support teams (e.g., chaplain, social worker). Working as a team was described as making decisions together, having clear communication, and trusting one another’s judgements. Nurses described working as a team to share their different perspectives when uncertain. Cheryl indicated:

Sometimes you have someone [medical staff] that’s really good, and you can see, you can sort of project an idea, project suggestions, and then they can help you map it out….I get different perspectives when I’m uncertain like that.

Formal meetings (e.g., team rounds) and informal discussions were used for “teaching each other” and “gaining from colleagues’ experiences.” Kerry indicated that “I think we used each other, and we’d rebound the information, because everyone has vast, different experiences.” Collaborating with team members was context or situation-dependent. For example, in uncertain situations that were described as “grey areas” (e.g., ethical dilemmas), Joanne explained how she consulted with an ethicist. Dena “liaised” with the respiratory
therapist (RT) for input about the patient’s secretions and readiness to be transferred to the floor. Anna described the importance of communicating with team members (e.g., RT) and having “support on standby” in case something happened. When patients were unresponsive or ventilated and unable to communicate, nurses turned to other nurses, the team, and/or the patient’s family members (i.e., for information about the patient) when uncertain about an aspect of the patient’s care/situation.

*Getting “everyone on the same page.”* Six nurses described the concept of getting “everyone on the same page” in terms of figuring out (and agreeing with) a plan of care. Nurses described how they consulted with their nursing peers, medical staff, other interdisciplinary team members, and the patient’s family members, as a strategy to manage their uncertainty around the care plan. Getting everyone on the same page occurred both within the team and between the team and the family. Nurses advocated for their patients and the family’s involvement in care decisions, and arranged family meetings to explain the patient’s status to the family. Anna described getting everyone on the same page as “managing what are your [nurse’s] wishes, what are the patient’s wishes, what are the family’s wishes, what does the team think.” She further stated:

If something happens [code blue], you sort of need to know what the rules are. I think it says a lot about the teams that you deal with, that, you know, everyone sort of knows. You’re all on the same page. And sometimes, you know, we have family meetings, like pretty much every day if we need to. It’s that dynamic.

Kerry further reinforced the importance of getting everyone on the same page in a follow-up interview:

I’m just thinking of this patient specifically today, no one’s on the same page because the family are totally thinking one thing, and we know clinically he [patient] will never wake up….with this to [getting everyone on the same page], uncertainty because you don’t know, what’s your care? Uncertainty, the patient arrests, what do I
do? That’s a stressful situation, doesn’t matter how many years’ experience you have, do I resuscitate or don’t I resuscitate, right?

Two nurses described getting everyone on the same page as “bridging.” The concept bridging reflected the collaborative effort involved in getting everyone on the same page.

Joanne described bridging as opening the lines of communication when there was disagreement with the plan of care. She stated:

After ethics [ethicist] got involved, there was certainly more communication between the two of us [physician and herself] about where we were going [with the plan of care]. I think that certainly helped bridge the gap between what we were both feeling and thinking at that time.

Anna, in a follow-up interview, highlighted both the importance of and difficulty with getting the team and the family on the same page in terms of a plan of care. She stated:

If there’s anything that you would disagree with then that’s the time [rounds] to bring it up. That’s within our team, but I think I also would read that [everyone on the same page] as the family and the team, together, bridging….you have to come together, are we all on the same page with this. So that’s important as well and that’s probably the more difficult one, with the family and the team come together.

Seeking Evidence: “Finding the Answer”

A fourth category of strategies nurses used to manage uncertainty was seeking evidence. Nurses described seeking evidence in terms of finding answers to their questions. Nurses were seeking both “consistent answers” and seeking “concrete evidence.” Uncertainty motivated nurses to find an answer to their questions. Irene stated, “I’d like to think that I’m the type of person, if I’m uncertain I’ll go find the answer and I’ll ask….I’ll be, Oh, I don’t know the answer to that question.”

Seeking “consistent answers.” Nurses described seeking consistent answers by consulting a variety of sources. This was described by three nurses. Nurses sought consistent answers for patient safety reasons, because they considered a “consistent answer” the right
answer or the best way to do something. Nurses searched for a consistent (similar) answer by asking several of their colleagues and (when time permitted) other resources such as the policies and procedures, the Internet on the computer, and/or staff from another hospital. For example, searching for a consistent answer involved “double checking” answers given by colleagues who appeared uncertain (e.g., showed hesitation) regardless of whom they received the information from. For example, Irene stated:

I would ask somebody around me, if there’s somebody close by, I’ll be like, “Do you know the answer?” And if they don’t know the answer, or even still, if there’s hesitation from that end, I’ll be, You know what? Let me double check that. Then I’ll go and double check. But it’s all situation-dependent. If the patient is crashing really, really bad, then I’m not going to leave like that.

Double checking or seeking “second opinions” was also carried out if the colleagues’ answer “leaves a question in my mind whether that was the right way to do it.” Finding a consistent answer made nurses feel more comfortable and confident in their decisions and actions. Barb emphasized the importance of finding a consistent answer:

I’m always thinking in the back of my head, “Does she for sure know? Does he for sure know?”….And so I’ll ask the resource nurse, and then I’ll ask a really experienced nurse after that. I’ll get about, you know, I’ll look it up. I’ll ask. I’ll ask again. I make sure that I get a consistent answer…. If I don’t have a consistent answer….I’ll say to the doctor, I’m uncomfortable doing it.”

Figure 7 is a flow diagram that depicts an example of the process of seeking a consistent answer. It is a narrative scheme showing information seeking actions and decisions, using the nurse’s own language. In this example, the nurse was seeking a consistent answer to her question of whether the order for a chemotherapy drug (and the administration route) is an advanced nursing competency. In this example, the nurse was unable to find a consistent answer, which influenced her decision to not carry out the treatment order.
Figure 7. Seeking a consistent answer.

Administer chemotherapy drug via naso-gastric tube

Is this an advanced competency? Should I administer it?

Consult resources: (e.g., resource nurse, unit manager, chemotherapy nurse, policies & procedures)

Consistent answer received?

No

Ask physician to administer medication
Seeking “concrete evidence.” Nurses also searched for “concrete evidence,” which was something tangible that would help them understand the situation (e.g., what was going on clinically with the patient) and reduce uncertainty. The concept of concrete evidence was indicated by five nurses. Concrete evidence provided information support to help nurses in their decision making. Examples of concrete evidence included lab tests or other procedure results, policies and procedures, the patient’s chart, and scholarly publications. For instance, nurses shared information such as protocols by placing it on the chart for the next shift, particularly in patient situations involving unfamiliar medical conditions or treatments.

Cheryl described how she read the patient’s chart to get a “clearer picture.” She stated:

That day, like I thought, Okay, let me just go and try to figure out who this patient is a bit more. So I sat down, I started reading the charts, reading some old notes, reading to get a bigger picture of who this patient is presenting to be….so I was trying to seek out or retrieve information as much as I could to get a clearer picture.

Dena described how she changed the way nurses were charting suctioning a patient’s secretions to obtain more detailed information to inform decision making. She described how she split the charting of secretion clearing to differentiate between the patient’s own secretion clearing and nurses’ suctioning the patient’s secretions. Concrete evidence provided a “factual basis for decisions,” and was something that substantiated and supported nurses’ decision making in uncertain situations.

Figure 8 is a schematic representation of an example of the reasoning process in determining a patient’s readiness for transfer to another floor. This nurse was uncertain about the patient’s readiness because of unclear and incomplete information: information on the patient’s suctioning requirements was lacking in detail. She was unable to interpret and differentiate between when the patient was expectorating independently and when nurses were intervening (suctioning). This example illustrates a data-driven, forward reasoning
process in which hypotheses are generated from the data, leading to a decision (Patel, Groen, & Patel, 1997). In addition to directionality of reasoning, it shows the types of evidence used to support her decision (i.e., chart information and consulting with multi-disciplinary team members). From the presence of thickened secretions, chart information, and in consultation with team members, the nurse reasoned forward to conclude that the patient should continue to be observed in the MSICU for another day. Thus, the hypothesis generated from the data was: *If the nurse continues to observe the patient in the MSICU, then there will be less risk of patient ventilator-dependence or readmission*. This pattern of reasoning is represented in a semantic network (Sowa, 1984, 1991) and is based on a forward reasoning process as described by Patel and colleagues (Patel & Groen; 1986; Patel et al., 1997; Patel, Arocha, & Kaufman, 2001). Concepts are shown in boxes and relations are represented by arrows.
Figure 8. Determining a patient’s readiness for transfer to a surgical floor: seeking concrete evidence.
To summarize, there were four categories of strategies that nurses used to manage their uncertainty: (1) figuring it out myself, (2) collaborating with nursing colleagues, (3) working as a team, and (4) seeking evidence. These strategies revealed cognitive, affective, behavioural and social processes that nurses engaged in to manage their uncertainty. Strategies revealed patterns that were more situation-dependent than others. Uncertainty in ethical dilemmas tended to be resolved through collaborating with co-workers and the patient’s family members. For example, getting everyone on the same page was a strategy described in the context of uncertainty in ethical situations. In another example, when nurses were uncertain about an unfamiliar illness or treatment, one strategy was to share information (e.g., protocols, policies and procedures) by placing it on the patient’s chart. Table 5 summarizes categories of strategies nurses used to manage uncertainty. Frequencies of their observation are appended (see Appendix M).
Table 5. Categories of Strategies to Manage Uncertainty

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figuring it out myself</td>
<td>Critically thinking through the situation</td>
</tr>
<tr>
<td></td>
<td>Going on instinct</td>
</tr>
<tr>
<td></td>
<td>Keeping an open mind</td>
</tr>
<tr>
<td>Collaborating with nursing</td>
<td>Seeking nurses who recently cared for that patient</td>
</tr>
<tr>
<td>colleagues</td>
<td>Seeking experienced, knowledgeable nurses</td>
</tr>
<tr>
<td></td>
<td>Asking approachable colleagues</td>
</tr>
<tr>
<td></td>
<td>Seeking emotional/social support</td>
</tr>
<tr>
<td>Working as a team</td>
<td>Collaborating with team members</td>
</tr>
<tr>
<td></td>
<td>Getting everyone on the same page</td>
</tr>
<tr>
<td>Seeking evidence</td>
<td>Seeking consistent answers</td>
</tr>
<tr>
<td></td>
<td>Seeking concrete evidence</td>
</tr>
</tbody>
</table>
Contextual Factors Influencing Uncertainty

Nurses described contextual qualities of the MSICU as factors that influenced how they managed uncertainty. These included three factors that influenced nurses’ strategies and decisions to act now or wait until later to address their uncertainty: (i) accessibility and availability of information and resources, (ii) availability of coworkers, and (iii) having the patient’s safety at heart. These three factors were interrelated temporally, that is, they all had an element of time that influenced how they managed uncertainty. For instance, time available influenced whether nurses turned to their neighbouring colleague for help or left their patient’s room to seek who they perceived as an approachable and/or knowledgeable colleague.

“Twelve hours of Go”

Amount of time available to find answers to nurses’ questions were limited by a busy shift. George stated:

I researched what I could at the time [for 10 minutes before shift started], but it was so busy that during the shift, once the shift got started, I really didn’t get a chance to do any more checking up on things. It was basically 12 hours of go.

When little time was available and the nature of uncertainty did not affect the patient’s status (e.g., disease pathology), nurses might decide to look it up later during the shift if more time became available or at home. Mary indicated:

I didn’t know anything about it [an autoimmune disease] so I quickly looked it up on my shift, but then more of the pathology and why it happens and what’s the incidence and how do they treat it, you do that at home because you don’t have time to do it.

Accessibility and Availability of Information and Resources

Accessibility and availability of information and resources influenced how nurses’ managed uncertainty. If resources were not readily accessible, nurses perceived that they did not have
time to search for them. For example, books were considered not readily accessible (e.g., missing, difficult to locate in the unit). Elaine observed: “we don’t really have good books for good access. They’re usually in another room in the back, so they’re not really readily accessible I think….newer books, they go missing.”

Availability of Coworkers

Working with “skeleton staff.” There were differences in how nurses responded to uncertainty depending on the time of shift. There were different dynamics (interactions) according to the time of shift, because it influenced availability of co-workers and the team. Nurses worked with “limited resources” on nightshift and with staff in their immediate area. Kerry indicated: “…whereas days, there’s more support staff around. There’s more people who can put input. But nights, there’s skeleton staff. And you’re really working with the people that are around you.” When nurses were uncertain during the nightshift the pace of resolving uncertainty was slowed because of the prolonged time and effort to find resources. Irene indicated:

I remember working nightshift and getting really frustrated because this person doesn’t know….I’ll call a pharmacist and there’s so many other processes you have to get to before getting to the end result. I remember the frustration that would happen especially if you were unsure.

“Having the Patient’s Safety at Heart”

How nurses managed uncertainty was framed by discourses around patient safety. Nurses felt a sense of obligation to ensure that patients’ best interests were being upheld and preventing unnecessary risk. Having the patient’s safety at heart was primarily described as knowing when to ask for help, and understanding before taking action. More specifically, nurses described having the patient’s safety at heart as the following:

- practicing according to available policies and procedures;
investigating until satisfied and comfortable with decisions and actions;

- being responsible and accountable for decisions and actions;

- advocating for the best course of care or appropriate level of patient care (e.g., keeping the patient’s best interests in mind); and

- making the right decisions when uncertain (e.g., a consistent answer was considered the right answer).

**Balancing risk with imposition of colleagues.** Three nurses described needing to know their own limits in terms of their level of knowledge and experience, and how much they could figure things out for themselves when uncertain before they needed to ask someone for help. Nurses described knowing when to say “hey, this is out of my league.” Cheryl, in a follow-up (member check) interview, highlighted the importance of knowing when to ask for help:

> What we find is nurses have to know within themselves to ask. Ask for help, ask for direction, ask for I don’t know. Say I don’t know….In three seconds something could change and you don’t know, you’ve got to be okay with asking.

Mary explained not knowing herself when to ask for help, but realizing after a decision was made and feeling guilty and regretful for not asking. She stated:

> You know, I didn’t know how to do this and I shouldn’t have done it….you have this little voice inside your head that’s saying, you should ask her….but I knew she [nurse] wanted to go home and I didn’t want to ask and I was like, I can figure it out myself….it’s not that big of a deal, but it was a big deal, I should’ve asked and I didn’t want to ask and I felt guilty then…I should have got her to walk me through it.

Two nurses described delaying an uncertain task or action as one strategy for coping with uncertainty. The decision to delay dealing with uncertainty was dependent upon the nature of the uncertainty. Mary further explained how she delayed responding to an uncertain aspect of care because she perceived the task as minor: “I was putting it off, putting it off, I wasn’t
really sure what to do….and it was a really minor thing [new blood sugar withdrawal system] but I put it off.” Larry described delaying action in terms of “backing off.” This nurse described backing off as “being lazy,” for not taking the initiative and becoming “more familiar” with the situation, and not knowing when to ask someone for help. When describing the importance of patient safety, Larry used words such as, “foolish,” “laziness,” and “knowing better.”

Having the patient’s safety at heart also meant “getting over the fear of the stupid question.” Nurses described the importance of getting over the fear of the stupid question, and how they were overriding their concern of looking stupid in the interest of patient safety (e.g., getting the right information, making the right decision). Irene stated:

…sometimes you ask a stupid question, but I’ve, over time, gotten over the fear of the stupid question. Like, if you’re, you know what I mean? Some people just don’t want to look dumb. I don’t care anymore, because at the end of the day I want to make sure that I’m doing something right, and make sure that I’m not jeopardizing anything, so I need to ask….And I always voice, I’m like, if I didn’t ask you, I wouldn’t have known. And I just wanted to clarify, because if not, then it would have been the wrong information or whatever. Doing the wrong thing.

Similarly, Mary stated:

I was embarrassed to say I didn’t know how to do something….I thought I could figure it out…it was me and my feelings and I let that get in the way of…who cares if you look like an idiot sometimes.

*Understanding before taking action.* Nurses highlighted the importance of developing an understanding before acting in the interest of patient safety, such as researching an unfamiliar medication or understanding the rationale for physician orders when uncertain and “not following the doctor’s orders blindly.” Nick stated: “If I don’t know what the drug’s for, I won’t give it. I’ll need to look it up.” After an exhaustive search for information on the proper administration of a medication, Barb remained uncertain. She stated: “I was not
comfortable in giving it (chemotherapy medication). So I got the staff physician to administer it.” She continued:

I don’t ever want that feeling ever again. It was so upsetting, you know? And it doesn’t just happen to you with chemotherapy. It has to do with the fact that I go home at night and I rest soundly, knowing that my patient is safe.

In summary, a number of contextual qualities of the MSICU setting influenced nurses’ decisions and actions when managing uncertainty. For instance, increased patient acuity and complexity limited time available to find an answer and nurses did not want to leave their patient’s bedside or put their patient at unnecessary risk.

**Patient Characteristics**

Contextual factors intersected patient characteristics (age, level of acuity and complexity) temporally, also influencing how nurses managed uncertainty.

*Acuity and complexity of the patient’s status.* Nature of the patient’s condition influenced nurses’ responses to uncertainty. A patient’s critical condition limited time available to access resources. Larry indicated:

…by the time you figure it out really, versus you getting the proper resources, which is faster. I mean minutes do count….that determines if you’re [patient] going into anoxic brain injury versus oh, left sided weakness, right?….it’s better to have two or three people thinking.

Similarly, Mary stated:

But I also, rather than ask a question, I would rather find it out myself….I prefer to go do it, because ultimately you’re the one that’s responsible. But if I really don’t know and I’m in a quick fix, and I need someone to tell me like right now, I would ask another nurse, for sure, first.

*Caring for a “young” patient.* When describing uncertain patient situations, five nurses included in their examples the additional complexity of caring for a “young” patient. Caring for a “young” patient was considered atypical and unexpected in an adult MSICU.
Typically, a MSICU consisted of older adult patients; however, due to bed shortages in other hospitals or because of the expertise of medical staff within these hospitals, young patients were sometimes admitted. Hannah, who has 20 years experience as a registered nurse and 6 years experience in the ICU, stated:

   Oh, intubated, all central lines, of course, everything, everything. A whole bunch of medicines. But in this case, it is not a usual case. Our cases are usually older people, 80, 90 years old, older people with COPD, difficult to wean, they’re months on the ventilator machine….

Nurses provided examples of caring for young patients with diagnoses such as drug overdose, retroperitoneal bleed, and allergic reaction to an antibiotic. Young patients (e.g., described by nurses as 15 and 50 years of age in their examples) changed the nature of nurses’ uncertainty. Caring for young patients in an already uncertain situation increased complexity and perceived risk in terms of providing care and the impact of decisions on patient outcomes. There was a greater expectation from the team, family, and the nurses for the patient’s condition to improve and for the patient to survive, and it was an emotional and challenging situation. Caring for a young patient also influenced an emotional response to patients and their family members. Joanne stated:

   Well, that situation in general was totally emotionally charged. I guess the biggest part was the fact that you had seen him get well, and he was so young. All those things play on your emotions. But not knowing whether or not what we were doing was right or wrong, it was just, I don’t know. It was confusing….Like it was just challenging because I didn’t know if it was just me, my point of view.

**Summary of Responses to Uncertainty**

Nurses’ responses to uncertainty included physiological and affective responses as well as strategies to manage uncertainty. There were several strategies to manage uncertainty that included different cognitive styles and collaboration, and highlighted the interpersonal processes, social dynamics, and relations involved in responding to uncertainty. Figure 9
summarizes the four categories of strategies used to manage uncertainty and factors influencing these strategies. It illustrates how nurses managed uncertainty (e.g., figuring it out myself) was influenced by individual nurse characteristics (e.g., domain knowledge and clinical experience). It shows that contextual factors influenced strategies nurses used to manage uncertainty. Patient characteristics influenced how nurses managed uncertainty through contextual factors. For instance, nurses’ perceived time available to find an answer was influenced by patient characteristics such as acuity and complexity, which impacted whether nurses left the patient’s room to seek information.
Figure 9. Four main categories of strategies to manage uncertainty and influencing factors.
There were three categories of outcomes or consequences of managing uncertainty: (1) resolving uncertainty, (2) having “lingering doubt,” and (3) embracing uncertainty as a “learning opportunity.” The “willingness to accept uncertainty” was a subcategory of having lingering doubt. Uncertainty motivated nurses to find answers to their questions; however, there were various degrees of resolving uncertainty. Uncertainty was also perceived as an opportunity to gain new knowledge and to build experience for future situations and decisions.

**Resolving Uncertainty**

Resolved uncertainty was the result of finding a *definitive answer* (e.g., family decision, test results), and/or *satisfaction* with nurses’ own decisions and actions. When nurses’ uncertainty stemmed from ethical aspects around the goals of patient care where family members were involved, resolved uncertainty meant that the family made a timely decision about the patient’s code status and goals of care; nurses’ uncertainty was resolved within their scheduled shifts with the same patient. For example, Cheryl, who was uncertain about her patient’s goals of care, stated: “She [patient’s wife] did come in and did end up withdrawing on her husband and not having surgery, not having dialysis…she decided she didn’t want any further treatment.”

Nurses also described resolved uncertainty as feeling that they had acted in the “right” manner and in the best interests of the patient. There was no question in their minds in the way they handled the uncertain situation. Fay indicated: “I was convinced that what I was doing was right…in my opinion, I was doing what I should be doing for the patient at this point.” They felt confident, comfortable and satisfied with their decisions and actions.
George stated: “I had found what I believed to be the best combination for the patient, and I was continuing to wean as tolerated. I felt good about the way I left the patient.” Dena felt satisfied with her decision to continue to observe the patient in the MSICU. She stated: “I do feel that he [patient] should have been kept yesterday. I don’t feel like, oh, maybe I should have said no, he could go.”

**Having “Lingering Doubt”**

Four nurses described their uncertainty as remaining unresolved. Unresolved uncertainty was described as not finding a definitive answer to questions pertaining to the patient situation.

Barb stated:

> It’s just, at the bedside you have a million different responsibilities. It was just, you know, it’s really, really hard to focus your whole day on one thing, and then at the end of everything still have the questions….And it’s just, nobody should ever be left being uncertain about anything that they’ve done.

The concept lingering doubt represented a continuum of unresolved uncertainty, which included: (i) nurses feeling *unsatisfied* with answers or uncomfortable with their decisions (e.g., feeling that it is not the “proper answer” or having “lingering doubt”), (ii) finding a *sufficient answer* and making a decision until more time available (e.g., “figure it out as best I can until I have a chance to look it up”), and (iii) not figuring it out or experiencing “*continuous uncertainty*.” For example, Elaine stated that “sometimes we’ve had some situations where you never do [figure it out]….we don’t know what’s going on.”

Having unresolved questions was characterized as an information problem: not having accessible or available information when needed or when “nobody knew the answer.” Unresolved uncertainty was also time-pressured. For instance, nurses described not having enough time to figure out what was wrong with the patient because the patient’s status was quickly deteriorating. Nurses remained in a continuous process of resolving uncertainty
throughout the shift(s) trying to figure out what was wrong clinically with the patient or trying to understand the situation. Nurses further described the patient’s family members needing time to make a decision around the goals of patient care, which could take several days, or longer, contributing to nurses’ feelings of lingering doubt over the course of their scheduled shifts.

“Willingness to accept uncertainty.” When uncertainty was not resolved (e.g., time was not available to look it up later, answer was not available) nurses described a “willingness to accept” uncertainty. Nurses described a “mid-point” or finding “middle ground,” where they accepted the fact that they were going to remain uncertain. Willingness to accept uncertainty was described as a level of uncertainty that nurses felt comfortable with. Barb indicated: “And you just have been investigating, investigating, investigating until you’re satisfied, and you can sleep at night knowing that that’s they way you did something.”

Cheryl, in a follow-up interview, stated:

…the bottom line comes down to what is it that you’re willing to accept. I think it’s a willingness to accept [that you’re going to be uncertain]….so I think it’s round and around we go and at what point, then, are you okay with giving the care that you’re actually giving, or comfortable in saying this is what we’ve done or I’m comfortable with everything that we’ve done and so you get to a mid point in all of that.

Anna, in a follow-up interview, further highlighted the “middle ground” of accepting uncertainty, where “everyone’s sort of stuck.” She further stated that “it’s okay to have episodes of uncertainty, because you grow as an individual and a team as well.”

Resolving uncertainty and having lingering doubt were not merely a dichotomy of resolved or unresolved uncertainty. Both categories ranged along different continuums, involved different elements of time and comprised different concepts.
Embracing Uncertainty as a Learning Opportunity: “Write it Up in your Book of Experience”

Nurses embraced the challenging nature of uncertainty as an opportunity to exercise their critical thinking skills and to use their nursing judgment. Uncertainty was perceived as a break from routine patients or chronic patients in the unit, providing an opportunity to experience “new things” or “interesting cases,” and to practice advanced nursing skills and training. George stated: “I was happy, because sometimes the unit can be a bit chronic. I like to be busy, I’m not afraid of new things. It was a challenge.” Nurses also perceived uncertainty as “welcoming.” Cheryl, in a follow-up interview, highlighted embracing uncertainty as a challenge. She stated that “I think a lot of the nurses would love to sit under that challenge.”

Building experience. Nurses perceived uncertainty as a learning opportunity and a way to build experience. Nurses described how they used their experience of uncertainty constructively to build new knowledge, gain experience, and guide future decisions. For example, Anna explained how she used this new knowledge for “reference points” and to “refine care.” Anna described how experiencing uncertainty was a way to “build up experience” and provided “new ideas that may help with the next patient that comes along.” Cheryl, in a follow-up interview, further highlighted uncertainty as a learning opportunity:

If you welcome the fact that you know that you’re uncertain about a particular thing, and you get through the uncertainty phase of it….it becomes positive because you’ve just learned so much in an hour, or the whole entire day….write it up in your book of experience because you just went through something that was either good or bad but you learned something from it and recognizing that you learned something from what happened, and I think that’s where the rewarding learning opportunities come in….because whether it’s good or bad you must have learned something through that process.
Regardless of whether uncertainty was resolved, nurses perceived uncertainty as a learning opportunity. Nurses learned from uncertainty on an individual level and from sharing experiences with one another.

**Peer debriefing.** Nurses also described learning from uncertainty through debriefing. Debriefing was an avenue to reflect on the uncertain situation both informally (e.g., among nursing peers) or formally (e.g., team rounds, presentation of the patient case).

**Following up.** Nurses followed up with decisions made around the uncertain aspects of the patient situation to inform their decision making in future situations. For example, nurses described reading the chart on physicians’ decisions, or seeking feedback from the unit manager on their own decisions. Nurses sought validation for their decisions from the unit manager so they would know how to respond in a similar situation.

**Using hindsight.** Hindsight was another way of learning from uncertainty. Nurses used hindsight from uncertain situations to develop an understanding of what they should have been looking for (e.g., clinically in the patient) or what they should have done in the situation. Kerry stated:

> And the one thing in the back of our mind that we didn’t think about which we should have in hindsight, is she should have been scanned. She should have had a stat CT of her abdomen. And none of us caught on to that.

Nurses learned from their uncertainty experiences, through peer debriefing meetings, following up with situations, and using hindsight. As one nurse stated: “*Learning from the uncertainty is a big one, and maybe that’s how we learn.*”
Uncertainty Defined

Based on the data, uncertainty is defined as: The recognition of a gap in knowledge, information, or understanding through the cognitive-affective processes of assessing, reflecting, questioning, and/or predicting. The experience of uncertainty is rooted in situations characterized as unexpected, unpredictable, (un)familiar, challenging, and/or complex, varying dimensionally by degree. It manifests as decisional, procedural, and ethical aspects of situations and evokes feelings of discomfort, uneasiness, and frustration.

Uncertainty is temporal in nature, experienced in the present and occurring throughout the decision-making process. Recognizing and responding to uncertainty involves a series of actions and interactions that evolve as both new knowledge and experience are gained.
Chapter Summary

This chapter addressed the research questions and sub-questions explicating how nurses experienced and responded to uncertainty in their practice. Patient care situations that nurses found uncertain were categorized as: feeling caught off guard, encountering unfamiliar or unique orders, and navigating the grey areas of practice. These three categories delineated different types and attributes of uncertainty and associated feelings. Nurses’ conceptualizations of uncertainty revealed four interrelating concepts of assessing, reflecting, questioning, or predicting, forming the process of recognizing uncertainty. Nurses described physiological responses to uncertainty that manifested as the stress response and affective (emotional) responses to uncertainty. Four categories described nurses’ cognitive, affective, behavioural, and social strategies in managing uncertainty: figuring it out myself, collaborating with nursing colleagues, working as a team, and seeking evidence. Nurses described individual characteristics that influenced how they experienced and responded to uncertainty, and patient characteristics and contextual conditions within the MSICU that influenced how and when nurses managed uncertainty. Consequences of how nurses managed uncertainty were categorized as resolved uncertainty, having lingering doubt from unresolved uncertainty, and building knowledge and experience by learning from the uncertain situation. The substantive theory that emerged from the data was recognizing and responding to uncertainty. The theory is schematically represented in Figure 10. Figure 10 illustrates how recognizing uncertainty involved a complex recursive process of assessing, reflecting, questioning, and/or predicting, occurring concomitantly with facing uncertain patient care situations. This process occurred pre-decisional, that is, before nurses engaged in actions and interactions to manage uncertainty. Managing uncertainty represents the four
categories of actions and interactions that nurses engaged in when responding to uncertainty. Outcomes or consequences comprise the three categories that represent what occurred post-decisional or after nurses responded to uncertainty. The arrow originating from the consequence categories denotes that having lingering doubt or learning from uncertainty initiated a feedback loop to the processes involved in recognizing and responding to uncertainty. For instance, if nurses were unsatisfied with the answer or decision made they would try again to find a solution. The bar under patient, nurse, and contextual characteristics illustrates that these were factors that influenced the processes involved in recognizing and responding to uncertainty.

Having described the findings in this chapter, the following chapter highlights the substantive theory developed from the data, presented in a manner that explicates relationships between the categories and theorizes how nurses experience and respond to uncertainty in their daily practice.
Figure 10. Recognizing and responding to uncertainty.
CHAPTER 5: THE SUBSTANTIVE THEORY

In this chapter, the substantive theory that emerged from the data, recognizing and responding to uncertainty, is further highlighted and theorized. Theorizing is an interpretive process that involves constructing an explanatory scheme from data that systematically integrates various concepts through statements of relationship (Strauss & Corbin, 1998). The purpose of this chapter is to highlight the theory for the reader, by explicating relationships between the ten main categories that comprised the theory. Recognizing uncertainty and responding to uncertainty were two concepts that consistently emerged from the data and interrelated to form a theory. The ten main categories interrelated as conditions, actions and interactions, and consequences. Using a summary technique adopted from Chiovitti (1997), Figure 11 was developed to illustrate the ten categories and their linkage with Strauss and Corbin’s (1998) coding paradigm of conditions, actions and interactions, and consequences. Figure 11 illustrates that there were three categories of uncertain patient situations representing conditions for recognizing and responding to uncertainty. The four categories of strategies to manage uncertainty represent actions and interactions involved in recognizing and responding to uncertainty. The three categories of consequences represent the outcomes of recognizing and responding to uncertainty. Conditions, actions and interactions, and consequences formed the theory of recognizing and responding to uncertainty.
Figure 11. Ten categories in relation to the coding paradigm.
Recognizing and Responding to Uncertainty

Antecedent (causal) Conditions

Three categories were interrelated as antecedent conditions to recognizing and responding to uncertainty. Causal conditions represent sets of events or happenings that influence phenomena (Strauss & Corbin, 1998). Conditions form the set of circumstances or situations in which phenomena are embedded (Strauss & Corbin, 1998). These three categories were: (1) feeling caught off guard, (2) encountering unfamiliar or unique orders, and (3) navigating the grey areas of practice. Feeling caught off guard had two subcategories. These included: (i) patients’ whose condition changes really quickly, and (ii) patients who throw you off clinically. Navigating the grey areas of practice had three subcategories. These included: (i) differing perspectives on level and goals of care, (ii) leaving things up in the air, and (iii) advocating for the patient’s best interests with limited decision making autonomy.

Subcategories related to their categories by further specifying and dimensionalizing category characteristics. There were also conceptual relations among the three main antecedent categories. Though distinct, there was overlap as nurses could encounter more than one uncertain situation at a time. For instance, a nurse could experience both caring for a patient whose condition quickly deteriorated and encountering an unfamiliar medication order.

Recognizing uncertainty was embedded in these antecedent conditions. It involved a complex recursive process of assessing, reflecting, questioning and/or predicting, occurring concomitantly with facing uncertain aspects of patient care situations. Together, antecedent conditions and the process of recognizing uncertainty shaped the experience of uncertainty.
Subsequently, the experience of uncertainty was antecedent (and a pre-decisional stage) to managing uncertainty.

*Nurse Characteristics*

Individual nurse characteristics influenced how nurses recognized and responded to uncertainty and the outcomes/consequences of uncertainty. These intervening conditions or factors are those that mitigate or otherwise alter the impact of causal conditions on phenomena (Strauss & Corbin, 1998). Recognizing uncertainty was influenced by nursing knowledge, clinical experience, values, attitudes and beliefs, feelings and emotions, and cognitive styles or skills. The relation of these characteristics to the experience of uncertainty is complex because they interconnected to influence the process of recognizing uncertainty. That is, how nurses thought and felt about the situation relative to their own knowledge and experience influenced whether nurses interpreted the situation as uncertain (or the perceived level of uncertainty) and how they recognized uncertainty (assessing, reflecting, questioning, and/or predicting). Uncertainty recognition was a subjective process involving appraisal and awareness. For instance, cognitive skills developed through nursing knowledge and experience (e.g., pattern recognition, critical thinking, reasoning) influenced how, and the extent to which, nurses assessed, questioned, reflected on and/or used prediction in interpreting the uncertain situation.

There were two main types of nurses’ responses to uncertainty: (1) physiological and affective responses, and (2) strategies to manage uncertainty. Nurse individual characteristics influenced both types of responses. Physiological and affective responses were based on the individual nurse’s thoughts, feelings and perceptions related to uncertainty. For instance, whether nurses experienced stress or anxiety from uncertainty was based on the individual
nurse. Personal factors also influenced strategies nurses used to manage their uncertainty, that is, the path of action and interaction. For instance, fear of the stupid question, which was described by nurses who identified themselves as “not having years and years of experience,” influenced how (and whom) nurses asked their colleagues for help. In another example, nurses described the importance of having an awareness of their own level of knowledge and clinical experience in terms of figuring something out for themselves versus knowing when to ask a colleague for assistance. Nurses’ physiological and affective responses to uncertainty also intersected (dimensionally) with strategies to manage uncertainty. For instance, one nurse described a level of anxiety from uncertainty that kept her focused and motivated to search for an answer.

Nurse characteristics also influenced the outcomes or consequences of recognizing and responding to uncertainty. For instance, the manner in which nurses managed their uncertainty played a role in the outcome. Another example of how nurse characteristics influenced the outcome of uncertainty is how nurses learned from their uncertainty and the different ways they used this experience for patient care.

Patient Characteristics

Patient age and level of acuity and complexity were also intervening conditions that modified the way uncertainty manifested and influenced nurses’ responses to uncertainty (emotionally and physiologically and how they managed uncertainty) and outcomes of uncertainty. For example, one nurse described having greater anxiety from uncertainty where there was a high level of patient complexity (e.g., this nurse described how every system in the patient’s body seemed to be going wrong). Patient age intersected with acuity and/or complexity and influenced how nurses responded to uncertainty. Patient age was dimensionalized as two
extremes, caring for a young patient (e.g., 15-50 years of age, as indicated by nurses) or caring for an elderly patient (e.g., 80-90 years of age, as indicated by nurses). Nurses described how caring for a young patient added complexity and increased emotions in an already uncertain situation and influenced how nurses managed uncertainty. Nurses perceived an increased risk in their decisions on patient outcomes in uncertain situations involving young patients. Caring for elderly patients also influenced how nurses responded to uncertainty. For example, in uncertain ethical situations, nurses described advocating for comfort care (e.g., treatment withdrawal) and the family’s involvement in care decisions for elderly patients who were acutely ill.

It is important to highlight that physiological and affective responses to uncertainty manifested during the process of recognizing uncertainty. This indicates that experience of uncertainty and responding to uncertainty converged on a physiological or an emotional level.

Actions and Interactions

In response to antecedent conditions or types of uncertain patient situations, there were four main categories of strategies to manage uncertainty, comprising several categories. The category *figuring it out myself* had three subcategories. These included: (i) critically thinking through the situation, (ii) going on instinct, and (iii) keeping an open mind. The category *collaborating with nursing colleagues* had four subcategories that included: (i) seeking nurses who recently cared for that patient, (ii) seeking experienced and knowledgeable nurses, (iii) asking approachable colleagues, and (iv) seeking emotional and social support. A third category, *working as a team*, had the following two subcategories: (i) collaborating with team members, and (ii) getting everyone on the same page. A fourth category, *seeking*
evidence, had two subcategories. These included: (i) seeking consistent answers, and (ii) seeking concrete evidence. These strategies revealed the cognitive, affective, behavioural, and social actions and interactions nurses engaged in with the goal of reducing or resolving uncertainty. Though separate categories of strategies, they intersected as nurses could combine these actions and interactions. For instance, a nurse might decide to seek information from the policy and procedure manual and collaborate with nursing colleagues.

In addition to relationships among the three categories of antecedent conditions, and relationships among the four categories of actions and interactions (strategies) to manage uncertainty, there were interrelationships between these antecedent conditions and action and interaction categories. Patient situations that nurses found uncertain created the stimulus for actions and interactions in response to uncertainty. Patterns were noted in the data that indicated particular strategies were related to the nature of the uncertain patient situation. That is, particular patient situations produced specific strategies. For instance, in the presence of unfamiliar patient illnesses or treatments, nurses shared information by placing protocols on the front of the patient’s chart (see Table 6).
Table 6. Interrelationships between Conditions and Actions and Interactions

<table>
<thead>
<tr>
<th>Situation (Antecedent Condition)</th>
<th>Strategy (Actions and Interactions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagreeing with level of care provided</td>
<td>Collaborating with the team</td>
</tr>
<tr>
<td></td>
<td>Seeking emotional support from nursing colleagues</td>
</tr>
<tr>
<td></td>
<td>Getting everyone on the same page</td>
</tr>
<tr>
<td>Fear of the stupid question in the context of an uncertain patient situation</td>
<td>Asking approachable nursing colleagues</td>
</tr>
<tr>
<td>Trying to identify the patient problem</td>
<td>Collaborating with the team</td>
</tr>
<tr>
<td></td>
<td>Seeking concrete evidence</td>
</tr>
<tr>
<td>Planning the order of weaning medications</td>
<td>Critically thinking through the situation</td>
</tr>
<tr>
<td>Unfamiliar patient illness or treatment</td>
<td>Sharing information by placing protocol on the patient’s chart</td>
</tr>
</tbody>
</table>
Contextual Factors

There were contextual factors that influenced how and when nurses managed their uncertainty. Contextual factors are patterns of conditions that intersect dimensionally (time and place) to create the set of circumstances or problems to which persons respond through actions and interactions (Strauss & Corbin, 1998). These factors included: (i) accessibility and availability of information and resources, (ii) availability of coworkers, and (iii) having the patient’s safety at heart. These aspects were interrelated temporally—time available to find an answer. Contextual factors also intersected with patient characteristics (e.g., acuity and complexity) temporally, modifying how nurses responded to uncertainty. These factors varied dimensionally by degree (e.g., amount of time available, degree of availability or approachability of coworkers, level of patient acuity). These contextual factors influenced actions and interactions taken to manage uncertainty. For instance, nurses made decisions and acted based on amount of time available relative to patient safety; they were weighing risk to patient safety with resolving uncertainty. A nurse caring for a patient with a high level of acuity and complexity tended to remain at the patient’s bedside, rather than searching for information in the unit.
There were three main categories of consequences of managing uncertainty: (1) resolving uncertainty, (2) having lingering doubt, and (3) embracing uncertainty as a learning opportunity. Consequences are outcomes of the actions and interactions and are represented by questions as to what happens as a result of those actions and interactions (Strauss & Corbin, 1998). Resolved uncertainty was a result finding a definitive answer (e.g., family decision, test results) and/or satisfaction with nurses’ own decisions and actions. Having lingering doubt had the subcategory, willingness to accept uncertainty. Embracing uncertainty as a learning opportunity had the subcategory, building new knowledge and experience.

The concept lingering doubt represented a continuum of unresolved uncertainty, ranging from feeling unsatisfied with answers or uncomfortable with decisions, to finding a sufficient answer and making a decision until more time becomes available, to not finding a solution or experiencing continuous uncertainty. Nurse, patient, and contextual factors played a role in influencing the resolution of uncertainty. For instance, these different outcomes were influenced by amount of time available to find an answer, acuity of the patient, the extent to which an answer existed, and nurses’ own satisfaction with decisions made and how they managed uncertainty. How nurses managed uncertainty (actions and interactions taken) influenced uncertainty resolution as did organizational factors beyond nurses’ immediate control (e.g., no policy in place).

Nurses also perceived uncertainty as a learning opportunity. Uncertainty enabled nurses to exercise their critical thinking and reasoning skills. Because nurses learned from their uncertainty experiences, it provided an opportunity to gain clinical experience and to
develop new knowledge to guide future decisions. What nurses learned from uncertainty experiences and how they incorporated this into their care was based on the individual nurse.

These three categories of consequences are post-decisional stages in recognizing and responding to uncertainty, because they are outcomes of this process. However, either one of the consequence categories, **having lingering doubt** or **embracing uncertainty as a learning opportunity**, initiated a feedback loop to the processes involved in recognizing and responding to uncertainty. The concept of lingering doubt highlighted how nurses recognized that they remained uncertain (through assessment, reflection, questioning, and/or predicting) and (when time permitted) they would try again to find a solution. However, the path of this feedback loop was interrupted by nurses who accepted a level of uncertainty in a patient situation. When uncertainty was not resolved (e.g., time was not available for information seeking, answer just did not exist) nurses described a point where they were willing to accept a level of uncertainty that they could feel comfortable with.

Embracing uncertainty as a learning opportunity also initiated a feedback loop to the processes involved in recognizing and responding to uncertainty, as nurses used their knowledge and experience gained for future uncertainty recognition and in dealing with subsequent uncertain situations. Thus, learning from uncertainty modified how uncertainty manifested and changed how nurses experienced uncertainty.

These categories of consequences elucidated the evolving nature of uncertainty. As a result of the actions and interactions in response to uncertainty, nurses’ perception of uncertainty changed. Through encounters with uncertain situations (antecedents), nurses became familiar with these situations and they were no longer recognized as uncertain, or they learned how to deal with these or similar situations, depending on which aspects of the
situation were perceived as uncertain. And, over time, nurses’ responses to uncertainty changed. For instance, one nurse who recently started in the unit described how her high level of stress and anxiety from uncertainty interrupted her sleep, but over time, it became easier for her. However, uncertainty is ever-present in the MSICU and continually evolving, as nurses indicated, there are always new illnesses, new technology and procedures to learn, and every patient is different. Thus, antecedent conditions, actions and interactions, and consequences of recognizing and responding to uncertainty continue to evolve.

Summary of the Theory of Recognizing and Responding to Uncertainty

Findings from this study revealed a grounded theory recognizing and responding to uncertainty. The ten main categories of antecedent, actions and interactions, and consequences were interrelated and connected through temporal and causal statements of relationship. Nurse, patient, and contextual factors influencing the processes involved in recognizing and responding to uncertainty were linked through patterns of conditions and intervening relational statements. Together, these conceptual relationships formed an explanatory theory of how MSICU nurses experienced and responded to uncertainty in their practice.
CHAPTER 6: DISCUSSION

Overview

The purpose of this study was to develop a substantive theory that explains how medical-surgical intensive care unit (MSICU) nurses experience and respond to clinical uncertainties arising from patient care situations and the influence of uncertainty on their information behaviour, to fill this gap in the current body of nursing knowledge. The grounded theory recognizing and responding to uncertainty emerged from analysis of interviews with 14 staff nurses working in a MSICU in two hospital settings. This theory provides new insight and understanding about how nurses experience and respond to uncertainty in their practice.

The purpose of this chapter is to interpret study findings in the context of existing literature, and to highlight the theory’s unique theoretical contribution to nursing knowledge. The chapter begins with a discussion of criteria for establishing trustworthiness of study data as outlined in Chapter 3 (credibility, transferability, dependability, and confirmability) so as to elucidate important study strengths and limitations and to place the discussion of findings within the context of the study. Next, the research questions are answered and study findings are compared with relevant literature with regards to the categories comprising the theory recognizing and responding to uncertainty.
Trustworthiness of Findings

Credibility

Credibility indicates that findings are trustworthy and believable, that they accurately represent the data and describe the phenomenon studied (Corbin & Strauss, 2008). In grounded theory, credibility is largely embedded within the constant comparative method of data analysis. Data collection and analysis are interrelated processes that continued until each category was saturated, thereby continually verifying data.

Meeting with my supervisor and committee members throughout the data collection and analysis period also enhanced credibility. I consulted with my supervisor and committee members throughout data collection and analysis to discuss my interviewing technique and to review coding and the emerging concepts, categories, and diagrams. For example, I showed my supervisor and committee members’ excerpts of transcript data and related coding, analytic categories as they were developed and refined, and interpretations for feedback and suggestions.

Member checking (respondent validation) was also used to enhance credibility of the study. Lincoln and Guba (1985) asserted that member checking is the most crucial technique for demonstrating credibility. Member checking involves taking the study findings and interpretations back to respondents for their reactions to the accuracy and relevance of the findings (Creswell, 1998; Lincoln & Guba, 1985). Strauss and Corbin (1998) described validation as determining how well the theory fits with the data and whether anything salient was omitted from the theoretical scheme. Validating the scheme was conducted by comparing the scheme against the data and with committee members, and through member checking interviews with study participants. Validating the theoretical scheme occurred with
interview participants at two different times: mid-analysis and at the end of analysis. During the mid-analysis member check, nurses were asked to comment on the accuracy of the preliminary findings relative to their experiences of uncertainty and to provide feedback on emerging categories. During the final member check, nurses were asked to comment on how well the categories resonated with and provided a reasonable explanation of their experiences of uncertainty in the ICU.

*Mid-analysis member check*

Mid-analysis member check interviews facilitated analysis, as nurses elaborated on categories, clarified concepts, and facilitated thinking about relations between categories. Overall, the three nurses who were involved in the mid-analysis member check (these nurses had been interviewed once before) agreed that what had been shown to them reflected their uncertainty experiences in the unit. For example, the second member check participant indicated: “I wouldn’t disagree with any of this. I think it captures it…this is good.” These member check interviews provided greater detail as to the properties and dimensions of theoretically relevant concepts, leading to refining of categories and subcategories and additional questions for subsequent interviews.

*Final member check*

The final member check was conducted to validate the empirical grounding of my interpretations of the data. Three nurses who participated in the final member check (and had also participated in the individual interview) indicated that the findings resonated with their experiences of uncertainty in the unit. For instance, the first nurse interviewed indicated: “I can relate to all of this, definitely, definitely.” Nurses did not suggest that anything was inconsistent with their experiences of uncertainty. These nurses also commented on the
categories by providing some examples from their practice. For instance, in response to the category *encountering unfamiliar or unique orders*, the third nurse interviewed stated that she was getting used to new dialysis orders because new dialysis machines were recently implemented in the unit. In response to the categories of strategies overall, the second nurse interviewed stated: “I think about my practice and that’s exactly what I do, all of them” [strategies]. Because nurses reflected on their practice and provided examples in relation to the categories, this further suggested that the findings resonated with their experiences of uncertainty in the MSICU.

**Transferability**

Transferability is the applicability of the findings in other contexts or at some other time or with other participants (Lincoln & Guba, 1985). Lincoln and Guba (1985) contended that advancing hypotheses together with a thick description of the time and context in which they were found to hold allows others to make decisions regarding transferability. Thus, it is the responsibility of the investigator to provide the database that makes transferability judgements possible for other investigators (Lincoln & Guba, 1985). Thick description was provided in chapter four of the findings and several quotes were used. In addition, providing sample characteristics and an audit trail should assist the individual in making transferability (applicability) judgements to other similar groups. However, it is likely that experiences and responses to uncertainty differ with nurses working in other units and in different settings.

Because the goal of this study was theory-building, the term explanatory power is used rather than generalizability. Explanatory power means the ability to explain what might happen in given situations (Strauss & Corbin, 1998). This research was conducted with nurses working in an MSICU from two urban acute care teaching hospitals, and findings are
based on the descriptions of their experiences of uncertainty in this setting. Because the
theory is derived from one substantive area, it is narrower in scope and abstraction than
formal theories, thereby limiting its applicability (Corbin & Strauss, 2008). A substantive
type does not have the explanatory power of a larger formal theory because it does not
include broad propositions (Strauss & Corbin, 1998). However, the real merit of a
substantive theory lies in its ability to speak specifically for the populations from which it
was derived (Strauss & Corbin, 1998). The theory recognizing and responding to uncertainty
is therefore context-specific and applicable to nurses who participated in this study. It is the
individual’s judgement of whether this theory is relevant and applicable in another context.
The more abstract the concepts and the more variation uncovered in the study, the more
likely it is that the propositions apply to a broad range of situations (Corbin & Strauss, 1990).

Dependability

Dependability refers to reliability (replicability) or consistency of findings (Lincoln & Guba,
1985). Explaining in detail how conceptualizations were arrived at enables others to follow
the analyst’s path of logic and that it is a plausible explanation for what is going on (Strauss
& Corbin, 1998). An inquiry audit is one technique outlined by Lincoln and Guba (1985) to
establish dependability (of both the process and product of inquiry). Dependability was
established through an audit trail, that is, detailed records of the research process and product
(e.g., data, findings, interpretations). The audit trail included raw data (e.g., interview
recordings and transcripts, written field notes), a codebook (list of codes), several types of
memos such as theoretical memos (e.g., concepts, hypotheses, categories, interpretations) and
methodological memos (e.g., interview guide revisions, procedural decisions), diagrams,
committee meeting records, and a reflexive journal (e.g., thoughts about how I might be
influencing interpretation of data based on my nursing experience). The computer software program NVivo 7® was used throughout data collection and analysis, which facilitated maintaining an audit trail. Computers increase “methodological awareness” (Seale, 2002, p. 108, cited in Corbin & Strauss, 2008) because the record of the researcher’s work and decisions is accessible (Corbin & Strauss, 2008).

Corbin and Strauss (1990) argued that “a grounded theory is reproducible in the limited sense that it is verifiable” (p. 15). They continued that “no theory that deals with social psychological phenomena is actually reproducible in the sense that new situations can be found whose conditions exactly match those of the original study, although major conditions may be similar” (p. 15).

**Confirmability**

Confirmability refers to neutrality or the objectivity of data, that is, the characteristics of the data are confirmable (Lincoln & Guba, 1985). It is the degree to which the findings of an inquiry are determined by the respondents and conditions of the inquiry and are not the biases and perspectives of the investigator (Lincoln & Guba, 1985). Confirmability was established through an audit trail, as described in establishing the dependability of the inquiry.

There are important study limitations to note. There is a potential for respondent bias, as those who participated in the study may have been more willing to share their perspectives and articulate their experiences of uncertainty. Further, because retrospective accounts of nurses’ experiences were elicited through interviews, there is a potential for participant recall bias. To minimize the potential for this bias, a one year timeline was placed on nurses’ stories, that is, nurses were asked to recall events of their uncertainty experiences that
occurred within the past year. Nonetheless, nurses tended to provide more recent accounts of their uncertainty experiences, typically experiences of uncertainty occurring within the week of being interviewed, and as recent as the previous shift. There is also the potential for social desirability bias in participants’ accounts of uncertainty experiences and responses. Social desirability response bias is the tendency of study participants to misrepresent their responses by giving answers that are consistent with prevailing social norms and values (Polit & Beck, 2004). For example, as noted by Covell and colleagues (1985) in their study on physicians’ information needs, information use may not be accurately self-reported. To reduce the potential for social desirability bias participants were assured prior to the interview that their responses will be kept confidential and that there are no correct answers to the interview questions (Collins, Shattell, & Thomas, 2005). To further mitigate the possibility of social desirability response bias, participants were asked to describe an uncertain patient situation from their own perspective rather than having it defined for them. However, it is difficult to assure the reader that how participants described their uncertainty, in particular their use of information and resources in response to uncertainty, accurately reflected how they responded in the situation.

There is a potential for researcher bias, based on the researcher’s background as a MSICU nurse. However, a reflective journal was maintained throughout the data collection and analysis period to capture biases and assumptions throughout this process.

Based on the research questions of inquiry, this study of uncertainty was viewed from an information seeking and decision making perspective. There may be other factors not captured in this study that influenced nurses uncertainty or other conditions under which nurses recognized and responded to uncertainty. Further studies should explore other
perspectives, such as a sociological viewpoint. For instance, researchers could further investigate social interactions and dynamics involved in recognizing and responding to uncertainty.

There are strengths to developing theory that warrant noting. A strength of developing grounded theory is that rigor is built into the research process (Corbin & Strauss, 2008). For instance, alternating data collection with analysis provides a systematic way to develop and validate concepts. An additional strength is that findings are applicable and useful to nurses and the academic community in that the theory provides a common language through which others can discuss and exchange ideas, and it provides insight, understanding, and directions for further research, thereby adding to the knowledge base of the profession (Strauss & Corbin, 1998).

How do nurses experience uncertainty in their daily practice?

The first research question was: How do nurses experience uncertainty in their daily practice? This research question is answered in two parts. The first part addresses experience in terms of what uncertainty meant to nurses, how it was characterized and understood by nurses, what made them uncertain, how uncertainty manifested in practice, and nurses’ feelings and perceptions about uncertainty. The second part answers this question in terms of theorizing the process of how nurses recognized uncertainty. Together, antecedent conditions and the process of recognizing uncertainty shaped the experience of uncertainty.

**Antecedents to Uncertainty**

Nurses identified several situations that gave rise to uncertainty. These preconditions of uncertainty were categorized into three broad types of patient situations: feeling caught off guard, encountering unfamiliar orders, and navigating the grey areas of practice. Uncertainty
was characterized by patient care situations that were unexpected, unpredictable, (un)familiar, challenging, and/or complex (in varying degrees) and evoked feelings of discomfort, uneasiness, and frustration. Uncertainty was multi-dimensional, manifesting as decisional, procedural, and ethical aspects of the patient situation. Though distinct, there was overlap as nurses could encounter more than one uncertain situation at a time. Patient age and level of acuity and complexity modified the way uncertainty manifested. For instance, it increased the level of stress or complexity in the uncertain situation.

*Feeling Caught Off Guard*

In the first type of uncertainty, nurses described feeling caught off guard when they experienced uncertainty with unexpected, complex, unfamiliar, or unpredictable events or situations (e.g., patient becoming unstable and deteriorating at an unusually fast pace, unusual illnesses, unique circumstances surrounding the situation). Nurses felt uncertain in these situations primarily because they had insufficient information, clinical knowledge, or time to make decisions. Uncertainty from feeling caught off guard was therefore a function of nurse characteristics (e.g., nursing knowledge base, clinical experience), characteristics of the patient (e.g., acuity, complexity), and the perceived nature of the situation (e.g., missing information, unfamiliar, unpredictable, unexpected).

*Encountering Unfamiliar or Unique Orders*

In the second type of uncertainty, nurses described their experience of uncertainty as procedural, skill/task uncertainty from encountering physicians’ orders for medications, treatments or procedures that were unique, complex, unfamiliar, and/or seemed counterintuitive. Although nurses explained that they could understand the rationale for these orders, nurses were unfamiliar with the procedural aspects of carrying out the order. Nurses
were uncertain about the technology, were inexperienced with skills required for the treatment or procedure, or there was no policy or procedure in place for a particular order. Thus, encountering unfamiliar or unique orders was less about the patient status than it was about the nurse’s own knowledge and experience and the perceived nature of the situation.

These two categories of antecedents to uncertainty, feeling caught off guard and encountering unfamiliar or unique orders, were consistent with previous studies in the nursing literature. Studies reported similar results in terms of nurses’ uncertainty due to unfamiliarity with the patient situation (Cioffi, 2000), technology or procedures (Bucknall & Thomas, 1997; Bucknall, 2003; Wichowski & Kubsch 1995), unpredictability of the patient’s status and/or unpredictability of nurses’ work (Carr et al., 2001; O’Connell, 1998; Scott, Estabrooks, Allen, & Pollock, 2008), inconsistent or unstructured information (Brannon & Carson, 2003; Tabak et al., 1996), or limitations in nurses’ own knowledge base and/or clinical experience (Charleston & Happell, 2005; Bucknall & Thomas, 1997; Bucknall, 2003). For instance, in a recent study exploring the process by which organizational context influences pediatric critical care nurses’ research utilization behaviours, Scott and colleagues (2008) reported four sources of uncertainty: (1) the precarious status of seriously ill patients, (2) the inherent unpredictability of nurses’ work, (3) the complexity of teamwork in a highly sophisticated hospital environment, and (4) a changing management. The first two sources of uncertainty support findings in this study that the medical condition of seriously ill patients can quickly change and create uncertainty and the inherent unpredictability of nurses’ work, such as trying to foresee patient outcomes or prognoses. The other two findings of complexity of teamwork or a changing management were not supported in this study. This is likely due to the different nurse group and context.
Bucknall and Thomas (1997) surveyed 230 practicing Australian critical care nurses to elicit their perceptions of the problems associated with decision making in the critical care setting. They found that between 22% and 56% of nurses reported experiencing difficulties on a weekly or more frequent basis due to knowledge base, lack of time to make decisions, lack of time to implement decisions, and personal values conflicts with other staff. In particular, they found that 94.8% of nurses reported that at times they had difficulty making decisions due to a perceived lack of knowledge. A frequently cited issue was the demands of new critical care technology on nurses’ knowledge bases. In a subsequent study, Bucknall (2003) examined contextual influences on critical care nurses’ decision making using observation and interview methods. One of the main influences identified was the patient situation. Bucknall found that the patient situation or health status (e.g., patient complexity or stability) was a strong influence on nurses’ decision making. Bucknall reported that unusual or unfamiliar patient situations made nurses less confident, uncertain, and tended to slow down the decision-making process as nurses pursued their options (when time and patient stability permitted).

**Navigating the Grey Areas of Practice**

A third source of nurses’ uncertainty manifested in an ethical context. Nurses described their decisional uncertainty around planning and providing end-of-life care and facing ethical dilemmas. Nurses described uncertainty from unpredictable patient prognoses or outcomes, lack of direction, vagueness of orders, and how best to advocate for their patients with limited decision autonomy. The concept of ethical uncertainty was multi-faceted, involving three main ‘grey areas’ of practice. These included: (1) nurses’ perceived differences of opinion or disagreement with medical staff about the “appropriateness” of the level and goals
of care for patients with a poor prognosis, (2) leaving things up in the air, and (3) advocating for patients’ best interests with limited decision autonomy. Nurses revealed that although ethical situations were not uncommon in the ICU, uncertainty manifested as unknowns or grey areas because each patient and family that came into the MSICU was different, creating different dynamics, scenarios, and situational contexts. Nurses felt uncertain and uncomfortable when they were providing care that they believed was not appropriate or not in the best interest of the patient and seemed medically futile; they considered comfort measures more appropriate. Nurses felt ethically torn and conflicted in making the proper decisions and being the one providing the care that was “keeping the patient alive” when the nurse did not consider the treatment plan appropriate for the patient. Nurses were uncertain about the best course of care or the right thing to do. These ethical situations were described as challenging, emotional, and complex, involving many members of the health care team and the patient’s family members.

The concept of ethical uncertainty reflects Jameton’s (1984) conceptualization of moral uncertainty, which he conceptualized as arising when one is unsure of what principles or values to apply to a problem. One is uncertain about what is the right thing to do. The individual is faced with lack of knowledge, lack of experience, or a unique situation, leading to an inability to determine the ‘right’ course of action (Wurzbach, 2005). Moral uncertainty is characterized by unease and questioning when the person is not clear about the right course of action (Hamric, 2000).

Nurse perceptions of physicians ordering aggressive treatment for patients whose prognosis was poor and that nurses considered inappropriate (e.g., futile care) has been portrayed as cure versus care perspectives (or technologizing versus humanizing care) in the
nursing ethics literature. That is, nursing has a stronger care orientation, while medical ethics are based more on justice (Parker, 1990, cited in Oberle & Hughes, 2001). Findings on differing perspectives between physicians and nurses on goals of patient care and withholding or withdrawing treatment decisions are well documented in literature (Peter, Lunardi, & Macfarlane, 2004) and in studies examining end-of-life decision making in adult ICU’s (e.g., Breen, Abernethy, Abbott, & Tulsky, 2001; Ferrand et al., 2003; Frick, Uehlinger, & Zenklusen, 2003; Oberle & Hughes, 2001; Palda, Bowman, McLean, & Chapman, 2005; Soderberg & Norberg, 1993; Viney, 1996). Because only nurses were interviewed in the present study, literature is presented that relates to ICU nurses’ experiences and perceptions of uncertainty at end-of-life care for patients, rather than a comparison of differing perceptions among physicians and nurses.

There is a small body of evidence in the nursing ethics literature that reports findings on nurses’ uncertainty as a dimension within an ethical decision making framework. This study’s findings are consistent with those of others. Nurses working in adult ICU’s were uncertain about patients’ prognoses and outcomes, and the best course of action. In a recent study, Calvin, Kite-Powell and Hickey (2007) explored ICU nurses’ perceptions about end-of-life care during the change in intensity of care from aggressive care to end-of-life care for patients. They found that nurses’ uncertainty stemmed from unpredictability of a patient’s course (outcome) and they described being positioned in the middle of the communication process. These findings are similar to findings from the current study where nurses described feeling stuck in the middle of the communication process between physicians and patients’ family members.
Kirchhoff and colleagues (2000) conducted focus groups to explore ICU nurses’ experiences with end-of-life care and found that noted problems were disagreement among caregivers, nurses’ uncertainty about prognosis, and communication problems. Similar to the present study findings, nurses in their study were uncertain about the patient’s prognosis, which put doubt in their mind about the ‘appropriate’ level of treatment in the patient’s best interests.

In interviews with physicians and nurses working in medical-surgical areas, including intensive care, Oberle and Hughes (2001) found that in end-of-life decision making, uncertainty about probable outcomes was the defining feature, leading to considerable deliberation and reflection about the ‘right thing to do.’ As found in this current study, nurses were uncertain about the best course of action for the patient and family.

Two studies reported findings similar to the concept of leaving things up in the air that emerged in the current study. Melia (2001) conducted interviews with ICU nurses concerning the complex nature of withdrawal of treatment decisions and the way it plays out in the social context of practice. Nurses reported feeling a sense of being “left with it” when there was no further medical interest taken in the management of the patient. Nurses described medical staff stood back, conveying a sense of futility. Nurses were frustrated over the perceived lack of team support. Hov and colleagues (2006) conducted focus groups with ICU nurses to explore their perspectives on withholding or withdrawing curative treatment. They reported a main theme was uncertainty, which manifested as ethical dilemmas (e.g., between doing good and doing no harm). They further reported that uncertainty existed when goals for the patient’s treatment were not set, were unknown or vague, or when physicians
gave conflicting messages. Unclear goals made nurses uncertain about the direction of their work.

The finding of uncertainty concerning advocating for the patient’s best interests with limited decision autonomy is consistent with previous studies addressing nurses’ ethical uncertainty and moral distress (Calvin et al., 2007; Gutierrez, 2005; Holly, 1993; McBride Robichaux & Clark, 2006; Sundin-Huard & Fahy, 1999). For instance, Sundin-Huard and Fahy (1999) reported that in ethical situations, critical care nurses experienced moral distress from unsuccessful attempts to advocate for their patients.

Two theoretical concepts within nurses’ perspectives on ethical uncertainty warrant further interpretation. Medical futility and moral distress were represented in nurses’ descriptions of their ethical uncertainty experiences. Extant nursing ethics literature on these concepts is presented to explicate how these (moral) concepts relate to nurses’ experiences of uncertainty in ethical decision making situations.

**Medical Futility**

Medical futility is defined as “any treatment that merely preserves permanent unconsciousness or that fails to end total dependence on intensive medical care” (Schneiderman, Jecker, & Jonsen, 1990, p.952). An act is considered futile if its goals are not achievable or its degree of success is empirically implausible (Meltzer & Huckabay, 2004; Schneiderman, 1990). Mobley and colleagues (2007) identified futile situations such as carrying out a physician’s order for unnecessary tests and treatment, or initiating extensive life-saving actions when the nurse thinks it only prolongs death. Several nurses in the present study shared this perspective. The term ‘appropriateness’ is often cited in the context of medical futility.
Consistent with this study’s findings, MacDonald and Murray (2007) found frequent use of the word *appropriate* by clinical staff. For instance, Murray observed its use during family meetings around the goals of care and during interprofessional team rounds. In theorizing why the word *appropriate* has become commonplace in clinical settings, MacDonald and Murray (2007) revealed its implications for clinical practice. MacDonald and Murray argued that while *appropriate* may appear neutral and scientific, it has underlying values and multiple meanings. “In clinical encounters, *appropriate* serves as a means of defining what is suitable for a particular person, situation, or place- a determination that requires value judgement and that references the parameters of normal” (p.68). “It is used by clinicians as a linguistic and moral technology to both distinguish between and judge the normal and the pathological” (p. 68). They further argued that in using the word *appropriate*, one is describing both what is and what ought to be, thereby inadvertently placing values, biases, and subjective judgements into clinical encounters.

Sharpe and Faden (1996) contend that the concepts “appropriate” and “futility” are fundamentally evaluative in nature and imply the endorsement of some goal. Decisions about care treatment at end-of-life are intrinsically value-laden (Oberle & Hughes, 2001). For instance, when patients were unable to speak for themselves, the value embraced was the best interests of the patient (Oberle & Hughes, 2001). The technological imperative is fuelled by the vanishing line between life and death, the inability to predict accurately when someone is terminal (Callahan, 1993, cited in Miller, Forbes, & Boyle, 2001). This is similar to what nurses in the present described as their uncertainty around trying to accurately predict the patient’s prognosis or outcomes of care.
Moral Distress

Nurses’ ethical uncertainty had a moral dimension. The findings of nurses’ concerns about the appropriateness of aggressive treatment and providing that treatment also parallel what has been theorized in the nursing ethics literature as moral distress. Jameton (1984) distinguished uncertainty from moral distress. Jameton, a philosopher, and first to theorize moral distress in a nursing context, conceptualized moral distress as arising “when one knows the right thing to do, but institutional constraints make it nearly impossible to pursue the right course of action.” (p.6). Wilkinson (1987/88) extended this definition to include “the psychological disequilibrium and negative feeling state experienced when a person makes a moral decision but does not follow through by performing the moral behaviour indicated by that decision” (p.16). Peter and Liaschenko (2004) highlighted the multi-dimensional nature of moral distress, and they argued that nurses’ proximity to patients is one neglected dimension of moral distress. They contended that it is important to “examine how proximity to patients compels nurses to experience their moral responsibilities as acutely as they do and in such a way that they experience constraints as morally distressing” (p. 221).

Nurses in this study experienced ethical uncertainty when they were not sure the right course of action or were not sure the best way to handle the situation. Nurses experienced moral distress when they felt they knew the right course of action in the interests of the patient, but were unable to act in a manner consistent with their moral values (e.g., because of limited decision autonomy). Though nurses in this study did not use the term moral distress, descriptions of their perceptions, feelings, and experiences with providing care in uncertain ethical situations reflected moral distress. Nurses may not have had the language of moral distress, or they did not perceive it as separate from ethical uncertainty.
Though nurses perceived themselves as having input into the end-of-life decision-making process, final decisions were made by physicians and the patient’s family members. Nurses described disagreement with the care plan or goals of care more commonly with reference to the medical team than with family members, though both contexts were present in the data. Nurses experienced moral distress as a result of providing care for patients whose treatment plan they did not agree with because they felt that it did not benefit the patient and in some cases, prolonged death. Nurses described feelings of discomfort, frustration, and helplessness, which are feelings associated with moral distress. Although nurses are not responsible for making final decisions about patient treatment, they are closest to its consequences (Melia, 2001). Previous research is consistent with the finding that ICU nurses’ perceptions of treatment as overly aggressive and providing treatment that they considered inappropriate, futile, or not in the patient’s best interest were sources of moral distress (Corley, 1995; Corley, Elswick, Gorman, & Clor, 2001; Elpern, Covert, & Kleinpell, 2005; Gutierrez, 2005; Hamric & Blackhall, 2007; Meltzer & Huckabay, 2004; Mobley et al., 2007; Oberle & Hughes, 2001; Sundin-Huard & Fay, 1999; Viney, 1996; Zuzelo, 2007).

Theorizing the Process of Recognizing Uncertainty

Recognizing uncertainty was a process central to nurses’ experience of uncertainty, forming the second part of the answer to the research question: How do nurses experience uncertainty in their daily practice? In theorizing the process of uncertainty recognition, three key questions guided this answer: (1) How do nurses know when they are uncertain? (2) What drives this process of recognition? and (3) What activities comprise this process?

Recognizing uncertainty involved a complex recursive process of assessing, reflecting, questioning and/or predicting, occurring concomitantly with facing uncertain
aspects of patient care situations. Nurses perceived uncertainty when they were cognitively aware that a gap existed. They did not know or understand some aspect of the patient situation. This awareness of a gap in knowledge, information, or understanding represented the point at which nurses realized that they were uncertain. For instance, nurses perceived the situation as unfamiliar, unpredictable, unexpected, or unclear. Nurses were uncertain because of their own limitations (e.g., clinical experience, knowledge) and/or the situation itself was uncertain (e.g., missing information).

Interpreting a patient care situation as uncertain and the cognitive-affective processes used was based on the nurse’s personal characteristics (i.e., knowledge and clinical experience, values, attitudes and beliefs, cognitive skills such as pattern recognition, thinking styles). Assessing, reflecting, questioning, and predicting are critical thinking skills nurses used in interpreting and trying to understand the situation. Recognition involved cognitive appraisal and awareness. Assessing was conceptualized as trying to get a clear picture of what was going on in the situation, which was largely due to inconsistent, insufficient, or missing information and interrupted the planning of patient care. Reflecting was a process nurses engaged in to determine whether a gap existed, by reflecting on their own knowledge and clinical experience and feeling that it was insufficient with respect to the situation they faced. Questioning was conceptualized as feeling a lack of self-confidence or trust in one’s own judgements and abilities, as well as questioning other team members’ judgements. Predicting was conceptualized as difficulty foreseeing outcomes or impact of nursing actions or foreseeing patient prognoses.

The process of recognizing uncertainty was largely pre-decisional; however, it also occurred post-decisional when nurses re-evaluated their decisions and the situation. That is,
the uncertainty recognition process resumed when nurses recognized that their uncertainty remained unresolved. This process of uncertainty recognition and the cognitive activities comprising it are supported in the nursing literature and the naturalistic decision making and sensemaking literatures.

Clinical Grasp

In the nursing literature, Benner and colleagues (1999) described uncertainty recognition as lack of clinical grasp of the situation. The concept of clinical grasp is a perceptual skill that enables the clinician to recognize when s/he does not have a good grasp of a clinical situation (Benner et al., 1999). Clinical inquiry, which is the search for understanding or puzzle solving, is initiated by a lack of clinical grasp of the situation (Benner et al., 1999). Critical thinking and clinical judgement are required to act in situations that are underdetermined, unexpected, or markedly different from one’s assumptive set (preconceptions) (Benner et al., 1999). Reframing the situation is a critical thinking skill required to let go of prior assumptions and gain a grasp of the situation. In a similar manner, through the processes of assessing, questioning, reflecting, and predicting, nurses in the present study were trying to gain a clinical grasp of the situation.

Naturalistic Decision Making Theories

“Naturalistic decision making (NDM) is an emerging field of research providing a descriptive view of how people make decisions in actual settings that often feature unstructured problems embedded within complex and dynamic systems” (Endsley, 1997, p. 269). NDM theories describe how individuals perceive a situation as uncertain, based on situation assessment and pattern recognition. NDM theories focus primarily on ‘predecision processes’ (Gettys, 1983, cited in Klein & Calderwood, 1991) primarily with regard to
decision makers’ recognition and assessment of the situation prior to making a decision. NDM theories support findings from this study, that recognizing uncertainty involves pre-decisional cognitive processes.

*Recognition-Primed Decision Theory*

Klein and colleagues’ (1993) recognition-primed decision (RPD) theory involves assessing the situation, recognition of events as typical, and evaluating a course of action based on previous experience. Their theory is similar to pattern recognition, where an individual assesses a situation in terms of its similarity to previous experiences. Action is based on recognition of a situation as familiar (Klein & Calderwood, 1991). The process of recognition-primed decision making consists of three phases: situation recognition, serial option evaluation, and mental simulation (Klein et al., 1993). “The judgement of familiarity to a given set of prior cases carries with it recognition of goals that are feasible, cues that are relevant, expectancies to monitor, and actions that are plausible” (Klein & Calderwood, 1991, p. 1021). To recognize the situation and guide the selection of proper action, the decision maker identifies critical cues that mark the type of the situation and causal factors that explain what is happening and what is going to happen (Lipshitz, 1993). However, when a decision maker cannot recognize the situation, they are unable to identify plausible goals, relevant cues, expectancies, and a typical course of action (Klein, 1993, cited in Lipshitz & Shaul, 1997).

*Recognition/Metacognition Theory*

Cohen, Freeman, and Thompson’s (1997) Recognition/Metacognition (R/M) theory describes a set of meta-recognition skills that supplement pattern recognition in novel, atypical, and uncertain situations. It is based on a problem solving approach (Cohen, Thompson, Adelman,
Bresnick, Shastri, & Riedel, 2000). Cohen and colleagues (1997) contend that in uncertain situations, recognition is inadequate when no familiar pattern fits the current situation. Thus, recognition needs to be supplemented with meta-recognition processes, such as critiquing and correcting (e.g., critiquing the results of recognition in order to identify uncertainty, and correcting problems) (Cohen et al., 1997). “Metarecognition is a cluster of skills that support and go beyond the recognitional processes in situation assessment” (Cohen et al., 1997, p. 258). Cohen and colleagues (1997) maintained that meta-recognitional skills are analogous in many ways to the meta-comprehension skills that proficient readers use when they construct a mental model based on the information in a text. They illustrate their argument using Baker’s (1985) example, that “skilled readers test and evaluate the current state of their ongoing comprehension, and they adopt a variety of strategies for correcting problems that are found, such as inconsistency or gaps in their understanding” (p. 258). Cohen et al. (2000) contended that in both reading comprehension and in situation assessment, decision makers ask reflective questions, such as “What in this situation conflicts with my expectations?” and “What information is missing that would clarify the assumptions?” (p. 17). They asserted that decision makers sometimes handle novel situations by identifying regularities underlying exceptions to known patterns. Mental models embodying these newly discovered regularities provide patterns that can be recognized in later situations (Cohen et al., 2000). Reflective questions can improve recognition skills and build recognitional knowledge (Cohen et al. 2000). For instance, nurses in this study described how they learned from their uncertainty experience and used that knowledge for the next patient situation.
Situation Awareness Theory

Endsley’s (1995) theory of situation awareness (SA) describes how decision makers achieve a state of knowledge. Endsley (1988, cited in Endsley, 1997) defined situation awareness as the “perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future” (p. 97). Endsley’s theory illustrates three levels in achieving SA: perception, comprehension, and projection. Perception (Level 1) includes processes of monitoring, cue detection, and simple recognition. Comprehension (Level 2) includes processes of pattern recognition, interpretation, and evaluation in light of one’s goals. Projection (prediction) (Level 3) is the ability to project the future actions of the elements in the environment (Endsley, 1995).

Endsley (1995) distinguished situation awareness from situation assessment, where situation assessment is the processes involved in achieving, acquiring, or maintaining that state of knowledge (situation awareness).

Findings from this study are consistent with these three NDM theories of recognition/metacognition and situation assessment with regard to nurses being engaged in a process of uncertainty recognition in patient situations. During assessment, nurses attempted to get a clear picture of what was happening through pattern matching with similar experiences with previous patient situations. Through their assessment and through reflection on their knowledge and experience, nurses recognized known patterns and cues in the situation and determined those that were unknown, unfamiliar or atypical. Through questioning, nurses evaluated the degree to which their own judgement and reasoning processes would guide them in making the correct decision. These assessment, reflection, and questioning processes are similar to Cohen and colleagues’ (1997) meta-recognition
concept of *critiquing*, where nurses reflected on results of their assessment to identify a situation as uncertain and evaluated the adequacy of their own knowledge base prior to making a decision. Through prediction, nurses visualized the ‘what-if’s,’ that is, what might happen (e.g., using mental simulation), to try and anticipate outcomes of a particular course of action. This is also similar to what Benner and colleagues (1999) refer to as ‘if, then’ thinking or *modus operandi* thinking.

*Sensemaking Theories*

Whereas NDM theories focus on assessing the situation and gaining situation awareness, sensemaking literature focuses on an individual’s cognitive gap and frames of reference. The cognitive processes nurses used in recognizing uncertainty in the present study are similar to the concept of *sensemaking*. Sensemaking is the process of searching for meaning and creating understanding in situations of uncertainty in order to make decisions (Weick, Sutcliffe, & Obstfeld, 2005). The concept of sensemaking is similar to situation assessment in terms of the cognitive processes involved in acquiring and maintaining situation awareness. Klein, Moon, and Hoffman (2006a) defined sensemaking as “a motivated, continuous effort to understand connections (which can be among people, places, and events) in order to anticipate their trajectories and act effectively” (p. 71). Sensemaking is the interplay of action and interpretation that is instigated whenever the current state of the world is perceived to be different from the expected state of the world (Weick et al., 2005). That is, sensemaking is activated by the question, “same or different?” (Weick et al., 2005). When the situation feels ‘different,’ an expectation of continuity is breached, and efforts are made to construct a plausible sense of what is happening (Weick et al., 2005). Weick and colleagues’ (2005) asserted that individuals make sense by ‘acting thinkingly,’ by
simultaneously interpreting their knowledge with trusted frameworks and test new frameworks and new interpretations. Yoon and Nilan (1999) asserted that the concept of uncertainty cannot stand alone without the concept of certainty. They stated that “human beings can only define what they do not know in contrast to what they do know” (p. 873).

**Situation-Gap-Use Theory**

Dervin’s (1983) Situation-Gap-Use theory (cited in Dervin & Nilan, 1986) describes sensemaking as a ‘cognitive gap’ in meaning. Individuals experience a cognitive gap when they try to make sense out of their worlds (Dervin & Nilan, 1986). In facing a gap, the sense-maker is stopped in a situation. Movement is prevented by a cognitive gap (e.g., having questions or a question set) (Dervin & Nilan, 1986). The cognitive gap is based on a discontinuity assumption (e.g., gap-defining moments) (Dervin, 2003). Individuals move forward by constructing a new or changed sense (Dervin, 2003). Dervin’s sensemaking metaphor involves moving across time and space, facing a gap, building a bridge across the gap, and then constructing and evaluating the uses of the bridge (Dervin & Frenette, 2003).

“Sensemaking is accomplished by verbings that involve the making or using of ideas or both, cognitions, thoughts, and conclusions; attitudes, beliefs, and values; feelings, emotions, and intuitions; and memories, stories and narratives” (Dervin & Frenette, 2003, p. 239). Gaps that are operationalized as questions are attempts to bridge the gap (Dervin & Nilan, 1986). Sensemaking is conceptualized as situated communicative practices, both internal (e.g., thinking and remembering) and external (e.g., asking and objecting) (Dervin & Frenette, 2003).

In the present study, similar to Dervin and Frenette’s (2003) notion of ‘verbings,’ nurses’ personal characteristics such as beliefs, values, attitudes, emotions, and thoughts
influenced how they made sense of the situation and what they perceived as uncertain. The cognitive gap concept also supports uncertainty recognition findings from the present study. Nurses used assessment and reflection to determine their level of knowledge and clinical experience relative to the patient situation and to identify their cognitive gaps in understanding the situation. Nurses were (momentarily) unable to set patient goals and proceed with a plan of care because they were “stuck” in the assessment phase of the nursing process. This parallels Dervin’s notion of gap-defining moments, where individuals are stopped in the moment and unable to proceed until a new framework is constructed and some (plausible) sense made out of the situation.

Data/Frame Theory

Klein and colleagues’ (2006b) Data/Frame theory of sensemaking describes a process that is initiated when individuals try to make sense of events. They asserted that the process begins with a framework, however minimal (Klein et al., 2006b). A frame functions as a hypothesis about the connections among data (Klein et al., 2006b). They described sensemaking as cyclical, involving elaborating the frame (e.g., discover new data, adding details) and they described a process of reframing, such as choosing between alternative frames and constructing a frame where none exists. The primary function of frames is recognition, to guide attention to fill in missing parts of the frame (Klein et al., 2006b). Frames are things you think with but also things you think about (Klein et al., 2006b).

The concept of reframing, also described by Benner et al. (1999) and Weick et al. (2005), describes a process similar to what nurses in this study conceptualized as assessing and reflecting, where nurses were attempting to gain understanding of and meaning in the situation. Nurses were making connections to what was known in the patient situation based
on their own frames of reference from their clinical experience. Nurses engaged in what Weick and colleagues’ (2005) referred to as ‘acting thinkingly,’ as they interpreted and perceived situations as uncertain using their critical thinking skills and frames of reference. Where no frame existed, nurses recognized that they were uncertain. This was the ‘point’ at which nurses realized that they were uncertain. Because nurses described learning from uncertainty and using this knowledge for subsequent patient encounters, they were developing new frames of reference from their uncertainty experiences. That is, they were building what Cohen et al. (2000) referred to as ‘recognitional knowledge,’ for the next patient encounter.

How does uncertainty influence recognition of information needs?

There were three sub-questions to the second research question addressing how nurses respond to uncertainty in their practice. The second sub-question was: How does uncertainty influence recognition of information needs? The answer to this question reflects the emergent nature of discovery in the research process. Though this question was originally posed as a sub-question to nurses’ responses to uncertainty, recognition of information needs emerged as shaping part of nurses’ experience of uncertainty. The answer to this question lies in the process of recognizing uncertainty. That is, through the process of uncertainty recognition, nurses identified gaps in their knowledge, understanding, or information. However, expanding this answer to specifically address this question, recognition of uncertainty also manifested as a question and need to find an answer or solution, a process occurring concurrently with facing uncertain patient situations. Recognition of an information need has been conceptualized as the first stage in information seeking models (e.g., Ingwersen, 1992; Kuhlthau, 1991). However, in this study, uncertainty influenced more than the recognition of
an information need. It influenced a need for understanding, knowledge, and a need to find a solution.

In a recent study, French (2006) observed clinical nurse specialists’ expressions of uncertainty and information need during workgroup meetings, and found that uncertainty was articulated as a clear question. Evidence-based practice proponents have argued that recognizing uncertainty and translating uncertainty to answerable questions are key initial steps in an evidence-based approach to care (French, 2006; Johnston & Fineout-Overholt, 2005; Thompson et al., 2002). However, studies have also shown that recognition of uncertainty (French, 2006) and information needs (French, 2006; MacIntosh-Murray & Choo, 2005) is often difficult for nurses because of the busy nature of their work. Similar to findings about the recognition process involving critical thinking skills in the present study, MacIntosh-Murray and Choo (2005) reported that identifying knowledge gaps (e.g., recognizing what you do not know) was perceived by practice leaders/educators as a critical thinking skill. These findings highlight the cognitive processes and critical thinking skills involved in uncertainty recognition, which is an important area for further exploration.

Defining Uncertainty

Based on the data, uncertainty was defined as: The recognition of a gap in knowledge, information, or understanding through the pre-decisional cognitive-affective processes of assessing, reflecting, questioning, and/or predicting. The experience of uncertainty is rooted in situations characterized as unexpected, unpredictable, (un)familiar, challenging, and/or complex, varying dimensionally by degree. It manifests as decisional, procedural, and ethical aspects of situations and evokes feelings of discomfort, uneasiness, and frustration. Uncertainty is temporal in nature, experienced in the present and occurring throughout the
decision-making process. Uncertainty is multi-dimensional, comprising cognitive, affective, behavioural, and social dimensions. Recognizing and responding to uncertainty involves a series of actions and interactions that evolve as new knowledge and experience are gained.

From a nursing perspective, Scott and colleagues (2008) defined uncertainty as “a cognitive state of being unable to anticipate the meaning and/or outcome of an experience” (p.350). Penrod’s (2001a) definition of uncertainty was developed from analysis of literature from several disciplines (including nursing). Penrod (2001a) defined uncertainty as: “a dynamic state in which there is a perception of being unable to assign probabilities for outcomes that prompts a discomforting, uneasy sensation that may be affected through cognitive, emotive, or behavioural reactions or by the passage of time and changes in the perception of circumstances…and is mediated by feelings of confidence and control” (p. 241). Similarly, Saltzberg (2002) explored nursing students’ uncertainty that focused on adult development and knowledge. Saltzberg (2002) reported that uncertainty included cognitive, affective, interpersonal, and intrapersonal dimensions.

In the medical sociology literature, Fox (1957) defined uncertainty as rising from: (1) incomplete or imperfect knowledge of the area, (2) limitations in available medical knowledge, and (3) distinguishing between the first two types.

Kuhlthau’s (1993) theory of information seeking was articulated as an uncertainty principle, defined as “a cognitive state which commonly causes affective symptoms of anxiety and lack of confidence…uncertainty due to a lack of understanding, a gap in meaning, or a limited construct initiates the process of information seeking” (p. 347).

Naturalistic decision making literature defines uncertainty in the context of action, as a degree of doubt that blocks or delay action (Lipshitz & Strauss, 1997), similar to Dervin’s
notion of gap-defining moments that stop action, and as the inability to identify plausible goals, relevant cues, expectancies, and a typical course of action (Klein et al., 1993).

The conceptualization of uncertainty in this study is congruent with these definitions from the literature. It is a cognitive state, it is a subjective experience, it is dynamic, individuals are unable to assign meaning to events or accurately predict outcomes, and it produces affective and behavioural reactions. However, because the nursing literature currently does not have a comprehensive definition of nurses’ uncertainty, the definition of uncertainty developed in this study, from nurses’ perspectives of uncertainty in their clinical practice, is a unique theoretical contribution to nursing knowledge.

How do nurses respond to uncertainty in their daily practice?

The second research question was: How do nurses respond to uncertainty in their daily practice? The answer to this research question addresses how nurses reacted and felt when uncertain, how nurses managed uncertainty, and the consequences of how they managed uncertainty. Nurses’ responses to uncertainty highlighted the cognitive, affective, behavioural, and social dimensions of uncertainty, thereby addressing the first research sub-question (e.g., cognitive, affective, behavioural responses).

Physiological and Affective Responses to Uncertainty

Nurses commonly described emotional responses to uncertainty as feeling uncomfortable, frustrated, uneasy, and stressed in the situation. Few nurses described physiological manifestations of uncertainty. Those who did, described physiological responses in terms of the stress response, such as sweating, feeling cold and clammy, and having increased respirations. Although stress as a response to uncertainty is well documented and theorized in
the medical decision making literature (e.g., Fox, 1957; Gerrity et al. 1990; 1992; 1995), only a few studies in the nurse decision literature explicitly addressed this association.

Gray-Toft and Anderson (1981) acknowledged the stressful nature of uncertainty by including a subscale uncertainty concerning treatment of patients as part of a larger instrument measuring hospital nurses’ job stress. Though nurses in the present study perceived inappropriate treatment orders as a source of stress (or moral distress) from uncertainty, nurses did not focus on physicians’ activities as sources of stress from uncertainty as the subscale items indicated.

In their rapid decision making model, Baumann and Bourbonnais (1984) described the positive and negative role of nurses’ stress from sudden change in the patient’s condition, unexpected events, or condensed time frame. They asserted that the positive influence of stress causes the nurse to be more alert and aware of cues in the patient’s environment that can lead to appropriate cue acquisition and an accurate rapid decision, whereas the negative role of stress produces the opposite. This is similar to findings from the present study, as some nurses described a level of stress from uncertainty that caused them to be more focused and motivated to find a solution, while a few nurses observed a level of stress that seemed to overwhelm less experienced nurses.

Penrod (2001a) recognized subjective manifestations of the experience of uncertainty such as discomfort and uneasy sensations based on her concept analysis of uncertainty. However, Penrod (2001a) theorized that confidence and control might affect behavioural responses to uncertainty more significantly than these subjective manifestations. Although the concept of control did not emerge in the present study in this manner, there is support for the concept of confidence, as some nurses described questioning their confidence and ability
to make the ‘right decision’ in the uncertain situation. However, subjective manifestations of uncertainty, such as level of stress, also played a role in responding to uncertainty, as previously indicated.

Managing Uncertainty

Findings from this study highlighted four broad categories of strategies nurses used to manage their uncertainty: (1) figuring it out myself, (2) collaborating with nursing colleagues, (3) working as a team, and (4) seeking evidence. These strategies highlighted the different thinking skills and interpersonal processes involved in responding to uncertainty. Each of these will be discussed separately in the context of related nursing literature.

Figuring it Out Myself

The category figuring it out myself outlined the cognitive skills nurses used in uncertain patient situations. Nurses were thinking through the situation analytically or made intuitive judgments in the decision moment in order to take some kind of action. Underlying the category figuring it out myself was nurses’ level of confidence in their own knowledge and experience. Nurses were relying on their own clinical experience.

This finding is congruent with other studies in the nursing literature that clinical experience is a valued source of knowledge. Scott and colleagues (2008) found that nurses relied on their own clinical experience because of the fragile condition of their patients and because nurses knew where the source of their information was from. Others have reported similar findings, that nurses rely on personal experience (experiential knowledge) to reduce uncertainty (Brannon & Carson, 2003; Estabrooks et al., 2005b; McCaughan et al., 2005; Tabak et al., 1996; Thompson et al., 2001b).
In their study exploring midwives’ clinical decision-making processes in patient assessment situations, Cioffi and Markham (1997) reported that midwives used heuristics (cognitive shortcuts in reasoning or rules of thumb) in uncertain situations, derived mainly from their clinical experience. In a subsequent study exploring decision making by emergency nurses in triage assessments, Cioffi (1998) found further support for this finding.

Collaborating with Nursing Colleagues

The category collaborating with nursing colleagues described how nurses asked their nursing peers for help, support, or information. This finding is congruent with previous studies that reported collegial verification and corroboration as a commonly reported response to reduce nurses’ uncertainty (Cioffi, 2000; Doran et al., 2007; Estabrooks et al., 2005b; Hedberg & Larsson, 2003; Thompson et al., 2001a, 2001b; McCaughan et al., 2005). These studies’ findings reported that nurses asked other nurses for information because they were perceived as accessible, credible, and provided context-specific answers. The present study extends these findings as nurses also listed particular qualities of nurses from whom they asked for information or support from when uncertain (e.g., decision support, emotional support).

Nurses sought colleagues who cared for the same patient previously or had experienced a similar situation, were experienced, knowledgeable and practiced according to guidelines and protocols, were approachable, and could provide emotional and social support. Additionally, nurses sought particular colleagues for different types of support when uncertain. Knowledge and experience were valued attributes in colleagues when nurses sought support through the decision-making process, and approachable colleagues were relied on for both decision and emotional support by nurses who feared asking a stupid question. Nurses also elicited different types of support in particular kinds of uncertain situations. For instance, emotional
support and validation of feelings was sought from colleagues when nurses faced ethical uncertainty in a patient situation.

*Working as a Team*

The category working as a team described how nurses managed their uncertainty by collaborating with the team, such as medical and interdisciplinary team members. This category describes interprofessional collaboration and the sharing of experiences for decision making (i.e., teamwork). It involved teaching one another and gaining from one another’s experience. The subcategory *getting everyone on the same page* emerged in nurses’ descriptions of uncertainty in ethical patient situations. Key concepts included communication, bridging, and trusting one another’s judgements, professional opinions, and perspectives. Nurses who shared this perspective described getting everyone on the same page in terms of figuring out (and agreeing with) a plan of care. It was a strategy to manage uncertainty around the care plan and goals of patient care. Getting everyone on the same page occurred both within the team and between the team and the family. That is, getting the team on the same page in terms of a plan of care and getting the team and family on the same page in terms of a plan of care.

The concept of *getting everyone on the same page* is consistent with studies in the nursing ethics literature that describe the concepts of collaboration, teamwork, and consensus. In a grounded theory study on nurse-physician collaboration in the ICU, Baggs and Schmitt (1997) found that the core process of collaboration was working together. Collaboration involved working together as a team, having the patient focused at the heart of working together (working towards a mutual goal), and sharing (communication, trust).
In her grounded theory study involving ICU nurses, Melia (2001) found that consensus was an important symbol of team strength during ethical issues such as the withdrawal of treatment and the differences of opinions around this decision. She noted that there was a strong moral desire in the social organization of the ICU that consensus should be achieved in the interests of good patient care. Melia (2001) asserted that consensus and the social processes that promote it are important because agreement, or at least tacit agreement to disagree, is the prime means through which the difficult work of intensive care is affected.

Kirchhoff and Beckstrand (2006) reported that ICU nurses perceived difficulties with patients’ families and physicians concerning end-of-life issues, particularly when it removed them from caring for a patient or caused the patient prolonged suffering. They found that nurses perceived families not fully understanding the meaning of life support, not accepting the patient’s poor prognosis, and requesting more technical treatment than the patient wished, as obstacles to providing end-of-life care. They reported that agreement among physicians about direction of care was the highest ranked ‘helpful behaviour item’ in providing end-of-life care. Families’ acceptance of the prognosis was also ranked high. Beckstrand and colleagues (2006) further reported that ICU nurses’ perceived end-of-life care could be improved if communication ensured that all members of the health care team were working toward the same goals for patients and patients’ families. Calvin and colleagues (2007) reported similar results.

Seeking Evidence

A fourth category of strategies nurses used to manage uncertainty was seeking evidence. Nurses described seeking evidence in terms of finding answers to their questions from information and available resources. Nurses sought both consistent answers and concrete
evidence (e.g., policies and procedures, lab results). Seeking consistent answers and information/resources was less commonly practiced than was collaborating with colleagues. Nurses sought consistent answers and second opinions to confirm their answers, suggesting that the most frequent and consistent answer was the ‘correct’ answer. Nurses wanted to feel confident in their decisions and trust the answers given to them. In their study on uncertainty, Carr and colleagues (2001) described the concept of double checking from a community nursing perspective. Community nurses described facing uncertainty alone because they were unable to collaborate with a colleague to double check answers to their questions, a practice they reported relying on while working in the hospital.

Using research evidence, particularly research publications, to reduce uncertainty was not a common practice. Recent studies reported similar findings (Estabrooks et al., 2005b; McCaughan et al., 2005; Scott et al., 2008; Thompson et al., 2001a, 2001b). Reasons given for this in the current study were patient instability and lack of time to search. However, nurses were using research evidence when uncertain. Nurses described ‘concrete evidence’ as factual information, and relied on hospital and unit policies and procedures to inform decisions when uncertain. They also asked the resource nurse/clinical nurse specialist questions. Nurses perceived advanced practice nurses as having a broad research-based knowledge that was a valued source of knowledge to answer their questions. This finding is supported by Thompson and colleagues (2001b), who reported that nurses perceived clinical nurse specialists’ trusted and translated information as useful resources in reducing their uncertainty. This finding was further supported by MacIntosh-Murray and Choo (2005), who found that educators were boundary spanners or information/change agents that nurses relied on for information.
Consequences of Managing Uncertainty

There were three main consequences of managing uncertainty: (1) resolving uncertainty, (2) having lingering doubt (unresolved uncertainty), and (3) learning from uncertainty. Resolved uncertainty was evaluated against nurses’ perceptions of finding a definitive answer and/or feeling satisfied with decisions and actions taken. Unresolved uncertainty was represented on a continuum, ranging from feeling unsatisfied with answers or uncomfortable with decisions, to finding a sufficient answer for the moment, to not finding a solution or experiencing continuous uncertainty. Unresolved uncertainty was accommodated by continuing to search for an answer, (creating a feedback loop to recognizing uncertainty), and a willingness to accept a level of uncertainty.

Little research has explored the concepts of resolved or unresolved uncertainty in the health care literature. From an information seeking perspective, Wilson (1999) modeled the information-seeking process for uncertainty resolution (based on Kuhlthau’s 1991 model), identifying stages through which an individual moves to resolve uncertainty: uncertainty, initiation, selection, exploration, formulation, collection, formulation/reformulation, and resolution. Wilson (1999) hypothesized that each stage represented successive resolution of uncertainty, and where uncertainty failed to be resolved at any one stage, it may result in a feedback loop to the previous stage for further resolution. Because this model is from the information science literature, it does not capture the busy nature of nurses’ work and that information seeking is limited by time and patient acuity in the ICU. However, it is useful in explaining the feedback loop that occurs when uncertainty is unresolved.

Uncertainty also initiated a process of learning. Nurses’ embraced uncertainty as an opportunity to learn and gain clinical experience. This finding is consistent with those from
Scott and colleagues (2008), who found that pediatric critical care nurses perceived uncertainty experiences as useful in building a repertoire of diverse clinical experience and knowledge and was seen as a valued strategy to decrease uncertainty. Other studies have reported that nurses requested continuing education to reduce their uncertainty concerning technology (Bucknall & Thomas, 1997; Wichowski & Kubsch, 1995), and the need for effective preceptorship to build knowledge and skills and reduce uncertainty in patient situations (Charleston & Happell, 2005). Findings from this study highlight that managing uncertainty builds knowledge, critical thinking skills, and clinical experience.

How does uncertainty influence decisions to seek additional information?
There were three sub-questions to the second research question addressing how nurses respond to uncertainty in their practice. The second sub-question, How does uncertainty influence recognition of information needs, was previously addressed. The third sub-question was: How does uncertainty influence decisions to seek additional information? There are two parts to this answer. The first part explains how uncertainty motivated nurses to find an answer, and the moderating role of patient and contextual factors. The second part to this answer is based on a pattern noted in the data, where nurses who described themselves as having little clinical experience feared asking their peers for help or information because they did not want to look stupid or incompetent.

**Uncertainty and the Moderating Role of Patient and Contextual Factors**
Uncertainty influenced decisions to seek additional information when nurses felt that their own knowledge base and experience were inadequate for a particular situation. Uncertainty motivated nurses to find an answer to their questions. As a result, nurses collaborated with their colleagues or other team members, and sought information and resources available in
the unit. The relation between uncertainty and the decision to seek additional information was moderated by (interrelating) patient and contextual factors: patient acuity and complexity, concerns for the patient’s safety, perceived time available, and perceived availability and accessibility of information and resources. Thus, the decision to seek additional information was a function of uncertainty, but was also moderated by these other factors.

Nursing studies have reported similar findings in terms of factors such as patient stability and time to search for information as influencing information-seeking and decision-making processes (e.g., Bucknall, 2003). There is evidence to support the relation between uncertainty and information seeking. In the naturalistic decision making literature, Klein and colleagues’ (1993) recognition-primed decision model specified uncertainty as a condition under which decision makers collect additional information prior to taking action. Additionally, in the information science literature, theories on information seeking (primarily based on problem solving models) have suggested a relation between uncertainty and information seeking, where uncertainty initiates the process of information-seeking (e.g., Ingwersen, 1992; Kuhlthau, 1991). For instance, Ingwersen (1992, cited in Spink, Wilson, Ford, Foster, & Ellis, 2002) defined the relationship between uncertainty and information seeking as action undertaken to resolve doubts that cannot be resolved by thinking alone. However, in the current study, the category figuring it out myself was not a necessary condition to seek additional information. That is, not all nurses described first trying to figure out the uncertainty themselves, and then seek additional resources. This may be related to nurses’ own acknowledgement of the limits of their knowledge and experience, or their perceived need to double check answers by consulting with others. The relationship between
uncertainty and information seeking is also described in the sensemaking literature, where uncertainty/gap-defining moments delay action (Dervin & Nilan, 1986). However, the role of uncertainty in influencing decisions to seek additional information has not been clearly explicated in the extant literature. The process involved in the decision to seek additional information when uncertain warrants further investigation.

_Fear of the Stupid Question and the Admission of Uncertainty_

The second part of the answer to how does uncertainty influence decisions to seek additional information is guided by the concept that emerged from the data, _fear of the stupid question_, and a question posed by French (2006): What structures embody the articulation and sharing of uncertainty? Fear of the stupid question influenced how nurses expressed their uncertainty to others and whom they sought information or decision support from. Because nurses who shared the ‘fear of the stupid question’ perspective concerned themselves with what their colleagues thought of them and wanted to appear competent, it mattered how they framed their uncertainty. Uncertainty positioned nurses professionally in particular ways. Nurses’ fear of embarrassment and appearing incompetent were perceived social and professional consequences of admitting uncertainty. These nurses used particular language and speech acts when asking others for help. Nurses framed their uncertainty admission around patient safety and needing to ask so as to not jeopardize the best interests of the patient. They were declaring themselves as responsible, safe practitioners. There were also certain structures that had to be in place for nurses to admit uncertainty. These included the need to know something quickly, and the availability of trustworthy, experienced, and approachable colleagues. How the admission of uncertainty was handled further revealed the meaning of
uncertainty. Fear of asking a stupid question was a marker for a particular conceptualization of uncertainty; it was conceived of as an issue of competence.

This finding parallels findings from Bucknall’s (2003) study, who reported that critical care nurses felt their self-esteem was at risk if they demonstrated lack of knowledge in an area in which they felt they should be familiar. Similarly, in their study of front-line staff working in a medical unit, MacIntosh-Murray and Choo (2005) found that “nurses talked about situations in which they were afraid or unwilling to ask questions or admit that they might need help because if they did, they might be seen as incompetent” (p. 1341). These findings suggest that fear of asking stupid questions is a reflection of professional socialization, a culture portrayed in the nursing discourse as eating our young, and a culture that highly regards competence.

Acknowledging and admitting uncertainty has been explored in other healthcare professions. There has been extensive study on the concept of training professionals for uncertainty in the medical sociology literature (e.g., Becker, 1961; Fox, 1957; Haas & Shaffir, 1991; Light, 1979). These seminal studies portrayed medical students’ training for uncertainty as a socialization process of learning to acknowledge uncertainty, coping with or tolerating uncertainty, and gaining professional competence.

More recently, Lingard, Garwood, Schryer, and Spafford (2003) examined professional socialization and the rhetorical and linguistic features of uncertainty in medical students’ case presentations. They found that students’ speech acts represented a novice rhetoric of uncertainty that focused on personal knowledge deficits and proving competence. In their study examining communicative features in optometry students’ case presentations, Spafford and colleagues (2006) found that optometry students took a different stance towards
uncertainty, one of owning the limits of their knowledge. In their two studies, both optometry and medical students sought guidance despite the perceived risk of being seen as uncertain or deficient. However, they also reported a disconnect between optometry students’ attitudes and behaviours towards uncertainty. Optometry students were willing to own their limits, but expressed an aversion to admitting clinical uncertainty or asking questions of their teachers because they were afraid of appearing stupid and not knowledgeable (this parallels the concept of fear of the stupid question).

From a social interaction perspective, Goffman (1959) characterized impression management behaviours that individuals engage in, such as presenting self as professionally competent in his book: The Presentation of Self in Everyday Life. In his framework, Goffman described the socialization process of performance, the tendency for performers to offer their observers an impression that is idealized to fit into the understanding and expectations of the society in which it is presented (p. 35). In the present study, the notion of performing competence through communicative practices is reflective of nursing’s professional expectations and professional identity.
Theoretical Contribution to Nursing Knowledge

The substantive theory that emerged from study data explained the processes through which nurses recognized and responded to their uncertainty in clinical practice. Nurses’ uncertainty is under-theorized in the nursing literature, despite calls for rigorous theoretical investigation in this area (French, 2006; Kim, 2000; Thompson et al., 2002). This study is unique in that it specifically explores MSICU nurses’ uncertainty in their practice using grounded theory methodology. This study contributes both theoretically and methodologically to nursing science. Findings from this study contribute to nursing knowledge a nascent understanding of how nurses experience and respond to uncertainty in their daily practice. Findings provide insight into the nature of the processes involved in how nurses think through, act and interact in patient situations for which they are uncertain.

Study findings broaden nursing disciplinary knowledge by defining uncertainty from nurses’ perspectives. Critical thinking processes involved in recognizing uncertainty, strategies nurses used to manage uncertainty, and the recursive processes through which nurses learned from uncertainty experiences are explicated in this substantive theory. The theory adds to our understanding the role of uncertainty in influencing recognition of information needs, decision making, and information seeking. In addition to theoretical contributions to nursing knowledge, findings from this study have implications for practice, education, theory, and research.
Study Implications

Implications for Nursing Practice

This study highlights the importance of developing a culture of acceptance of uncertainty because it is an important aspect of patient care and nursing practice. Nurses should be encouraged to discuss their uncertainty experiences, because it is a key aspect to learning and gaining experience. Study findings not only highlight the importance of acknowledging uncertainty but also support the need to have collegial support structures in place to assist nurses in managing uncertainty. Establishing an open discussion about uncertainty in a safe environment might encourage the sharing of experiences and create opportunities to promote awareness of uncertainty. Nurses should be encouraged by their managers, educators, and peers to discuss how they managed their uncertainty and how their unresolved uncertainty was accommodated. Providing similar debriefing opportunities for student nurses is also important. For instance, capturing uncertainty experiences as teachable moments in practice and by debriefing may be of value, however informal. How uncertainty is managed can have potential implications for patient care and outcomes of that care. Understanding how nurses experience and respond to uncertainty at different stages in the clinical decision-making process (e.g., pre-decisional, decisional, post-decisional) can lead to the design of targeted interventions. Such strategies can guide nurses in managing their uncertainty throughout the process of patient assessment, diagnosis/problem identification, and planning interventions and care.

Nurses’ uncertainty may have implications for retention. For instance, continually experiencing overwhelming uncertainty that is unresolved or a high level of stress from uncertainty may have potential implications for intentions to leave the position or the
profession. Nurses in this study experienced moral distress in ethical situations. Strategies to minimize moral distress and ethical uncertainty are warranted. For instance, there is evidence that suggests ICU nurses’ moral distress has an impact on retention (Corley, 1995; Corley et al., 2001; Elpern et al., 2005; Hamric & Blackhall, 2007). Strategies to reduce moral distress and ethical uncertainty might include regular staff meetings with ethics committee members, inservices on palliative care in the ICU, and how to manage disagreements between staff with regards to the patient’s care plan and goals of care. Palliative care guidelines could be in place for uncertainty in ethical situations, particularly around end-of-life care and withdrawing treatment, and guidelines for nurses’ role as patient advocates in these situations. Improving the work environment is another key strategy that might minimize nurses’ moral distress. For instance, improving the moral habitability of the work environment through ethics education for nurses, physicians, administrators, and policymakers (Peter, Macfarlane, & O’Brien-Pallas, 2004). “Morally habitable environments are those in which differently situated people experience their responsibilities as intelligible and coherent” (Peter et al., 2004, p. 356).

A theory such as this, one that increases our understanding of nurses’ clinical uncertainty, could form the basis for developing decision support systems. Providing opportunities for nurses to obtain real-time feedback and see the relationships between their nursing interventions and their patients’ outcome achievement is an innovative example of supporting evidence-based decision making (Doran et al., 2007) and may create new venues for nurses to seek information at the point of care to reduce uncertainty.
Implications for Nursing Education

The second objective of this doctoral study was to identify strategies to assist MSICU nurses to recognize information needs and manage their clinical uncertainties. Findings from this study indicate several nursing education strategies. Similar to Fox’s (1959) notion of training for uncertainty, preparing students to acknowledge the uncertainty they face in practice and teaching students (and practicing nurses) how to manage uncertainty are key educational strategies. Tailored nursing education programs could be developed to assist nurses in developing skills in recognizing, articulating, and managing their uncertainty. Teaching nursing students and practicing nurses to recognize uncertainty and admit and acknowledge it to others is an initial step towards managing uncertainty. Recognizing uncertainty requires cognitive effort, such as critical thinking and ‘acting thinkingly.’ Thus, uncertainty recognition is a critical thinking process involving skills that require development and consideration.

Although uncertainty needs to be managed (on some level), uncertainty leads to acquisition of new knowledge, skills and clinical experience. Education strategies might focus on an evidence-based approach to care. Theory about nurses’ uncertainty can guide educators engaged in teaching students and practicing nurses about an evidence-based approach to care, such as translating uncertainty into clinical questions. Teaching nurses how to build ‘recognitional knowledge’ in the context of uncertain patient situations based on their experience is another key educational strategy.

Findings indicating that using research evidence was not common practice and that nurses relied on resource nurses for answers to their questions, suggests that there are several opportunities to strengthen clinical decision making. There is a current lack of professional
culture that expects or requires the use of research to inform decision making, and there is inadequate nursing education programs to train and support nurses to use research evidence in their practice. One strategy to counter this might be to include more training in nursing programs for nurses to develop research skills, not only in critically appraising research findings, but in conducting research studies—using the research process. Another key strategy might involve capitalizing on the role of the resource nurse as a research and knowledge translation provider, by having these advanced practice nurses train nurses in developing decision making and research skills through seminars conducted in the ICU. Strengthening nurses’ clinical decision making and research skills might afford nurses more autonomy in their practice and support and evidence-based approach to care. The theory developed in this study provides a useful basis for such education strategies, by providing a common language to discuss and exchange ideas about nurses’ uncertainty in their daily practice.

**Implications for Further Theory Development and Research**

Suggestions for further research are theoretical, substantive, and methodological in nature. The theory recognizing and responding to uncertainty expands our understanding of nurse decision making theory by explicating uncertainty as a phenomenon and a process in nurses’ decision making (e.g., pre-decisional, decisional, and post-decisional processes). For example, this theory expands our understanding of nurses’ rapid decision making (Baumann & Bourbonnais, 1984) by providing insight into the role of uncertainty in influencing how and when nurses make decisions and act on their decisions when time-pressured. This substantive theory expands information seeking studies in the nursing literature by providing theoretical understanding of the role of uncertainty in recognition of information needs, gaining understanding and knowledge, and explicating how uncertainty influences decisions.
to seek additional information. The theory extends our understanding of uncertainty in naturalistic decision making theories. For instance, Klein and colleagues’ (1993) recognition-primed decision theory and Cohen et al.’s (1997) recognition/metacognition theory portray uncertainty in the context of novel or unfamiliar situations. However, findings from the current study indicate that uncertainty not only occurs in novel or unfamiliar situations, but in familiar situations (e.g., uncertainty in ethical patient situations). Nurses indicated that although the situation was familiar, there were aspects that contributed to their uncertainty because every patient and family is different. The theory recognizing and responding to uncertainty extends Klein and colleagues’ recognition-primed decision making theory in two additional ways. First, the RPD theory does not address influences such as organizational constraints (Klein, 1997). In this study, organizational constraints were described as contextual factors influencing how nurses managed their uncertainty. For instance, availability of coworkers, information, and resources influenced strategies nurses used to manage uncertainty. Second, Cohen, Freeman, and Wolf (1996) contended that pattern recognition is not the whole story (in naturalistic decision theories). For instance, they indicated that pattern recognition does not capture how uncertainty is effectively handled. Findings from this study include aspects of pattern recognition and strategies used to manage uncertainty, providing further insight into uncertainty in decision making.

This study has provided a theoretical foundation from which further research can extend, test, and refine a theory of uncertainty in nursing. This theory requires further testing with other MSICU nurses. Further research that explores the various aspects and dimensions of recognizing and responding to uncertainty may provide additional insight. For example, future research could extend this theory, by exploring the cognitive, affective, behavioural,
and social dimensions of uncertainty. As well, there may be aspects of uncertainty other than decisional, procedural, and ethical uncertainty that are antecedent conditions in patient situations, and additional strategies nurses use to manage uncertainty. This theory could be extended by exploring other structures and processes involved in nurses’ uncertainty. Findings highlight the cognitive processes and critical thinking skills involved in uncertainty recognition, which is an important area for further exploration. Findings from this study also indicated that nurses’ individual characteristics and physiological responses to uncertainty influenced their decisions and actions in patient care. This warrants further investigation. Future studies should explore the process involved in the decision to seek additional information when uncertain, as well as how unresolved uncertainty is accommodated.

Mapping conditions of uncertainty to specific strategies is a key area for additional research that may provide the understanding needed to develop targeted interventions to support nurses in their decision making. Because uncertainty can potentially have an impact on patient outcomes, how uncertainty influences risk in decision making, quality of patient care, and patient outcomes merits further study. Further understanding of nurses’ uncertainty may also lead to important directions toward understanding how uncertainty influences an evidence-based approach to care. Also, studies could use a sociocultural perspective to explore the complex processes involved in recognizing and responding to uncertainty and how uncertainty positions nurses socially and professionally. This would provide further insight into the role of uncertainty in the professional socialization of nurses. This theory also highlights the significance of ethical uncertainty in MSICU nursing practice, and the importance of developing theory in this area. Theorizing nurses’ uncertainty from an ethical decision making framework could extend this theory.
A study employing triangulated methods, such as using observation and interviews, may provide additional insight into the theory recognizing and responding to uncertainty. As well, comparative studies might provide further understanding from various perspectives. For instance, studies could include a comparative analysis of novice and expert nurses’ uncertainty experiences and responses. Another comparative study on uncertainty might include theoretical sampling nurses working in different areas or different settings, such as uncertainty among community nurses compared with uncertainty among nurses working in an acute care hospital. Another research area for consideration would be to explore nurse and physician perceptions of uncertainty in patient situations from an interprofessional collaboration perspective. As well, the concept of getting everyone on the same page could be further tested in studies examining interprofessional collaboration and teamwork.

These study data were collected at a single point in time, however, a longitudinal study may lead to further understanding of recognizing and responding to uncertainty and may deepen understanding of how uncertainty changes over time. For instance, a longitudinal study might explore the processes involved in learning from uncertainty and in developing ‘recognitional knowledge.’
Concluding Statement

Uncertainty is an unavoidable, omnipresent part of nurses’ practice. Nurses play an integral role in patient care quality and patient outcomes. High quality nursing care is dependent on making good clinical decisions (Thompson & Dowding, 2002). Because nurses act on the basis of their decisions, which in turn have implications for patient outcomes, it is important to understand how nurses experience and respond to uncertainty in the daily practice. The theory recognizing and responding to uncertainty provides an increased understanding of uncertainty from the nurse’s perspective. Antecedents, actions and interactions, and consequences that comprised this theory were conceptually related, forming an explanatory scheme of how MSICU nurses experience and respond to uncertainty in their practice.

Findings from this study contribute significantly to nursing knowledge by advancing the nursing perspective of uncertainty in clinical practice. This study highlights new areas of uncertainty to consider in nursing practice and strategies for nursing education. The theory provides a foundation upon which future research about nurses’ uncertainty can extend this knowledge, using a variety of research methodologies, which would further contribute to advancing nursing science in the area of nurses’ uncertainty.
REFERENCES


tolerance/intolerance of ambiguity and perceived environmental uncertainty in 

perceptions about end-of-life care. *Journal of Neuroscience Nursing, 39*, 143-150.


Campbell, D. J., & Gingrich, K. F. (1986). The interactive effects of task complexity and 
participation on task performance: A field experiment. *Organizational Behavior and 
Human Decision Processes, 38*, 162-180.

Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council 
of Canada, Social Sciences and Humanities Research Council of Canada, *Tri-Council 
Policy Statement: Ethical Conduct for Research Involving Humans*. 1998 (with 2000, 

Carr, S. M., Bell, B., Pearson, P. H., & Watson, D. W. (2001). To be sure or not to be sure: 
Concepts of uncertainty and risk in the construction of community nursing practice. 

*Primary Health Care Research and Development, 2*, 223-233.


Nurses’ uncertainty in decision making: A literature review. *Worldviews on Evidence-Based Nursing*, 6, 3-15.


Outcomes in the Palm of Your Hand: Improving the Quality and Continuity of Patient Care. Project funded by: Ministry of Health and Long-Term Care, CHSRF, CITO, Nortel.


Estabrooks, C. A., Rutakumwa, W., O’Leary, K. A., Profetto-McGrath, J., Levers, M. J., &


Moving from recognizing and admitting uncertainties to asking searchable, answerable questions. *Worldviews on Evidence-Based Nursing*, 2, 98-102.


relationship between moral distress and perception of futile care in the critical care unit.

*Intensive and Critical Care Nursing, 23, 256-263.*

Morse, J. M. (2007). Qualitative researchers don’t count. *Qualitative Health Research, 17,* 287.


Tourangeau, A. E., Tu, J., Doran, D., Pringle, D., McGillis Hall, L., O’Brien-Pallas, L. (2002-2006). *Nursing and other determinants of hospital level outcomes such as 30-day mortality and readmission rates*. Project funded by the Canadian Institutes of Health Research.


APPENDIX A: STUDY FLYER

Attention: Medical/Surgical ICU Nurses

OPPORTUNITY TO PARTICIPATE IN A RESEARCH STUDY!

Study Title
Medical/Surgical Intensive Care Nurses’ Clinical Decision Making Experiences

Purpose
- To better understand medical/surgical ICU nurses’ clinical decision making experiences and associated feelings and behaviours.
- The goal of this study is to increase our understanding of nurses’ clinical decision making experiences so we can facilitate the development of strategies to support nurses in their practice.
- This study is being conducted as partial fulfillment of Lisa Cranley’s Doctor of Philosophy degree at the Faculty of Nursing, University of Toronto.

Procedure
- You are being asked to participate in one face-to-face interview scheduled for one hour at a date, time and location of your convenience.
- Your participation is entirely voluntary and confidential and if you choose to participate, you can withdraw at any time.

For more information about the study, please contact:

PhD Student:
Lisa Cranley RN, PhD (Candidate)
Lawrence S. Bloomberg Faculty of Nursing
University of Toronto
Phone: (416) 946-3928
APPENDIX B: STUDY EXPLANATION LETTER

Dear Colleague,

You are invited to participate in a research study entitled: “Medical-Surgical Intensive Care Nurses’ Clinical Decision Making Experiences.” You are invited to participate in this study because you are a staff registered nurse in an adult medical-surgical intensive care unit at XX hospital.

The purpose of this study is to develop an understanding about how nurses experience and respond to patient care-related situations for which they are unsure and associated feelings and behaviours. The goal of this study is to develop a theory that will increase our understanding of nurses’ clinical decision making experiences to facilitate the development of strategies to support nurses in their practice. This study is being conducted as partial fulfillment of Lisa Cranley’s Doctor of Philosophy degree at the Faculty of Nursing, University of Toronto.

You are being asked to participate in one face-to-face interview that will be scheduled for one hour. The interview will take place at a date, time and location of your convenience, such as your home or the education/conference room at XX Hospital. I will be asking you about your experiences and responses to patient care situations for which you felt unsure about and your associated feelings and behaviours. With your consent, the interview will be audiotape recorded and transcribed word for word to facilitate an accurate description of the information that you provide. You may also be asked to participate in a focus group to provide feedback on the emerging or final study findings.

All information that you provide will be kept confidential and your name will be kept anonymous, as a study number will be used to identify you. Your name or any other names mentioned in the interview will not be transcribed from the tape. Your name or any other personal identifier will not be used in any publications of study findings or other dissemination activities. Information will be secured in a locked file cabinet and a password protected computer. Your participation is entirely voluntary and if you choose to participate, you can withdraw at any time without any consequences on your employment. There are no known serious risks involved in participating in this study, however, there is minimal risk that emotional distress or discomfort may be created by some questions. You may receive no direct benefits from being in this study, although you may find the interview an opportunity to reflect upon your practice. The benefits of the study will be in the information that you provide to enhance understanding about how nurses experience and respond to aspects of patient care for which they are unsure about, and will contribute to the development of theory that will lead to the design of strategies to support nurses’ in their clinical practice. You will receive a copy of the summary of study findings, if you wish. Thank you for taking the time to consider participating in this study. If you are interested in participating in this study or have any questions regarding this study, please contact: Ms. Lisa Cranley, PhD candidate, Faculty of Nursing, University of Toronto at 416-946-3928.
APPENDIX C: INTERVIEW CONSENT FORM

Consent to Participate in a Research Study

Study Title: “Medical-Surgical Intensive Care Nurses’ Clinical Decision Making Experiences.”

Study Contacts:

XX Hospital On Staff Investigator:
Name removed

Principal Investigator/PhD Thesis Supervisor:
Dr. Diane Doran, RN, PhD
Professor
Lawrence S. Bloomberg Faculty of Nursing
University of Toronto
Phone: (416) 978-2866

PhD Student:
Lisa Cranley RN, PhD (Candidate)
Lawrence S. Bloomberg Faculty of Nursing
University of Toronto
Phone: (416) 946-3928

Introduction: Before agreeing to participate in this research study, it is important that you read the information in this research consent form. It includes details we think you need to know in order to decide if you wish to take part in the study. If you have any questions, ask the study staff. You should not sign this form until you are sure you understand the information. All research is voluntary. You may also wish to discuss the study with a family member or close friend.
Purpose of the Research: You are being asked to consider taking part in a research study. You have been approached to participate in this research study because you work as a staff registered nurse in an adult medical-surgical intensive care unit at XX hospital. The purpose of this study is to develop an understanding about how nurses experience and respond to patient care situations for which they are unsure and associated feelings and behaviours. The goal of this study is to develop a theory that will increase our understanding of nurses’ clinical decision making experiences, to facilitate the development of strategies to support nurses in their practice. This study is being conducted as partial fulfillment of Lisa Cranley’s Doctor of Philosophy degree at the Faculty of Nursing, University of Toronto.

Description of the Research: You are being asked to participate in one face-to-face interview that will be scheduled for one hour. The interview will take place at a date, time and location of your convenience, such as your home or the education/conference room at XX Hospital. Ms. Cranley will be asking you about your experiences in making patient care situations for which you felt unsure about and your associated feelings and behaviours. With your consent, the interview will be audiotape recorded and transcribed word for word to facilitate an accurate description of the information that you provide. We also ask your permission to contact you by telephone to schedule and remind you of the interview date, time, and location, and to clarify questions that Ms. Cranley may have about the interview during the analysis. Approximately 12-26 participants will be enrolled in the whole study, from two hospital study sites. It is expected that approximately 8-10 participants may be recruited from XX Hospital.

Potential Harms: There are no known harms associated with participation in this study. However, there may be minimal risk that emotional distress or discomfort may be created by some questions. Should you experience distress or discomfort during the interview, you can suspend or end your participation in the study and without providing a reason.

Potential Benefits: You may receive no direct benefits from participating in this study, although you may find the interview an opportunity to reflect upon your practice. However, results from this study may help us to better understand how nurses experience and respond to aspects of patient care for which they are unsure about, and contribute to the development of theory that will lead to the design of strategies to support nurses’ in their clinical practice.

Protecting Your Information: Information obtained during the study will be held in strict confidence. Identifying information collected from you will include your name, telephone number, and mailing address. This information will be collected in order to schedule and remind you of the interview date, time, and location, to clarify questions that I may have about the interview during the analysis, and to provide you with a copy of a summary of the study findings, if you wish. Information on the demographic questionnaire includes year of birth, gender, education, years experience as nurse and as an intensive care nurse, years employed on current unit, and current employment status. This information will be collected to describe the study sample. A study number will be used to identify you. A master list will be maintained that links personal identifiers with a unique study number, which will be used on all study documents. Your name or any other personal identifier will not be used in any publications of study findings or any other dissemination activities. No information collected
that discloses your identity will be released without your consent or as required by law. Your name or any other names mentioned in the interview will not be transcribed from the tape, but will instead be indicated as “deleted name.” All information will be secured in a locked file cabinet and a password protected computer away from the hospital. Only the research team will have access to the data. During the regular monitoring of your study or in the event of an audit, your study file may be reviewed by the XX Hospital Research Ethics Board. You may be contacted by a representative of the Research Ethics Board to ask questions about your experience with the recruitment and consent process or regarding your experience in the study, with a view to assuring and improving the quality of those processes. Transcripts, computer files, and other data collected over the study period will be destroyed after 5 years. Audiotapes will be destroyed after the analysis is completed, the study report developed, and findings are published. It is anticipated that audiotapes will be destroyed 2 years after the end of the study.

**Study Results:** You will receive a copy of the summary of study findings, if you wish.

**Cost and Reimbursement to the Participant:** The cost to you will be the time to complete the interview, which will not exceed 60 minutes. You will be compensated for your participation in the study by a direct payment of a $25 gift certificate for Chapters Indigo bookstore.

**Compensation for Injury:** If you suffer a physical injury from participating in this study, medical care will be provided to you in the same manner as you would ordinarily obtain any other medical treatment. In no way does signing this form waive your legal rights nor release the study investigators or involved institutions from their legal and professional responsibilities.

**Participation and Withdrawal:** Participation in any research study is voluntary. If you choose not to participate, it will not affect your employment at XX Hospital. If you decide to participate in this study you can change your mind without giving a reason, and you may withdraw from the study at any time without any effect on your employment at XX Hospital. Withdrawal from the study will include removal of your data. You can ask questions or raise concerns about the study from Monday to Friday between 9:00 am to 5:00 pm.

**Research Ethics Board Contact:** If you have any questions regarding your rights as a research participant, you may contact Dr. XX, Chair, Research Ethics Board, during business hours. If you have any questions about your rights as a research participant, please contact Jill Parsons, Research Ethics Officer, Health Sciences in the Ethics Review Office, University of Toronto, at telephone 416-946-5806 or by email: jc.parsons@utoronto.ca.
XX Hospital On Staff Investigator: Name removed

Principal Investigator/PhD Thesis Supervisor: Dr. Diane Doran, RN, PhD
Professor
Lawrence S. Bloomberg Faculty of Nursing
University of Toronto
Phone: (416) 978-2866

PhD Student:
Lisa Cranley RN, PhD (Candidate)
Lawrence S. Bloomberg Faculty of Nursing
University of Toronto
Phone: (416) 946-3928

Consent: The research study has been explained to me, and my questions have been answered to my satisfaction. I have the right not to participate and the right to withdraw without affecting my employment at XX Hospital. As well, the potential harms and benefits of participating in this research study have been explained to me. I have been told that I have not waived my legal rights nor released the investigators or involved institutions from their legal and professional responsibilities. I know that I may ask now, or in the future, any questions I have about the study. I have been told that my study file will be kept confidential and that no information will be disclosed without my permission unless required by law. I have been given sufficient time to read the above information. I consent to participate. I have been told I will be given a signed copy of this consent form.

Participant’s Name (Print)  Participant’s Signature  Date

Name of Person  Signature  Date
Obtaining Consent and Position

Investigator Signature

I, Dr. Diane Doran, am the investigator responsible for the conduct of this study at XX Hospital, and I have delegated the explanation of this study to this participant to Lisa Cranley.

Signature of PI  Date

*Focus Group Participation:
I am interested in either participating in or obtaining more information about the 60-minute focus group to provide feedback on the emerging or final study findings.

☐ Yes  _______  ☐ No  _______  (please check ✓ and initial one box)

Initials  Initials
APPENDIX D: FOCUS GROUP INFORMATION LETTER

Study:
Medical-Surgical Intensive Care Nurses’ Clinical Decision Making Experiences

Study Purpose:
The purpose of this study is to develop an understanding about how nurses experience and respond to patient care situations for which they are unsure and associated feelings and behaviours. The goal of this study is to develop a theory that will increase our understanding of nurses’ clinical decision making experiences, to facilitate the development of strategies to support nurses in their practice. This study is being conducted as partial fulfillment of Lisa Cranley’s Doctor of Philosophy degree at the Faculty of Nursing, University of Toronto.

Purpose of the Focus Group:
You are invited to participate in this focus group because you work as a staff registered nurse in an adult medical-surgical intensive care unit at XX hospital. You are being asked to provide feedback and your reactions to the emerging or final study findings in terms of how accurately the findings reflect your practice and your experiences in an intensive care unit setting.

Procedure:
The location of the focus group will be a room that will be booked at one of the study hospital sites. I will present the study findings in a 10-15 minute power point presentation. I will then seek your feedback on the study findings in an open discussion format, which will be scheduled for 30-45 minutes. All information that you provide will be kept confidential and your name will be kept anonymous, as a study number will be used to identify you. Your name or any other names mentioned in the interview will not be transcribed from the tape. Your name or any other personal identifier will not be used in any publications of study findings or other dissemination activities. Information will be secured in a locked file cabinet and a password protected computer. Your participation is entirely voluntary and if you choose to participate, you can withdraw at any time without any consequences on your employment.

There are no known serious risks involved in participating in this study however, there is minimal risk that emotional distress or discomfort may be created by some questions. You may receive no direct benefits from being in this study, although you may find the interview an opportunity to reflect upon your practice. The benefits of the study will be in the information that you provide to enhance understanding about how nurses experience and respond to aspects of patient care for which they are unsure about, and will contribute to the development of theory that will lead to the design of strategies to support nurses’ in their clinical practice. You will receive a copy of the summary of study findings, if you wish.

If you are interested in participating or have any questions regarding this study, please contact: Ms. Lisa Cranley, PhD candidate, Faculty of Nursing, University of Toronto at 416-946-3928.
APPENDIX E: ORIGINAL INTERVIEW QUESTION GUIDE

**General Aim of the Study:** I am interested in learning more about medical-surgical ICU nurses’ clinical decision making experiences, such as how nurses think through, act, and respond to these experiences.

Tell me about some of the kinds of situations that you encounter in your practice.

Tell me about some decisions that you have made concerning patient care that were difficult to make. What in particular made the decision(s) difficult?

I want you to think about a time during a shift within the past 6 months when you had to make a decision about your patient’s care for which you felt unsure about. I want you to recall and describe as completely as you can what you consider a positive experience and a negative or unfavourable experience for which you had to make a patient care-related situation for which you felt unsure about.

Please start by describing the context in which the situation occurred. I want you to imagine the setting and describe what happened step by step. Walk us through the situation. Please take your time. For example, what was your patient’s diagnosis/illness, what was the unit like that day (e.g., patient workload, staffing, patient census), what were the circumstances surrounding the situation?

**Probing questions:**

How typical or atypical is this experience in your practice?

What in particular made you feel unsure in this incident?

How did you feel at the time?

Exactly what did you do in this situation? (e.g., behaviours, actions, strategies)

How did you react? (e.g., affective, cognitive, behaviours)

What information was present?

In response to this situation, do you consider your behaviour (e.g., actions taken) effective or ineffective? In what ways? Why was this behaviour (action) particularly effective or ineffective?

What were your concerns or thoughts at the time?
What happened next?

Who was involved (roles)? (e.g., interaction)

What was your decision and what was the outcome/result of your decision? (e.g., consequences).

Clinical uncertainty is a term that I’ve seen used in the literature. What does this term mean to you? Is uncertainty a term that describes or encompasses the situation that you have described? What term would you use to describe your situation?

Closing Questions

Is there anything else that you feel is important about the experiences you described that you would like to tell me about?

Do you have any questions?

Thank him/her for their participation.

Strategies to facilitate recall of a critical incident:

- use a arrow diagram and have participants visualize the event or incident
- visualize some of the patients that they cared for over the past 6 months, who the patient’s family members were that visited, who was working that day
- probing questions (e.g., What kinds of health problems have patients been diagnosed with that you have care for over the past 6 months?”)
APPENDIX F: INITIAL DATA COLLECTION AND ANALYSIS PLAN

Initial Purposive Sample

Data Collection
(Interviews)

Data Analysis
(Constant Comparison)

Category saturation?

Yes
Verification of Theory
(Focus Group - Member Checking)

Stop Data Collection

No
Theoretical sampling

2-3 Pilot Interviews
Transcription of interviews
Ongoing Committee Consultation
Mid-analysis member checking
Dear Colleague,

You are being asked to participate in a review of a two-page interview guide for the study entitled: “Medical-Surgical Intensive Care Nurses’ Clinical Decision Making Experiences.”

**Study Purpose:** The purpose of this study is to develop an understanding about how nurses experience and respond to patient care situations for which they are unsure and associated feelings and behaviours. The goal of this study is to develop a theory that will increase our understanding of nurses’ clinical decision making experiences, to facilitate the development of strategies to support nurses in their practice. This study is being conducted as partial fulfillment of Lisa Cranley’s Doctor of Philosophy degree at the Faculty of Nursing, University of Toronto.

**Description of the Interview Guide Pilot Test:** You are being asked to participate in a 30-60 minute individual meeting with myself to evaluate the relevance and validity of the interview guide, and the clarity of the interview questions and the interview procedure that will be used in this research study. Your expertise is being sought because you work as a Clinical Nurse Specialist, Hospital Educator, or ICU manager in the hospital where the study is being conducted, and because you have extensive nursing knowledge and experience.

During the meeting, I will read through the interview guide questions. You do not have to answer the question asked, but rather, I would appreciate feedback on the following aspects of the interview guide:

- clarity of instructions used in the interview guide
- the interview procedure
- clarity of questions asked
- types of questions asked
- the ordering of the questions
- the language and terms used

The meeting will take place at a date, time, and location of your convenience. Your participation in the interview guide pilot test is voluntary. No identifying information will be collected from you.

If you have any questions regarding this study, please contact: Ms. Lisa Cranley, PhD candidate, Faculty of Nursing, University of Toronto at 416-946-3928.
APPENDIX H: DEMOGRAPHIC QUESTIONNAIRE

Hospital Code # ________
Participant # ________

1. Year of Birth: ____________

2. Gender: □ Female □ Male

3. Nursing Education completed (Check all that apply):
   □ RN Diploma □ RPN Diploma □ Baccalaureate Degree □ Master’s Degree □ Doctorate Degree

4. Non-Nursing Education completed (Check all that apply):
   □ Diploma □ Baccalaureate Degree □ Master’s Degree □ Doctorate Degree
   Field of study________________________________________________________

5. Have you completed any specialty nursing certificate programs? □ Yes □ No
   If yes, name of certificate:__________________________________________

6. Years of experience as a registered nurse _______
   If less than one year experience as a registered nurse, indicate number of months_______

7. Years experience as a registered nurse in an ICU____________________

8. Years employed on current ICU at this hospital:____________________

9. If less than one year experience on current unit, indicate number of months:__________

10. Current employment status: □ Full time □ Part time
APPENDIX I: FOCUS GROUP CONSENT FORM

Consent to Participate in a Focus Group

Study Title: “Medical-Surgical Intensive Care Nurses’ Clinical Decision Making Experiences.”

Study Contacts:

XX Hospital On Staff Investigator:
Name removed

Principal Investigator/PhD Thesis Supervisor:
Dr. Diane Doran, RN, PhD
Professor
Lawrence S. Bloomberg Faculty of Nursing, University of Toronto
Phone: (416) 978-2866

PhD Student:
Lisa Cranley RN, PhD (Candidate)
Lawrence S. Bloomberg Faculty of Nursing, University of Toronto
Phone: (416) 946-3928

Introduction: Before agreeing to participate in this research study, it is important that you read the information in this research consent form. It includes details we think you need to know in order to decide if you wish to take part in the study. If you have any questions, ask the study staff. You should not sign this form until you are sure you understand the information. All research is voluntary. You may also wish to discuss the study with a family member or close friend.
Purpose of the Research: You are being asked to consider taking part in a research study. You have been approached to participate in a focus group because you work as a staff registered nurse in an adult medical-surgical intensive care unit at XX hospital. The purpose of this study is to develop an understanding about how nurses experience and respond to patient care situations for which they are unsure and associated feelings and behaviours. The goal of this study is to develop a theory that will increase our understanding of nurses’ clinical decision making experiences, to facilitate the development of strategies to support nurses in their practice. This study is being conducted as partial fulfillment of Lisa Cranley’s Doctor of Philosophy degree at the Faculty of Nursing, University of Toronto. The purpose of the focus group is to seek your feedback and your reactions to the emerging or final study findings. You are being asked to provide feedback in terms of how accurately the findings reflect your practice and your experiences in an intensive care unit setting.

Description of the Research: You are being asked to participate in a focus group discussion that will be scheduled for one hour. The focus group will take place at XX hospital. Ms. Cranley will be asking you for your feedback, thoughts, and reactions to the study findings. Ms. Cranley will present the emerging or final study findings in a 10-15 minute power point presentation. Ms. Cranley will then seek your feedback on the findings in an open discussion format, which will be scheduled for 30-45 minutes. The focus group will be audiotape recorded and transcribed word for word to facilitate an accurate description of the information that you provide. We also ask your permission to contact you by telephone to schedule and remind you of the focus group date, time and location.

Potential Harms: There are no known harms associated with participation in this study. However, there may be minimal risk that emotional distress or discomfort may be created by some questions. Should you experience distress or discomfort during the focus group, you can suspend or end your participation in the study and without providing a reason.

Potential Benefits: You may receive no direct benefits from participating in this study, although you may find the focus group discussion an opportunity to reflect upon your practice. However, results from this study may help us to better understand how nurses experience and respond to aspects of patient care for which they are unsure about, and contribute to the development of theory that will lead to the design of strategies to support nurses’ in their clinical practice.

Protecting Your Information: Information obtained during the study will be held in strict confidence. Identifying information collected from you will include your name, telephone number, and mailing address. This information will be collected in order to schedule and remind you of the focus group date, time, and location and to provide you with a copy of a summary of the study findings, if you wish. A study number will be used to identify you. A master list will be maintained that links personal identifiers with a unique study number, which will be used on all study documents. Your name or any other personal identifier will not be used in any publications of study findings or any other dissemination activities. No information collected that discloses your identity will be released without your consent or as required by law. Your name or any other names mentioned in the focus group will not be transcribed from the tape, but will instead be indicated as “deleted name.” All information
will be secured in a locked file cabinet and a password protected computer away from the hospital. Only the research team will have access to the data. During the regular monitoring of your study or in the event of an audit, your study file may be reviewed by the XX Hospital Research Ethics Board. You may be contacted by a representative of the Research Ethics Board to ask questions about your experience with the recruitment and consent process or regarding your experience in the study, with a view to assuring and improving the quality of those processes. Transcripts, computer files, and other data collected over the study period will be destroyed after 5 years. Audiotapes will be destroyed after the analysis is completed, the study report developed, and findings are published. It is anticipated that audiotapes will be destroyed 2 years after the end of the study.

**Study Results:** You will receive a copy of the summary of study findings, if you wish.

**Cost and Reimbursement to the Participant:** The cost to you will be the time to complete the focus group, which will not exceed 60 minutes. Refreshments will be provided during the focus group.

**Compensation for Injury:** If you suffer a physical injury from participating in this study, medical care will be provided to you in the same manner as you would ordinarily obtain any other medical treatment. In no way does signing this form waive your legal rights nor release the study investigators or involved institutions from their legal and professional responsibilities.

**Participation and Withdrawal:** Participation in any research study is voluntary. If you choose not to participate, it will not effect your employment at XX Hospital. If you decide to participate in this study you can change your mind without giving a reason, and you may withdraw from the study at any time without any effect on your employment at XX Hospital. Withdrawal from the study will include removal of your data. You can ask questions or raise concerns about the study from Monday to Friday between 9:00 am to 5:00 pm.

**Research Ethics Board Contact:** If you have any questions regarding your rights as a research participant, you may contact Dr. XX, Chair, Research Ethics Board, during business hours. If you have any questions about your rights as a research participant, please contact Jill Parsons, Research Ethics Officer, Health Sciences in the Ethics Review Office, University of Toronto, at telephone 416-946-5806 or by email: jc.parsons@utoronto.ca.
XX Hospital On Staff Investigator:
Name removed

Principal Investigator/PhD Thesis Supervisor:
Dr. Diane Doran, RN, PhD
Professor
Lawrence S. Bloomberg Faculty of Nursing
University of Toronto
Phone: (416) 978-2866

PhD Student:
Lisa Cranley RN, PhD (Candidate)
Lawrence S. Bloomberg Faculty of Nursing
University of Toronto
Phone: (416) 946-3928

Consent: The research study has been explained to me, and my questions have been answered to my satisfaction. I have the right not to participate and the right to withdraw without affecting my employment at XX Hospital. As well, the potential harms and benefits of participating in this research study have been explained to me. I have been told that I have not waived my legal rights nor released the investigators or involved institutions from their legal and professional responsibilities. I know that I may ask now, or in the future, any questions I have about the study. I have been told that my study file will be kept confidential and that no information will be disclosed without my permission unless required by law. I have been given sufficient time to read the above information. I consent to participate. I have been told I will be given a signed copy of this consent form.

____________________________ ____________________
Participant’s Name (Print)  Participant’s Signature   Date

____________________________ ____________________
Name of Person   Signature    Date

Obtaining Consent and Position

Investigator Signature

I, Dr. Diane Doran, am the investigator responsible for the conduct of this study at XX Hospital, and I have delegated the explanation of this study to this participant to Lisa Cranley.

____________________________ ____________________
Signature of PI   Date
APPENDIX J: FOCUS GROUP QUESTION GUIDE

**Introduction/Purpose**
Introduce facilitators, study purpose, confidentiality and informed consent process, audiotape recorder, purpose of the focus group (e.g., to seek participants’ perceptions and feedback concerning the study findings).

**Leading Question:**
1. Do you consider the findings an accurate depiction of your experiences in an ICU setting?

**Probing Questions:**
1a) If not, what was not consistent? Could you explain why?
1b) What is consistent or reflective of your practice? Could you explain why?

2. What are your reactions or feelings about the study findings?

**Probing Question:**
2a) Can you explain your reactions or feelings?

Additional probing questions will be guided by the group discussion of themes and topics.

**Closing Questions:**
Is there anything else that you feel is important to discuss about the study findings that you would like to share?

Thank the group for their participation.
APPENDIX K: MID-ANALYSIS PRELIMINARY FINDINGS (FOR MEMBER CHECK)

Summary of Mid-Analysis Findings

1. What types of conditions or patient situations contribute to nurses feeling uncertain?
   - Busy shift
   - Complex patient (e.g., young patient, patient condition quickly changed)
   - Ethically challenging / difficult situations (e.g., providing end-of-life care)
   - Newly encountered situations (e.g., unfamiliar or unique doctor’s orders, unfamiliar aspects of patient situation or condition- something never seen or done before)
   - Rotating and changing medical staff (e.g., residents, interns), doctor’s decisions change, residents uncertainty; lack of consistency in care

2. How do nurses feel when uncertain in these types of situations?
   - Frustrated
   - Uncomfortable
   - Helpless at times
   - Uneasy
   - Anxious / Stressed
   - Emotionally drained
   - Challenged (positive manner)
   - Conflicted

3. How do nurses describe clinical uncertainty?
   - Feeling a lack of control over the patient situation / not having a grasp on what’s going on clinically with the patient
   - Inability to see overall clinical picture / being stuck in assessment phase / figuring out how to plan care
   - Not knowing all the cause and effect of nursing actions or interventions / inability to foresee or predicting outcomes of actions
   - Questioning your ability and judgements / questioning if you’re making the right choices / doing the right thing (confidence in decision making)
• Reflecting on your knowledge and experience and accessing resources and still feeling unsure of the course of your care / actions

• Feeling ethically conflicted or challenged (e.g., differing viewpoints around direction of patient care, providing medically aggressive care vs comfort measures, questioning appropriateness of level of care)

• Difficult / stressful situation

• Feeling ineffective in your care

• Challenging (in a positive, rewarding way- learning opportunity; more focused)

4. What strategies do nurses use to address their uncertainty?

• Seeking feedback and/or validation from colleagues / collaborating with nursing colleagues and team / sharing knowledge and experience with nursing colleagues- mentoring/teaching

• Working as a team / team support / communicating with team

• Figuring out a plan for care

• Thinking ahead of consequences of your actions

• Accessing available information and resources (e.g., reading policies, procedures, chart, drawing on previous experience, intuition)

• Reassessing and rethinking the situation (e.g, mapping it out, piecing the information together, stepping back to see overall clinical picture)

• Getting everyone on the same page in terms of a plan for care (e.g, family meetings, patient / family advocate, team rounds)

• Learning from uncertainty experiences (e.g., using the uncertainty experience as knowledge for future clinical decisions)
APPENDIX L: CATEGORIES AND SUBCATEGORIES OF UNCERTAIN PATIENT SITUATIONS - FREQUENCY OBSERVATIONS

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling caught off guard</td>
<td>6</td>
<td>Patients’ whose condition changes really quickly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patients who throw you off clinically</td>
</tr>
<tr>
<td>Encountering unfamiliar or unique orders</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Navigating the grey areas of practice</td>
<td>8</td>
<td>Differing perspectives on the level and goals of care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leaving things up in the air</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advocating for the patient’s best interests with limited decision autonomy</td>
</tr>
</tbody>
</table>

Note. N=frequency indicated by nurses. Frequencies surpass 14 (number of nurses interviewed) because nurses provided more than one example of uncertainty.
APPENDIX M: CATEGORIES OF STRATEGIES TO MANAGE UNCERTAINTY-FREQUENCY OBSERVATIONS

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Subcategories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figuring it out myself</td>
<td>7</td>
<td>Critically thinking through the situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Going on instinct</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Keeping an open mind</td>
</tr>
<tr>
<td>Collaborating with nursing colleagues</td>
<td>3</td>
<td>Seeking nurses who recently cared for that patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seeking experienced, knowledgeable nurses</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Asking approachable colleagues</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Seeking emotional/social support</td>
</tr>
<tr>
<td>Working as a team</td>
<td>10</td>
<td>Collaborating with team members</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Getting everyone on the same page</td>
</tr>
<tr>
<td>Seeking evidence</td>
<td>3</td>
<td>Seeking consistent answers</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Seeking concrete evidence</td>
</tr>
</tbody>
</table>

Note. N=frequency indicated by nurses. Frequencies surpass 14 (number of nurses interviewed) because some nurses provided more than one strategy for uncertainty.