EXPLORING ORGANIZATIONAL INFLUENCES ON PATIENT SYMPTOM MANAGEMENT IN HOSPITALS

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ABSTRACT

CYNTHIA THORNTON BACON: Exploring organizational influences on patient symptom management in hospitals
(Under the direction of Dr. Barbara Mark)

Nurses' abilities to effectively manage hospitalized patients' symptoms may be influenced by organizational factors on the nursing units, particularly the size of the nursing unit, work complexity and nurses' participation in decision making. Guided by Structural Contingency Theory (SCT) which assumes that structural forms and context must match in order for effectiveness to be achieved in organizations, this study assumes that achieving effective management of patient symptoms in hospitals depends on identification of nursing unit structures that are best suited to the technological contexts in which nursing units operate. The purpose of this study was to investigate the interrelationships among the nursing unit's context (unit size and work complexity), structure (nurses' participation in decision making) and effectiveness (symptom management).

Mixed-effects linear models were used to test the data according to the hypothesized statements. The hypothesized relationship between increased unit size, operationalized as number of beds, and increased work complexity was supported, but the relationship between increased unit size, operationalized as number of nurses, and increased work complexity was not supported. The hypothesized relationship between increased work complexity and increased nurses' participation in decision making was not supported. Work complexity was significantly associated with nurses' participation in decision making but in the opposite
direction from that which was hypothesized. The hypothesized relationship between increased nurse participation in decision making and patient ratings of symptom management was not supported.

Despite the limitations of the study, this research highlights the importance of the effects of unit size on work complexity for nurses that is often not accounted for when determining nurse staffing in hospitals. This study also illustrates the important effects of work complexity on nurses' ability to participate in decision making on nursing units. Nurses' participation in decision making was found to be significantly negatively impacted by increasing work complexity which reinforces the importance of nurse leaders' facilitation of work conditions that support nurses' full participation in decisions on nursing units. Finally, this study provides support for continued research to identify organizational contexts and structures that foster the delivery of hospital care that is consonant with patients’ expectations for symptom management.
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CHAPTER 1 INTRODUCTION
PROBLEM, BACKGROUND & SIGNIFICANCE

The health care system in the United States (U.S.) has been under intense scrutiny in the last two decades as concerns about the quality of health care have grown. Several prominent review panels have played an important role in publicizing these quality issues as they documented the large scale and seriousness of the problem (Advisory Commission on Consumer Protection and Quality in the Health Care Industry, 1998; Committee on Quality of Health Care in America Institute of Medicine (IOM, 2001). These landmark reports stimulated research and discussion about improving the quality of health care, particularly related to patient safety, but it remains unknown whether these efforts will translate into better quality care for patients (Leape & Berwick, 2005; Provonost, Holzmueller, Needham, Sexton, Miller et al., 2006; Stelfox, Palmisani, Scurlock, Orav & Bates, 2006; Watcher, 2010). Recent research characterizes progress towards health care quality and safety as "showing pockets of excellence on specific measures or in specific services at individual health care facilities" (Chassin & Loeb, 2011), but also that consistently high levels of quality have not yet been achieved (Chassin & Loeb, 2011; Landrigan, Parry, Bones, Hackbarth, Goldmann & Sharek, 2010; Leape & Berwick, 2006). Therefore, problems with health care quality remain today.

The advisory panels stressed that quality problems occur typically not because of a lack of knowledge, effort or resources devoted to health care, but because of
shortcomings in the way care is organized. The U.S. health care system often lacks the environment, processes and capabilities to ensure that services are in line with the IOM's aims of safe, effective, patient-centered, timely, efficient and equitable care (Committee on Quality of Health Care in America IOM, 2001).

Substantial research has been done to investigate factors that are associated with quality patient care. Patient-centeredness has been found to play a key role in patients' assessment of what constitutes quality care and in their ratings of the effectiveness of health care interventions (Berwick, 2009; Committee on Quality of Health Care in America Institute of Medicine (IOM), 2001; Saha, Beach & Cooper, 2008). Patient-centeredness focuses on the patient's experience of illness and health care and on the systems that do or do not meet individual patients' needs. Researchers have identified six dimensions of patient-centered care:

- respect for patients' values preference and needs
- coordination and integration of care
- information, communication and education
- physical comfort including management of symptom distress
- emotional support including relieving fear and anxiety
- involvement of family and friends

(Committee on Quality of Health Care in America Institute of Medicine (IOM), 2001; Gerteis, Edgman-Levitan & Daley, 1993; Saha et al., 2008). Patients' preferences are highly specific to each individual and they can change over time depending on the circumstances or the problem in question. Because patients are variable in their preferences, clinicians alone cannot make the best decisions for their patients (Balint, 1993; Barry, Fowler, Mulley,
Henderson & Wennberg, 1995; Brock, 1991; Emanuel & Emanuel, 1992; Wagner, Barrett, Barry, Barlow & Fowler, 1995). Patients increasingly want to be involved in health care decision making (Deber, Kraetschmer & Irvine, 1996; Guadagnoli & Ward, 1998; Mansell, Poses, Kaziz & Duefield, 2000) but they differ in terms of how large a role they wish to assume (Committee on Quality of Health Care in America Institute of Medicine (IOM), 2001). Therefore, the goal of patient-centeredness is to "modify the care to respond to the patient, not the patient to the care" (Committee on Quality of Health Care in America (IOM), 2001, p. 51). For these reasons, health providers and systems must be dynamic - they must be structured to adapt and respond to variations in order to effectively meet patient needs.

Despite the IOM's efforts encouraging providers to structure health care in a patient-centered manner patient centered care is not always well implemented. Patients have expressed frustration with their inability to fully participate in health care decisions affecting them (Braddock, Edwards, Hassenberg, Laidley & Levinson, 1999; Cleary, Edgman-Levitan, Roberts, Moloney, McMullen, Walker & Delbanco, 1991) and often do not get their comfort needs fully met. In addition, several studies report that patients frequently experience pain, shortness of breath and other distressing symptoms while hospitalized and fail to receive adequate pain relief or respiratory management (Ingham and Foley, 1998; SUPPORT Principal investigators, 1995). Patients also report emotional and spiritual suffering that is not well addressed by health providers (Byok, 1998; Cassell, 1991). Thus, this study will focus on one aspect of patient-centered care - meeting comfort needs through management of symptom distress.

Addressing patients' comfort needs through effective management of distressing symptoms while hospitalized is consistent with the IOM goal of both promoting patient-
centered care and increasing health care effectiveness. High levels of symptom distress have been associated with reduced quality of life (Germino, 1987) and decreased satisfaction with hospital care (Jackson, Chamberlin & Kroenke, 2001; Kroenke, Stump, Clark, Callahan, & McDonald, 1999). Further, patients who experience higher levels of symptom distress during hospitalization are more likely to require home care once discharged (McCorkle, Strumpf, Nuamah, Adler, Cooley, Jepson, Lusk & Torosian, 2000). The experience of troubling symptoms creates distress for patients and it also disrupts social functioning (Dodd, Janson, Facione, Faucet, Froelicher et al., 2001).

In general, two approaches have been typical of the research to investigate effective management of patient symptoms. First, researchers have conducted studies with individuals as the unit of analysis to identify specific patients who either have or are at risk for these concerns. Cancer patients have been most widely studied because despite the variety of disease processes, and stages of the disease, cancer patients share many of the same characteristics of symptom distress (McCorkle, 1973) and needs for nursing care (Holmes & Eburn, 1989). A recurrent theme in the research literature on symptom management in cancer patients finds cancer pain is inadequately assessed despite the magnitude and the negative consequences on unrelieved symptoms in this population (Von Roenn, Cleeland, Gonin, Hatfield & Panda, 1993; Ward, Goldberg, Miller-McCauley, Mueller, Nolan et al., 1993) and when it is assessed it is undertreated (Cleeland, 1998; Cleeland, Gonin, Hatfield, Edmondson, Blume et al., 1994). Further, evidence supports the underassessment of fatigue (Rieger, 2001; Stone, Richardson, Ream, Smith, Kerr & Kearney, 2000) and depression (Briebart, 1994, 1995).
However, more recent research indicates that the prevalence of symptom distress is high in both cancer and noncancer patients (Tranmer, Heyland, Dudgeon, Groll, Squires-Graham & Coulson, 2003). Studies indicate that patients are especially vulnerable to distressing symptoms during hospitalization, particularly pain, lack of energy, sleep disturbances and nausea, (Kris & Dodd, 2004; Kroenke et al.,1999; Tranmer et al., 2003) and these symptoms are often poorly controlled (Kris & Dodd, 2004; Toscani, Di Giulio, Brunelli, Miccinesi & Laquintana, 2005).

Recent research suggests that symptom distress is highly prevalent among many groups of hospitalized patients. In a study of 2,100 hospitalized medical patients, the majority of patients reported distressing symptoms, with 80% admitting to fatigue on admission (Kroeneke et al, 1999). Subsequent research confirms that these findings are also true in medical-surgical populations where patients reported an average of nine symptoms per patient, with 74% reporting pain, 67% reporting dry mouth, and 50% or more reporting lack of energy, difficulty sleeping and drowsiness (Kris & Dodd, 2004). These findings suggest that symptom distress is widespread in hospitalized patients. Further, these symptoms do not appear to be treated as effectively as they could be because patients reported symptoms that failed to resolve by hospital discharge 25-50% of the time (Kroeneke et al, 1999). It is possible that organizing care in a manner that maximizes caregivers' abilities to deliver high levels of patient-centered care may influence management of patient symptoms in hospitals.

Second, researchers have isolated factors thought to contribute to ineffective management of patient symptoms. These include patient/family, professional and system barriers. Patient/family barriers include lack of awareness of possible benefits, lack of access
to services, cultural and religious issues and ineffective communication with providers (Beck, 2004). For example, knowledge and language barriers may lead to less optimal symptom relief for patients (Beck, 2004). Even when information and access barriers are removed, research indicates that effective management of symptoms remains difficult because family members report inability to implement or maintain recommended treatments and competing demands from other distressing symptoms, suggesting that providers’ coordination and integration of treatment for symptom distress could be improved (Johnson, Kassner, Houser & Kutner, 2005). Professional barriers include those related to health care providers such as misconceptions and attitudes about how people perceive and behave in response to symptoms and lack of knowledge (Beck, 2004). For example, significant differences have been found between cancer patients' and nurses' perceptions of symptom occurrence and distress with nurses underestimating the majority of symptoms expressed by patients (Tanghe, Evers & Paridaens, 1998). Further, in a study comparing provider, patient and caregiver perceptions of symptom distress in cancer patients in a hospital hospice care unit, neither family caregivers nor physicians were able to give congruent distress scores for distressing symptoms experienced by patients (Oi-Ling, Man-Weh & Kam-Hung, 2005).

System barriers focus on the organization and structure of care including a lack of or reduced access to resources needed to deliver effective care to patients and these are often considered in terms of perceptions of consumers and/or providers or as observable characteristics of the system (Melnyk, 1988). For example, in a study examining barriers to effective symptom management in hospices, nurses perceived difficulty achieving effective patient-family-provider relationships as the chief barrier to effective symptom management (Johnson et al, 2005). Many problems in the health care system impede effective management of patient
symptoms including lack of an integrated approach to managing patient symptoms, lack of care coordination and ineffective teamwork (Beck, 2004).

**Improving Patient Symptom Management in Hospitals**

Health care experts suggest that the highly complex work environment in hospitals plays an important role in contributing to difficulties in providing patient centered and effective care (Committee on Quality of Health Care in America Institute of Medicine (IOM), 2001). Narrowing this focus to a specific aspect of patient-centered care, management of patient symptoms, researchers have found differences in symptom management across both hospitals and nursing units, unexplained by patient characteristics (Brown, Sandoval, Murray & Boissonnault, 2008; Desbiens, Wu, Broste, Wenger, Connors, Lynn, Phillips, Fulkerson, 1996). These findings suggest that organizational characteristics may influence the extent to which patient symptoms are perceived as effectively managed while patients are hospitalized.

There is growing evidence of a link between the structure of organizational systems and symptom management outcomes but most of this research has been limited to the symptom of pain. Organizational factors that affect pain management have been found to include low prioritization of pain; lack of written standards for assessment and management of pain; lack of accountability for pain management and lack of criteria for pain management in quality improvement initiatives (National Institute of Nursing Research, 1994). Specifically, the structure of the nursing unit has been shown to be important to the management of pain because it can either facilitate or hinder effective pain management (Foster, 1991; Hester, Miller. Foster & Vojir, 1997; Miller, 1994). However, the nature of the relationship between organizational structure and symptom management has been difficult to
capture because much of the research has failed to consider the nursing unit as a complex entity in which multiple interrelationships exist between characteristics of the nursing unit, such as the size of the unit, nurse staffing, and the complexity of the work on the unit and structural mechanisms, such as the participation in decision making that underpins professional nursing practice, that are needed to achieve effective symptom management for patients.

One study by Bacon and colleagues (Bacon, Hughes & Mark, 2009) utilized such a comprehensive approach when they tested a structural contingency theoretical model of the relationships of hospital context, nursing unit structure, and patient characteristics to patients’ perceptions of the extent to which nurses met their expectations for management of a range of troubling symptoms. These researchers found that when structural mechanisms facilitating professional nursing practice (autonomy, participation in decision making and collaboration with other health providers) were present on the nursing unit patient symptom management was significantly positively impacted (Bacon et al, 2009). This study will focus on the effects of one of these structural supports - nurses’ participation in decision making - on nurses’ ability to effectively manage patient symptoms.

Context, Work Complexity and Decentralized Decision Making

To explore the relationship between nursing unit context, work complexity and the structural mechanisms needed to achieve effective symptom management for patients the following is proposed: the size of the nursing unit is an important contextual characteristic because unit size (number of beds and number of nursing staff) determines the work volume through the number of patients that are admitted to the unit. As work volume - more
patients - increases there is increased uncertainty due to the need for new information about
the additional patients, increased unpredictability due to inability to predict when new
admissions will arrive (Argote, 1982) and increased requirements for control and
coordination (Ford & Slocum, 1977). As the number of patients increase, the number of
nursing staff needed to care for them also is expected to increase. Increased unit size thus
results in increased work complexity and this increased complexity then affects how
decisions are made on the nursing unit. With increased complexity, there is also an increased
need to control and manage the inputs - patients (Ford & Slocum, 1977). When decisions
focused on patient care are required, decentralized methods of decision making may
maximize nurses' flexibility and discretion (Argote, 1982), and may lead to improved
symptom management. In addition, when nurses participate in decision making they may
have more control over their work and may be more effective in the care of their patients,
including symptom management (Mark, Salyer & Wan, 2003; Mark, Hughes, Belyea, Chang,
Hoffman, Jones & Bacon, 2007). In this manner nurses contribute to unit organization and
functioning which then impacts their ability to care for patients including management of
troubling symptoms.

Research Questions

Despite the key role that hospital nurses play in monitoring symptoms and acting to
ensure that they are resolved, their contributions to the management of patients’ symptoms
during hospitalization are not well understood. Further, the size of nursing units may present
previously unrecognized challenges to nurses' ability to effectively manage patients'
symptoms. Finally, although the positive effects of nurse participation in unit level decision
making on nurse outcomes has been well documented, its relationship to management of
patient symptoms has not been well documented. This research aims to fill these gaps by exploring these relationships. The conceptual model for this dissertation is noted below in Figure 1. This model will be described in detail in the next chapter.

Figure 1: Dissertation Conceptual Model

Based on this conceptual model, the following research questions are proposed:

1) What is the impact of size on work complexity on medical-surgical units in acute care hospitals?

2) What is the impact of work complexity on participation in decision making on medical-surgical units in acute care hospitals?

3) What is the impact of participation in decision making on patient symptom management on medical-surgical units in acute care hospitals?
Chapter Summary

In this chapter, the need to investigate organizational effects on patient symptom management was described. Before such research can be conducted, however, it is important to develop a theoretically meaningful understanding of the link between unit size, work complexity and nurses' participation in decision making and patient symptom management.

In Chapter 2, the research model for this study will be introduced along with identification of the research hypotheses that will be tested in this study.
CHAPTER 2 THEORETICAL FOUNDATION

UTILIZING STRUCTURAL CONTINGENCY THEORY TO INVESTIGATE ORGANIZATIONAL INFLUENCES ON PATIENT SYMPTOM MANAGEMENT

Symptom distress is widespread and poorly controlled in hospitalized patients (Kris & Dodd, 2004; Kroeneke et al, 1999). As discussed in the previous chapter, there may be certain organizational factors on the nursing units that influence the extent to which nurses can effectively manage patients' symptoms. One of the factors affecting nurses' capacity to deliver care is the size of the nursing unit. Unit size determines work volume through the number of patients that are admitted to the unit and the number of nursing staff required to care for them. As the size of the units increases there is increased uncertainty due to the need for new information about additional patients and unpredictability due to inability to predict when new admissions will arrive (Argote, 1982) necessitating increased information processing among nurses on the unit (Galbraith, 1974). Increases in unit size are also associated with tighter administrative control, increased task differentiation and increased bureaucratization (Blau, 1970; Blau & Schoenerr, 1971) suggesting that on units with more nurses there is a greater need for control and coordination of work activities and that a larger proportion of unit activity may be allocated to administrative duties at the actual or perceived expense of direct patient care, (Alexander, 1984) particularly the effective management of patient symptoms. Increased numbers of patients and nurses leads to increased complexity of patient care and the need for frequent interactions among team members (Kozlowski, Gully, Nason & Amith, 1999; Olson & Teasley, 1996) reflecting the need for structures, particularly
participation in decision making, that support increased information processing among nursing staff to effectively manage patient symptoms (Galbraith, 1974).

One organizational theory that focuses on the relationships among context (in this case, unit size and the complexity of patient care), how work is organized (in this case, participation in decision making) and organizational effectiveness (in this case, management of symptom distress) is Structural Contingency Theory (SCT). SCT arose in the mid-twentieth century as a direct challenge to the classical management perspective that assumed that an ideal organizational structure could be identified and universally applied to all organizations in order to achieve the best possible performance. Structural contingency theory emerged as a paradigmatic shift in the ideas governing how researchers and managers thought about organizational structure. Instead of a single approach to organizational structure, organizations began to be described as open systems that interact with the context in which they functioned and in which structures were expected to vary depending on their particular context (Child, 1975).

Lawrence and Lorsch (1967) are credited with the "contingency theory" label which has two core assumptions. The first is that there is no single best way to structure or organize the work in an organization. This rejects the assumption of a single best approach to structuring work assumed by classical management theorists. The second assumption of structural contingency theory is that different approaches to organizational structure are not equally effective (Donaldson, 2001; Galbraith, 1973; Scott, 2003). This rejects the classical argument and suggests that multiple structures can be effective as long as they are matched to

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1 For the purposes of this dissertation, when describing SCT/Galbraith's theory, use of the word "organization" is intended to mean "nursing unit."
the contextual contingencies faced by the organizations in which they operate (Betts, 2003; Ford & Slocum, 1997; Galbraith, 1973; Ifinedo, 2007; Ifenido & Nahar, 2006; Peterof & Reed, 2007; Scott, 2003; Shafritz & Ott, 1996; Tosi & Slocum, 1984; Weill & Olsen, 1989; Zott & Amit, 2007). SCT theorists further assert that certain structural forms may work in some contexts but not work in others because structural forms and context must match in order for optimal performance to be achieved. The major relationships examined in contingency theory are diagrammed in Figure 2.

Figure 2. Key Concepts in Structural Contingency Theory

<table>
<thead>
<tr>
<th>CONTEXT</th>
<th>STRUCTURE</th>
<th>EFFECTIVENESS</th>
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<tbody>
<tr>
<td>Environment</td>
<td>Structure</td>
<td>Organizational Effectiveness</td>
</tr>
<tr>
<td>Technology</td>
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Technology has been defined as the nature of the raw materials (i.e. the complexity of patients' care) and how the work (i.e. nursing care) is structured to transform these raw material inputs (hospitalized patients) into completed outputs (discharged persons) (Alexander & Bauerschmidt, 1987; Donaldson, 2001; Lawrence & Lorsch, 1967; Thompson, 1967). According to SCT, both the organization's environment and its technology are critical
determinants of its structure, with structure defined as the administrative mechanisms that are used to coordinate, organize and control work activities (Donaldson, 2001; Jackson & Morgan, 1986). Structure is a key factor in determining how information is communicated both within and outside the boundaries of the organization, how and by whom decisions are made, and how the production of goods or services is divided among workers (Ambrose & Schminke, 2003; Hollenbeck, Moon, Ellis, West, Ilgen et al., 2002; Pugh, Hickson, Hinings, & Turner, 1968). Effectiveness has no widely agreed upon conceptual definition in SCT, however, it is often discussed in terms of organizational performance as the achievement of desired goals or results (Donaldson, 2001).

**Context**

*Environment*

Context incorporates both the environment and technology of the organization. Environment has been defined as the factors or inputs that are both within and beyond the boundaries of the focal organization (i.e. the nursing unit) that have the potential to influence the way the organization is structured and determines how work is completed. Although SCT distinguishes an external environment from an internal environment, it is the nursing unit's internal environment that is the focus of this study. The internal environment is composed of factors within the boundaries of the nursing unit that affect its functioning. The internal environment at the nursing unit is seen as especially relevant since it is the level at which the transformation of inputs to outputs occurs (i.e. nursing care to patients). For this reason, the internal environment is recognized as a source of contingencies that are relevant to structure and, ultimately, performance (Duncan, 1972; Lawrence & Lorsch, 1967; Leatt & Schneck, 1982; Stoelwinder & Charns, 1981).
Size

The size of the nursing unit is an important environmental contingency because the size (defined in this study as the number of beds and the number of nursing staff) determines work volume through the number of patients that are admitted to the unit. As work volume - more patients - increases there is increased patient activity and turnover (Unruh & Fottler, 2006) and an increased need for new information about the additional patients (Argote, 1982). As the number of patients increase, the more likely there is to be patient turnover as evidenced by transfers in and transfers out of the unit as well as patient transfers to and from diagnostic and interventional procedures (Unruh & Fottler, 2006). These transfers are highly labor intensive and increase the need for information sharing among nurses in order to coordinate these patient care activities. They also may divert time and attention away from the nurse's ability to respond to patients' needs for symptom relief. There may be increased need for information processing which may be best managed through participation in decision making among the nurses (Galbraith, 1974) because when nurses are involved in decisions about patient care they can more easily coordinate and control patient care activities (Comstock & Scott, 1977) and may be better able to manage patient symptoms as a result.

Large volumes of patients may also lead to competing demands for nurses' time and attention because the potential for more patients who might experience a change in condition increases as volume increases. When such changes occur, the nurses are faced with providing care in the midst of competing priorities (Ebright, 2010; Cook & Woods, 1994). For example, a nurse may be caring for a patient with acute anxiety who is distraught about their
diagnosis and threatening to leave the hospital against medical advice, while another patient simultaneously calls for assistance to deal with a sudden onset of severe pain. Or a nurse may be asked to accept a new admission while in the process managing acute nausea in a post-operative patient, while a new graduate nurse concurrently seeks her assistance to manage the unanticipated decision to discharge a patient two days earlier than planned to make room for another new admission. In such instances, nurses' participation in decision making may assist the nurses to better manage the needs of their patients because they can more easily coordinate and prioritize the job tasks that must be carried out in the face of competing demands.

As diagrammed in the Figure on page 3, traditional interpretations of SCT consider the environment and size to be co-occurring factors independently affecting the organization’s structure. However, an argument can be made that the key environmental variable in this study – unit size – actually affects the complexity of work on nursing units (the technology). Thus, increased size influences work complexity through its affects on patients and the nursing care that they require.

Unit size is also determined by the number of nurses required to care for the patients residing on the unit. As the number of patients increases, it is expected that the number of nurses will also increase in order to maintain effective levels of staffing. Most prior research has defined nurse staffing as the ratio of registered nurses to total nursing staff or hours of care delivered to patients (Mark, 2001). Larger numbers of nurses on nursing units has been associated with improved patient outcomes in a number of studies, for example, a recent study found that higher numbers of registered nurses was associated with
lower 30-day patient mortality (Estabrooks, Midodzi, Cummings, Ricker & Giovannetti, 2011).

Research over the last decade suggests that the creation and maintenance of effective nursing teams is more complicated on larger nursing units with more nurses. While larger teams may provide more efficient, cost-effective care (Barry-Walker, 2000), as the number of nurses increases there are more likely to be communication barriers that arise due to the increasing complexity and the larger number of coworkers that nurses need to interact with (Kalisch & Begeny, 2005; Kalisch & Lee, 2011) as they carry out their job tasks. Large team size may make it more difficult to achieve the high level of teamwork required as work complexity increases (Kalisch & Begeny, 2005) and nurses may be less satisfied with their jobs (Mark, Salyer & Wan, 2003). In nursing units with more nurses there have been higher reported levels of intragroup conflict (Cox, 1997; Cox, 2001) however, the association between intragroup conflict and large numbers of nurses can be buffered by nurses’ perceptions of unit morale and interpersonal relationships. This suggests that units with large number of nurses can minimize conflicts and communicate effectively when nurses participate in decision making as this can be perceived as one aspect of a supportive peer-work group environment. Participation in decision making may increase nurse job satisfaction on these larger units and may in turn promote effective patient symptom management.

When there are more patients on the nursing unit work complexity is expected to increase because more frequent patient transfers and multiple competing patient demands increase the requirements for their nurses to control and coordination their care (Ford & Slocum, 1977). When there are more nurses on the nursing unit work complexity is expected
to increase because it becomes increasingly challenging for larger groups of nurses to effectively communicate and coordinate the work - patient care - that needs to be carried out on the unit (Smith, Smith, Olian, Smis, O'Bannon & Scully, 1994). This suggests a relationship between unit size and work complexity with increased size likely to result in increased work complexity.

Consistent with this argument, the following hypothesis is proposed:

**Hypothesis 1:** As unit size (the number of beds) increases, work complexity will increase on nursing units.

**Hypothesis 1 A:** As unit size (the number of nurses) increases, work complexity will increase on nursing units.

Increased work complexity affects nurses' capacities to process the information needed to effectively carry out the transformation process in which their patients become discharged persons (Alexander & Bauerschmidt, 1987). Nurses will then have an increased need for information processing which can best be obtained through their participation in decision making (Galbraith, 1973) which will then allow them to more easily coordinate and control patient care activities on the nursing unit. Thus, given the argument that unit size can affect unit technology, the figure is redrawn as:
Technology

Alexander and Bauerschmidt (1987) define nursing technology as the acts employed by nurses to change the status of an individual from hospitalized patient to a discharged person. This is consistent with SCT which conceptualizes technology as the work or tasks to be carried out by the organization (Burns and Stalker, 1961; Lawrence & Lorsch, 1967; Perrow, 1967; Thompson, 1967) and is further specified as the actions that an individual performs upon an object, referred to as raw materials, within an organization in order to make some change in that object (Perrow, 1967). Therefore, nursing technology can be further specified in terms of both the raw materials - patients - and the transformation process - the nursing care required to transform these patients. Using a framework developed by Perrow (1967) and later applied to nursing work, (Alexander & Bauerschmidt, 1987; Alexander & Kroposki, 2001; Mark & Hagenmueller, 1994; Overton, Schneck & Hazlett,
1977) researchers describe three dimensions that depict the nature of nursing technology: uncertainty, instability and variability. These dimensions are illustrated below in Table 1. The discussion that follows will focus first on the nature of the raw materials - the patients - and then the nature of the transformation process - the nursing care - as they relate to uncertainty, instability and variability.
Table 1

*Dimensions of Technology*

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology in general</td>
<td></td>
</tr>
<tr>
<td>Technological Uncertainty</td>
<td>Lack of knowledge or information about the raw material to be transformed in the process of work (Perrow, 1967)</td>
</tr>
<tr>
<td></td>
<td>Absence of information about work (Daft &amp; Lengel, 1986)</td>
</tr>
<tr>
<td></td>
<td>General lack of knowledge about cause-effect relationships (Duncan, 1972; Lawrence &amp; Lorsch, 1967)</td>
</tr>
<tr>
<td></td>
<td>An inability to assign probabilities as to the likelihood of future events (Duncan, 1972; Pennings, 1981; Pennings &amp; Tripathi, 1978; Pfeffer &amp; Salancik, 1978)</td>
</tr>
<tr>
<td></td>
<td>An inability to predict accurately what the outcomes of a decision might be (Downey &amp; Slocum, 1975; Duncan, 1972; Hickson, Hinings, Lee, Schneck, &amp; Pennings, 1971; Schmidt &amp; Cummings, 1976).</td>
</tr>
<tr>
<td>Technological Instability</td>
<td>Degree to which raw materials and transformation processes present unexpected exceptions for workers (Comstock &amp; Scott, 1977)</td>
</tr>
<tr>
<td></td>
<td>Unpredictable change in work (Milliken, 1987)</td>
</tr>
<tr>
<td>Technological Variability</td>
<td>Extent that the transformation of raw materials can be standardized or require continual adjustment (Perrow, 1967)</td>
</tr>
</tbody>
</table>
Table 1 (continued)

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Definitions</th>
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<tbody>
<tr>
<td>Number of exceptional cases encountered in the work requiring different methods or procedures for doing the work (Van de Ven &amp; Delbecq, 1974)</td>
<td></td>
</tr>
<tr>
<td>Stability or uniformity of inputs and outputs (Hickson et al., 1971; Thompson, 1967)</td>
<td></td>
</tr>
<tr>
<td>Degree to which workers must engage in multiple tasks (Alexander &amp; Randolph, 1985; Overton et al., 1977)</td>
<td></td>
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<tr>
<td>Diversity of inputs (Rousseau, 1983)</td>
<td></td>
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</table>

**Technology in Nursing - Raw Materials (Patients)**

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainty</td>
<td>Degree to which there is insufficient knowledge about the raw materials (patients) (Overton, Schneck, and Hazlett, 1977)</td>
</tr>
<tr>
<td></td>
<td>Patients with more than one diagnosis and complex nursing problems (Leatt &amp; Schneck, 1981)</td>
</tr>
<tr>
<td>Instability</td>
<td>Unpredictability arising from changes in each patient's condition (Overton, Schneck, and Hazlett, 1977)</td>
</tr>
<tr>
<td></td>
<td>Degree of unpredictable fluctuations in raw materials - patients (Leatt &amp; Schneck, 1981; Overton, Schneck, and Hazlett, 1977)</td>
</tr>
<tr>
<td></td>
<td>Frequency and magnitude of moment-to-moment changes in patient conditions (Mark &amp; Hagenmueller, 1994; Mark, Sayler &amp; Smith, 1996)</td>
</tr>
</tbody>
</table>
### Table 1 (continued)

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Definitions</th>
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<tbody>
<tr>
<td><strong>Patients who require frequent nursing observation and attendance, highly specialized technical monitoring, and/or might require emergency procedures</strong> <em>(Overton, Schneck, and Hazlett, 1977)</em></td>
<td></td>
</tr>
</tbody>
</table>
| **Variability** | Unpredictability arising from variations among patients *(Overton, Schneck, and Hazlett, 1977)*  
Extent to which patients have multiple, different problems *(Leatt & Schneck, 1981)* |

**Technology in Nursing - Nurses’ Work**

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Definitions</th>
</tr>
</thead>
</table>
| **Uncertainty** | Inability to attribute specific cause and effect relationships between nurses' work and its outcomes *(Mark, Sayler & Smith, 1996)*  
Difficulty in identifying a clear and consistent relationship between a particular nursing action and a specific patient outcome *(Mark & Hagenmueller, 1994)*  
Probability of achieving intended patient outcomes when there is insufficient knowledge about patients *(Overton, Schneck, and Hazlett, 1977)*  
Extent to which lack of information about patients leads to complex patient problems, difficulty in nurses' problem solving and changes in nursing care related to discerning patient needs *(Leatt & Schneck, 1981)* |
<table>
<thead>
<tr>
<th>Concepts</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree to which nurses' work is difficult to understand or complex (Alexander &amp; Bauerschmidt, 1987)</td>
<td>Instability</td>
</tr>
<tr>
<td>Degree to which nurses are required to deal with increased frequency and magnitude of moment-to-moment changes in patient conditions (Mark, Sayler &amp; Smith, 1996)</td>
<td>Extent to which nursing observations and interventions are required due to unpredictable changes in patient conditions (Leatt &amp; Schneck, 1981; Overton, Schneck &amp; Hazlett, 1977)</td>
</tr>
<tr>
<td>Degree to which unpredictable fluctuations in patients leads to unpredictable fluctuations in work techniques and practices (Alexander &amp; Bauerschmidt, 1987)</td>
<td>Variability</td>
</tr>
<tr>
<td>Degree to which nurses are required to deal with patients who have diverse health problems (Mark, Sayler &amp; Smith, 1996)</td>
<td>Extent to which differences in types of patient leads to differences in nursing tasks performed (Alexander &amp; Bauerschmidt, 1987)</td>
</tr>
<tr>
<td>Unpredictability arising from the nursing care needs of large varieties of patients (Overton, Schneck, and Hazlett, 1977)</td>
<td>Extent to which large variety in patients' problems affect nurses' decisions and problem solving related to their patients (Leatt &amp; Schneck, 1981)</td>
</tr>
</tbody>
</table>
Uncertainty is concerned with knowledge. Uncertainty arises when there is a lack of knowledge or information about the raw material to be transformed during the work process (Perrow, 1967). Typically, this lack of knowledge refers to a general lack of knowledge rather than a specific individual's learned knowledge. Uncertainty with respect to patients focuses on the degree to which there is insufficient knowledge about them (Overton, Schneck & Hazlett, 1977) which leads to difficulty in identifying a clear and consistent relationship between nursing actions taken to deal with specific patient problems and the resultant outcomes (Mark & Hagenmueller, 1994). Further, because patients with high levels of uncertainty tend to possess more than one diagnosis and complex nursing problems (Leatt & Schneck, 1981) it can be difficult for nurses to discern and prioritize their needs.

Perrow (1967) defines instability in terms of whether the raw materials can be treated in a standardized fashion. If the materials have a high degree of instability they are perceived as non-routine or non-standardized. Nursing researchers further define instability with respect to patients as a situation where patients' needs are often changing (considered non-routine by Perrow) because they possess unpredictable fluctuations and shifting needs that often do not follow a typical pattern or trajectory (Alexander, 1996). When changes in patients' conditions are frequent and of high magnitude, they are considered to present with a high level of instability (Mark, Slayer & Smith, 1996). Discerning patients' needs when there are unpredictable and changing needs is challenging for nurses because it will be difficult for nurses to understand the needs of their patients and how best to treat them. Therefore, when patient instability is high on the nursing unit it may be more difficult to manage patient symptoms when they arise.
Variability in terms of patients refers to differences among patients which is measured by the degree to which patients exhibit different problems that lead to the application of many nursing techniques (Alexander & Bauerschmidt, 1987). According to Perrow, organizations uniformly seek to standardize their raw materials to minimize exceptional situations (1967). Hospitals generally try to do this by grouping patients in a manner so that their clinical needs are similar, for example patients are placed in nursing units according to clinical diagnoses and specialty, and their care is organized in a standard manner when possible through protocols or care pathways that map standard courses of treatments for specific diagnoses or procedures. However, when patients are placed in units where they typically do not receive care, such as when hospital occupancy is high, exceptional situations will be more likely because nurses will be unfamiliar with the standards of care required by these patients.

Large numbers of patients on the nursing unit may increase the likelihood that there will be a large differences in the patients and thus there will be a high variety in patient needs (Alexander, 1996). When patients needs vary highly it may be more difficult for nurses to assess, monitor and treat their needs because they may not be as familiar with the wide variety of needs that they must meet. As a result, when patient variability is high it may be more difficult for nurses to make decisions that best meet patients' needs for management of their symptoms.

Work complexity

In the present study, the work to be completed by the organization is the delivery of patient care by nurses within hospital nursing subunits. When patients - the raw materials -
are uncertain, unstable and variable, the work of providing care can be described as complex.
When patients are uncertain there is insufficient knowledge for nurses to transform them
from hospitalized patients to discharged persons. Thus, patient uncertainty leads to
uncertainty in nurses' work because nurses are responsible for carrying out the
transformation process. When nurses' work is uncertain, there is an inability to attribute
specific cause and effect relationships between nurses' work and its outcomes - this means
that nurses are unclear how their nursing actions might affect patients' abilities to achieve
their goals i.e. symptom relief. Moreover, it is not only the existence of uncertainty that is
important, but the amount as well, because when there is extensive uncertainty about patients'
needs, it is more likely that patients' problems will be complex (Leatt & Schneck, 1981),
which makes nurses' problem solving more difficult. Further, because uncertain patients
have uncertain needs, nurses are challenged in determining the care that they will provide in
order to best meet patients' needs (Leatt & Schneck, 1981). For example, when atypical or
"off-service" patients are placed on the nursing unit, or when unexpected admissions occur,
nurses may be unfamiliar with the specific needs of such patients. Nurses may lack
information about the clinical course that these patients are expected to follow, they may
struggle to find the most effective treatment for a patient's problem and they may not be as
apt to anticipate and respond to symptoms that might occur. Thus, patient uncertainty may
lead to increased uncertainty and complexity in nurses work (Alexander & Bauerschmidt,
1987) because nurses must frequently revise their plan of care, determine alternate treatment
options and mobilize the treatment team to achieve effective patient outcomes.

When patients are unstable their needs change frequently and in an
unpredictable manner. When patients are unstable, nurses' work becomes increasingly
challenging because nurses must care for patients in the midst of frequently changing patient conditions. When patients' needs change from moment-to-moment, nursing care changes from moment-to-moment. The more unpredictable the changes, the greater the extent of nursing observations and interventions that are required (Leatt & Schneck, 1981; Overton, Schneck & Hazlett, 1977). In such situations, nurses may have little time to gather and process the information needed to make effective patient care decisions, and must act quickly to determine the best plan of action for their patients. When patients are unstable they may experience problems that are both sudden and acute and need immediate attention. In such situations, this affects nurses' abilities to meet patients' needs because they must provide their care in the midst of competing priorities for multiple patients. For example, a nurse may be caring for a patient with onset of acute anxiety who is distraught about their diagnosis and threatening to leave the hospital against medical advice, while another patient simultaneously calls for assistance to deal with a sudden onset of severe pain, while a nurse colleague seeks assistance in planning the best course of action for a patient who has experienced a sudden fall. Instability in nursing work increases the complexity of the job tasks that nurses must carry out and may make it more challenging for them to meet the needs of their patients.

When patients are highly variable the extent to which patients have multiple, different problems is high (Leatt & Schneck, 1981) and there is a high degree of unpredictability in determining their needs because of the variations among the patients (Overton, Schneck & Hazlett, 1977). When patients are highly variable, nurses' work becomes more demanding because nurses must deal with patients who have diverse health problems (Mark, Sayler & Smith, 1996), perform many diverse tasks depending on the diversity of patient problems (Alexander & Bauerschmidt, 1987) and deal with the increasing unpredictability of patient
care needs that arise when there are large variety of patients (Overton, Schneck & Hazlett, 1977). Further, when there is a large variety in patients there will be a large variety in patients' problems that must be addressed which will affect nurses' decision making and problem solving abilities (Leatt & Schneck, 1981).

When patient variability is high, it will be more challenging for the nurses to be fully knowledgeable about each patients' specific needs because they may not be as familiar with the care that they need. When there is high variability in work, a high level of worker expertise and participation in decision making is needed in order to achieve effectiveness (Randolph & Finch, 1977; Schoonhoven, 1981) so that workers can obtain the knowledge they require to carry out their job tasks. Therefore, as nursing work becomes more complex, there is an increased need for information processing among nurses in order to perform patient care tasks (Galbraith, 1974; Kozlowski et al, 1999; Olson & Teasley, 1996; Salvador, Scholtz & Larson, 1996; Weick, 1976).

Complexity in nursing work has important implications for the information processing requirements (the amount of information that has to be processed between decision makers during execution of tasks) at the subunit level and therefore for the structural form that is most likely to result in unit effectiveness (Galbraith, 1974). The greater the work complexity, the greater the amount of information that must be processed among decision makers (nurses) during patient care in order to achieve effective symptom management. This suggests that work complexity increases the need for participation in decision making. Thus, unit size contributes to the increased complexity of nursing work and influences the structure that supports the work, which in turn, may influence the effectiveness of symptom management for patients.
In summary, the raw materials - patients - present as uncertain, unstable and variable, contributing to the complexity of nursing work which then necessitates high levels of collaboration and information sharing among team members (McGrath, 1991; Sundstrom, deMusee& Futrell, 1990). This argument is supported in SCT as Galbraith (1974) asserts that the greater the complexity of work, the greater the amount of information that must be processed among decision makers during task execution in order to achieve a given level of performance. Greater information processing capacity is obtained through nurses' participation in decision making.

**Structure**

*Participation in Decision-making*

SCT defines structure as the administrative mechanisms that are used to coordinate, organize and control work activities (Donaldson, 2001; Jackson & Morgan, 1986). Determining the appropriate structure for an organization is dependent upon the demands placed upon it by the organization's context, i.e. its environment and technology. As previously discussed, the complexity of nursing work requires high levels of participation in decision making to achieve effective symptom management. This is because the raw materials - patients - are uncertain, variable and unstable which makes care of them complex, and when work - the transformation process achieved through nursing care - is complex, more information needs to be shared among members of the work team - nurses.

Participation in decision making, described as horizontal participation by some researchers (Alexander, 1984; Pugh et al, 1968) refers to the practice of managers allowing subordinates to be involved in decision making and problem solving in their work groups (Wagner, 1994). When nurses participate in the decisions involving the care of their patients
they are better positioned to quickly gather the information needed to more fully understand patients' problems and assemble a plan to treat them. This increases their knowledge about patients' specific needs which may make them more apt to pick up on subtle changes in their conditions. In this manner then, symptoms may be detected earlier in a patient's clinical course when they may be more easily treatable as opposed to later in a clinical course when they may be more difficult to treat. Therefore, nurses' participation in decision making may influence nurses' ability to manage the increasing complexity that results from increasing numbers of patients on the nursing unit. For example, when nurses are involved in designing nurse-patient assignments they can more quickly mobilize the resources needed to make changes to these assignments because they understand the assignment making process. In such a situation, when one nurse's patient develops an acute problem requiring immediate attention, the other nurses can quickly assemble an on-the-spot plan that temporarily disperses the care of that nurse's other patients among her nurse colleagues so she can deal with the immediate problem at hand. If nurses had not been allowed to participate in how such decisions were made there could be a delay in getting patient care needs met, such as management of their troubling symptoms, as they sought a supervisor to assist them in this process.

Increased size and work complexity affects the need for decision making in the work unit. As size increases there is a increased need to control and manage the inputs (Ford & Slocum, 1977). This is particularly true in the case of nonprogrammed decisions (complex and novel decisions) which characterize patient care as contrasted to programmed decisions (those that are repetitive and routine). When more nonprogrammed decisions are required, decentralized methods of decision making, such as nurse participation in decision making,
are needed to maximize the flexibility and discretion with which nurses can make decisions (Argote, 1982).

It is the assertion of this study that the complexity of nursing work necessitates high levels of information sharing among nurses in order to facilitate the complex decision making that occurs. The mechanism hypothesized to best accomplish this in the nursing unit is to increase the capacity to process information and bolster the information sharing process among the nurses on the nursing unit and between levels of the nursing unit hierarchy (Galbraith, 1973). Nurse participation in decision making should maximize the information that nurse have available to them, reducing the uncertainty that is in part caused by fluctuations and increases in patient volumes, and thus exert more control over their work which will in turn allow them to provide more effective care for patients through better management of their troubling symptoms. This is supported by research conducted by Jirathummakoon (2004) which found that on nursing units where nurses felt they influenced decision making about patients' pain, patients had shorter lengths of stay, suggesting that patients' were able to be discharged more quickly because their pain was better managed. In light of these arguments the following hypothesis is proposed:

**Hypothesis 2**: As work complexity increases, nurses participation in decision making will increase.

**Effectiveness**

Effectiveness is often discussed in terms of organizational performance as the achievement of desired goals or results (Donaldson, 2001). In this study, effectiveness is conceptualized as the degree to which nurses met patients' expectations for symptom
management during hospitalization. Symptoms can be defined as subjective experiences in
the biophysical functioning, sensations or cognition of an individual (Dodd, et al, 2001). The
symptoms most commonly experienced by patients during hospitalization include nausea,
pain, difficulty sleeping, headache, mobility issues, and lack of energy (Kris & Dodd, 2004;
Kroenke et al., 1999; McCorkle & Young, 1978; Tranmer et al., 2003). Symptom distress is
widespread in hospitalized patients (Kris & Dodd, 2004) and symptom relief is often
ineffective because symptoms persist at hospital discharge in up to 50% of patients
(Kroeneke et al, 1999). Management of troubling symptoms is important to patients and
meeting expectations for symptom relief has been identified as a strong predictor of patient
satisfaction (Jackson, Chamberlin, & Kroenke, 2001; Kroenke et al, 1999). Hospitalized
patients who have persistently severe symptoms tend to be less satisfied with their care than
patients who experience improvement in symptom severity (Desbiens et al., 1996; Jackson et
al., 2001; Kroenke et al.,1999). Because of nurses' direct care roles, symptom management
can be directly attributable to the care that nurses provide. An important component of
patient's perceptions of their symptoms involves how well they are treated and the effects of
these symptoms on their lives (Dodd et al, 2001). If nurses are effectively responding to
patients' symptoms then patients are expected to have positive perceptions regarding
management of their symptoms.

This study hypothesizes that symptom management is a measurement of
effectiveness. Previous research indicates that hospitalized patients are more likely to state
that their expectations for symptom management were met on subunits where the nursing
workgroup reported better work conditions (Bacon, Hughes & Mark, 2009). A primary
component of these working conditions is nurses' participation in decision making. When
nurses participate in decisions at the unit level, they increase the capacity to process information. This is because information is collected at the point of origin - the nursing unit - and can be directed quickly to dealing with the immediate problems at hand. Joint planning and problem solving is also facilitated which fosters lateral relationships among nurses on the unit (Galbraith, 1974). Enhanced and expedited information sharing and decision making should make it easier for nurses to mobilize the resources necessary to better anticipate and manage patients' troubling symptoms. Therefore, the following hypothesis is proposed:

**Hypothesis 3:** As nurses' participation in decision making increases, patients will report better management of their symptoms.

**Theoretical Model**

Achieving effective management of patient symptoms in hospitals will depend on identification of nursing unit structures that are best suited to the technological contexts in which nursing units operate. The role of unit size as it affects work complexity and the effect of work complexity on nurses' participation in decision making and effective management of patient symptoms needs further study. This research aims to investigate these interrelationships utilizing the theoretical model detailed below in figure 4.
Of note in this theoretical model is the representation of the contextual factors as they relate to structural contingency theory. Traditional SCT generally discusses the contextual components of environment and technology separately with environment drawn above technology as was depicted earlier in figure 2 (see page 13). While traditional SCT acknowledges that these contextual factors are important determinants of the structure adopted by the organization, a weakness of the theory is that it doesn't discuss how environment and technology may be related. In the present study, the proposed research examines a model in which environmental contingencies lead to technological contingencies that the organization must structure itself for. In this model, size leads to work complexity which leads to participation in decision making which then impacts the way in which patients' symptoms are managed in the nursing unit.
In summary, the hypotheses to be tested in this study are:

**Hypothesis 1**: As unit size (the number of patients) increases, work complexity will increase on nursing units.

**Hypothesis 1A**: As unit size (the number of nurses) increases, work complexity will increase on nursing units.

**Hypothesis 2**: As work complexity increases, nurses' participation in decision making will increase.

**Hypothesis 3**: As nurses' participation in decision making increases, patients will report better management of their symptoms.

**Chapter Summary**

In this chapter, Structural Contingency Theory was presented as the theory that will be used to investigate organizational influences on patient symptom management. Hypotheses were developed and the research model was described. In chapter 3, a synthesis of the literature addressing the variables in the research model developed for this study will be presented.
CHAPTER 3 REVIEW OF THE LITERATURE

THE IMPORTANCE OF SYMPTOM MANAGEMENT IN PATIENT CENTERED CARE

When health care organizations are structured in a patient-centered manner, research indicates that patient outcomes are improved. For example, patient-centered communication has enabled patients to gain common ground with their physician, improve their health status and increase the efficiency of their care (Jayadevappa & Chhatre, 2011; Stewart, Brown, Doner, McWhinney, Oates et al, 2000; Wanzer, Booth-Butterfield & Gruber, 2004). Patient-centered nursing interventions are characterized by responsiveness, individualization, coordination and proficiency (Lauver, Ward, Heidrich, Keller, Bowers et al, 2002; Ward et al, 2002; Radwin, Alster & Rubin, 2003; Radwin, Cabral & Wilkes, 2009). When nursing interventions for hospitalized patients are structured to provide patient centered care, patients report increased trust in nurses, an improved sense of well-being and increased optimism in their prognosis (Radwin et al., 2009; Zambroski, Moser, Bhat & Ziegler, 2005). Given that nurses are principally responsible for the direct care that patients receive in hospitals, it is important that nursing care - particularly the management of patient symptoms - be delivered in an patient-centered manner.

Effective management of symptoms is important to the health status of individuals and populations. This is strikingly illustrated through research examining the prevalence of symptoms which finds that distressing physical symptoms account for more than half of all
health care visits (Kroeneke, Zhong, Theobald,Wu, Wanzhu & Carpenter, 2010) and several symptoms, including back pain, fatigue and dizziness, are strongly associated with functional impairment (Gatchel, Ricard, Brede & Howard, 2009; Hung, Krebs, Coups, Feinstein, Park, Burkhalter & Ostroff, 2011; McCaslin, Jacobsen, Grantham, Piker & Verghese, 2011). However, despite the fact that symptom distress is pervasive and many studies, particularly those related to pain, have been conducted during the past two decades, research in symptom management remains fragmented. Most research has focused primarily on specific groups, most often cancer patients, and patients' experiences outside the hospital. Research examining patients' symptom management experience in hospitals has been limited leaving a lack of complete information about its predictors, prevalence, severity, contributing factors, and relationship to patient and other outcomes.

**Symptom Management in Hospitals**

Symptoms at the time of hospitalization are an important diagnostic tool and an indicator of the likely course of the hospital stay (Kroenke et al, 1999; McGaughey, Alderdice, Fowler, Kapila, Mayhew et al, 2007; Ng, Niti, Tan, Cao, Ong et al, 2007). Management of patient symptoms while hospitalized is also important to patient outcomes as it is a critical indicator of patient satisfaction with the care that they receive (Bacon et al, 2009; Bacon & Mark, 2009). Research examining symptoms of hospitalized patients gained momentum in the last decade with studies focusing on the frequency and persistence of symptoms from admission to discharge (Kroeneke et al, 1999) and symptom burden (Desbiens et al, 1999; Goodell & Nail, 2005). Researchers have learned that hospitalized patients do not tend to suffer from single symptoms such as pain, rather they suffer more often from symptom clusters related to their illness or treatments (Desbiens, et al, 1999;
Walsh & Rybicki, 2006). For example, patients with pulmonary edema often suffer from pain, dyspnea and nausea. Overall, however, the most distressing symptoms reported by patients in hospitals include pain, nausea, fatigue and shortness of breath (Goodell & Nail, 2005).

Kroeneke and colleagues (1999) studied the presence and severity of 11 physical symptoms upon admission to the hospital for 2,100 inpatient medicine patients. These symptoms (prevalence noted next to symptom when included in the researcher's data) were fatigue (80%), dyspnea, (60%), cough (51%), dizziness (51%), headache (47%), chest pain (46%), nausea (43%), chills, edema, diarrhea and flank pain. These researchers also assessed two other symptom measures, sleep quality and appetite quality, along with the eleven physical symptoms in a thirteen symptom total severity score. This score was called symptom burden and could range from a low of 0 to a high of 33, with higher scores indicating a higher degree of symptom burden. In the study, the short term prognosis of physical and emotional symptoms, as well as functional limitations, was generally favorable with fewer symptoms rated as severe and symptom prevalence at discharge was usually half or less of that observed on admission (Kroeneke et al, 1999). Satisfaction with care was associated with both the degree of symptomatic improvement that had occurred during hospitalization (the symptom change score) and the severity of symptoms at discharge (1999). Persistent symptoms, those that did not improve by time of discharge, were associated with decreased satisfaction with care. The three most prominent predictors of persistence of symptoms were shorter lengths of stay, severity of the symptoms on admission and total symptom count (Kroeneke, et al, 1999).
Kris and Dodd (2004) examined the symptom prevalence, severity and distress along with the patient characteristics of 334 hospitalized medical-surgical patients. Higher levels of symptom distress were found in women and in those who were unpartnered (Kris & Dodd, 2004). Some studies have found that hospitalized women (Kroeneke, et al, 1999) and women in general (Haeglin, Seiger & Furst, 2006) report higher levels of symptom distress than men, however other studies did not find a significant relationship between gender and the level of symptom distress in hospitalized patients (Koopmans & Lamers, 2007). In the Kris and Dodd study, the average number of symptoms reported per patient was 9.31 with a mean symptom distress rating of 1.8 on a 0-5 scale and a mean symptom severity rating of 1.65 on a 1-5 scale (2004). Greaves and colleagues (2009) examined treatment of nausea in hospitalized patients. Their research team audited charts of 82 advanced cancer patients admitted to a large teaching hospital and found that although nausea was present in 32% of patients, and most reported moderate to severe symptoms of nausea, many either were undertreated or did not receive treatment for this symptom (Greaves, Glare, Kristjanson, Stockler & Tattersall, 2008). Desbiens and colleagues (1999) assessed 1,500 seriously ill hospitalized patients with common, high mortality diagnoses in five tertiary care centers and found six frequent symptoms: fatigue, pain, dyspnea, anxiety, depressions and nausea. Nearly half of the patients (49.1%) reported that they had one or more symptoms that were moderately to extremely severe and occurred at least half of the time, thus demonstrating a high symptom burden. Dyspnea and pain were the most common single symptoms while pain/dyspnea/anxiety/depression, pain/anxiety/depression and pain/dyspnea/anxiety were the most common symptom clusters (Desbiens, et al, 1999). These researchers concluded that seriously ill hospitalized patients have a high symptom burden with male gender, disease
category, more comorbidities, more dependencies in activities of daily living prior to illness and poorer quality of life associated with greater symptom burden (Desbiens, et al, 1999). Another study found that symptom control was highly inadequate for the most seriously ill hospitalized patients with 75% experiencing at least one severe symptom, most often pain or dyspnea, yet nurses’ rated the care of these patients as "good" or "very good" despite the persistence of symptoms and scant use of analgesics (Toscani et al, 2005). Symptom burden has also been found to be high in patients hospitalized in intensive care units (Delgado-Guay, Parsons, Li, Palmer & Bruera, 2009).

**Research Approaches to Symptom Management**

As introduced in chapter 1, three approaches have been typical of the research to investigate effective management of patient symptoms. First, researchers have conducted studies with individuals (mostly cancer patients) as the unit of analysis to identify specific patients who either have or are at risk for these concerns. A recurrent theme in this literature is that cancer pain (Caraceni, Brunelli, Martini, Zecca & DeConno, 2005), fatigue (Rieger, 2001; Stone et al, 2000) and depression (Greaves et al, 2009) are inadequately assessed and undertreated (Cleeland, 1998; Goodell & Nail, 2005). Further, research indicates that the prevalence of symptom distress is high in both cancer and noncancer patients (Tranmer, et al, 2003) and as discussed in the previous section, patients are especially vulnerable to these distressing symptoms during hospitalization (Kris & Dodd, 2004; Kroenke et al.,1999; Tranmer et al., 2003) where their symptoms are often poorly controlled (Kris & Dodd, 2004; Toscani, et al, 2005).
Second, researchers have isolated factors thought to contribute to ineffective management of patient symptoms. These include the patient/family, professional and system barriers discussed in chapter 1. Patient/family barriers include lack of information about effective treatments, lack of access to services, cultural and religious issues and ineffective communication with providers (Beck, 2004). For example, one problem in effectively managing patients’ pain is that patients often lack information about analgesia and frequently have misconceptions about its use, which can lead to unrelieved pain (de Wit, van Dam, Zandbelt, van Buuren, van der Heijden, Leenhouts & Loonstra, 1997; Lai, Guo, Keefe, Tsai, Chien, Sung & Chen, 2004). Professional barriers include those related to health care providers such as lack of information about analgesia and misconceptions and attitudes about how people perceive and behave in response to symptoms and lack of knowledge (Beck, 2004). For example, nurses may not understand patients’ perceptions of the severity of their symptoms. System barriers focus on the organization and structure of care including a lack of or reduced access to resources needed to deliver effective care to patients. System barriers are often considered in terms of perceptions of consumers and/or providers or as observable characteristics of the system (Chih-Yi Sun, Borneman, Ferrell, Piper, Koczywas & Choi, 2007). For example, symptoms have been found to be poorly managed in seriously ill hospitalized patients partly because the management of these patients does not routinely include experts skilled at treating the severe symptom distress that can occur in this patient population. One study found that referring patients hospitalized in intensive care units with severe symptom distress to palliative care consultants resulted in improved patient outcomes as evidenced by improvements in pain (90%), dyspnea (90%), anxiety (80%) and delirium (44%) (see Delgado-Guay et al, 2009). Although improvements have been made in reducing
or overcoming these barriers, most research finds that barriers to effective symptom management persist (Jablonski & Wyatt, 2005; Johnson et al., 2005; Kravitz, 2001).

The third approach utilized by symptom management researchers has been interventional research aimed at improving patient outcomes. This encompasses a vast body of research much of which will not be included in this dissertation. The emphasis here will be on interventional research in hospitalized patients as hospitalized patients are the focus of this study. A recent rigorous review of the literature by Goldberg and Morrison (2007) describes institutional interventions designed to improve the assessment and treatment of pain, the most widely researched symptom, in hospitalized patients. Goldberg and Morrison identified five interventions: professional and patient education, instituting regular pain assessment, audit of pain results and feedback to clinical staff, computerized decisional support systems and specialist-level pain consultation services.

Goldberg and Morrison (2007) reviewed twenty-one interventional studies of oncology and mixed populations of patients and providers. Initially, the gap between pain research and clinical practice was typically ascribed to two factors: inadequate provider education and provider/patient attitudes toward analgesics (2007). Both of these factors were thought to contribute to providers' reluctance to prescribe and administer opiates and patients' reluctance to take them. Their review found that progress had been made in educating providers in management of pain throughout the 1980s and 1990s, as evidenced by the large number of articles discussing ways to increase teaching about analgesic therapies in medical journals, textbooks and continuing medical education and the fact that by 2006 most medical and nursing school curricula included pain management. Moreover, professional journals devoted exclusively to pain and symptom management were commonly found by that time.
Goldberg and Morrison (2007) found six studies that examined the effect of the first intervention, educational interventions, on the management of pain in hospitalized patients. Nursing educational interventions improved nurses' knowledge about pain and analgesic prescribing but were not shown to improve patients' rating of pain or their satisfaction with care. Educational sessions directed at patients, however, improved pain scores and altered negative pain beliefs and misconceptions. This suggests that interventions to improve nurse and patient outcomes may require different approaches for each group, and that effective management of symptoms in hospitals may require a multi-pronged approach. Further, these findings suggest that simply assuring that clinicians have the proper knowledge to manage symptoms is not sufficient, rather systems approaches may be needed.

The second intervention identified by Goldberg and Morrison (2007) involved instituting regular pain assessment by including pain as a fifth vital sign, in other words including assessment of pain as part of the routine assessment for every patient. This has been recognized by hospital regulators and in 2004 was added to the Joint Commission for the Accreditation of Hospital Organizations (JCAHO) standards for hospital care. Goldberg and Morrison (2007) identified four types of interventions to improve the assessment and documentation of pain in cancer patients. These interventions included graphic recording on bedside charts, standardized pain assessment forms and pain assessment flow sheets, incorporation of both formal education sessions and assessment tools and institution wide, multidisciplinary interventions. Routine assessment of pain as a vital sign was shown to improve nurses’ documentation of pain assessment scores, improve agreement between patient and nurse ratings of pain, improve both patient and staff satisfaction with pain management and improve analgesic prescribing practices. However, despite improved
documentation, these interventions did not result in improvements in patients' overall pain scores or pain severity. It remains unclear if instituting pain as a 5th vital sign improves the quality of pain management, as was noted in a study subsequent to the Goldberg and Morrison review, which found no improvement (Mularski, White-Chu, Overby, Miller, Asch et al, 2006). These findings suggest that although a more multi-pronged, multi-disciplinary approach yielded some positive changes for patients, it did not consistently improve overall symptom management or patient satisfaction with symptom management. This indicates that other factors or combinations of factors may influence the extent to which patient symptoms are effectively managed in hospitals.

The third intervention identified in Goldberg and Morrison's review (2007) involved auditing of pain results and feedback to clinical staff. Audit and feedback was successfully used in several studies to improve both the detection and management of pain but only three articles describing its use in hospitals were found. One study found that feedback to nurses resulted in significant improvements in nurses' knowledge and attitudes, significant reductions in nurses' perceptions of barriers and improved patient satisfaction. Another study found that audit and feedback of patients' pain scores to nursing staff resulted in significant improvement in pain assessment rates but had no effect on pain severity. A third study evaluated the impact of multidisciplinary teams, education sessions, monthly team conference calls and monitoring and sharing of improvement methods on a series of pain measures and found that these interventions significantly decreased the prevalence of moderate or severe pain, increased documentation in pain care plans and increased rates of education provided to patients. These researchers report that the sharing of ideas and feedback among team members was critical to the success of this collaborative as it enabled
clinicians to improve their own clinical practice based on the feedback that they got from their colleagues. They described both verbal and written feedback among team members as well as ongoing electronic communication via an organizational extranet site that enabled effective improvement of patients' pain management. It is possible then, that nurses on individual nursing units could improve symptom management for their patients in a similar manner if they participate in decision making and share ideas among themselves about the most effective ways to effectively manage their patients' symptoms.

The fourth intervention identified in Goldberg and Morrison's review (2007) involved use of computerized decisional support systems (CDDS). Several studies suggested that use of CDDS by physicians may enhance clinical performance for medication dosing and prevention of adverse drug reactions but only one study was found that used a CDSS to try and improve symptom management through physicians' prescribing of analgesics and treatment of opiate-related adverse effects. In that study, the CDSS provided recommendations to physicians on initiating and dosing analgesics and made recommendations when patient goals were not achieved such as switching analgesic agents. Although the CDSS was associated with improvements in reductions of usage of specific drugs, it was not associated with improvement in patients' pain scores.

The fifth intervention identified in Goldberg and Morrison's review (2007) involved specialty consultation for treatment of troubling symptoms. They found that referring cancer patients to specialists who are trained in pain and symptom management resulted in beneficial effects on pain and other symptoms as well as improved patient satisfaction with care and reductions in length of stay. Moreover, utilizing pain specialists in hospitals resulted in significant decreases in patients' pain intensity, and lower percentages of patients in
moderate to severe pain. Further, they found that referral of patients with advanced cancer and pain to palliative care specialists increased patients' pain control, increased patients' feelings of security and improved continuity of care. This is also supported in a study subsequent to the Goldberg and Morrison review which found that utilizing palliative care specialists for patients with advanced cancer pain resulted in better management of their symptom distress (Delgado-Guay et al, 2009). These findings suggest that linking patients with providers that have specialized knowledge of symptom management improves patient outcomes.

Interventional research to improve patient symptom management in hospitals has largely focused on pain. The findings from this research suggest that improving professional and patient education, instituting regular pain assessment, audit of pain results and feedback to clinical staff, computerized decisional support systems and specialist-level pain consultation services all improved some aspects of pain management for patients, however, in most cases it did not improve patients' pain. This suggests that gaps remain in our understanding of how symptoms can be best managed in hospitals. One area that has received limited study is the context within which symptoms occur, including the organizational factors that affect symptom management. Although it has been well established that patient symptoms (pain, in particular) are poorly controlled during hospitalization (Kris & Dodd, 2004; Toscani et al., 2005), our knowledge remains limited as to the effects of organizational context on symptom management. Researchers have found statistically significant differences in symptom management across both hospitals and nursing units, unexplained by patient characteristics (Brown et al., 2008; Desbiens et al., 1996). These findings suggest that other factors such as organizational characteristics may
influence the extent to which patient symptoms are perceived as effectively managed during hospitalization. Researchers contend that effective management of symptoms must include the consideration of the context within which the symptoms occur (Dodd et al., 2001) which in this study is the hospital, specifically the nursing unit. Although hospital nurses play a key role in monitoring symptoms and acting to ensure that they are resolved, their contributions to the management of patients’ symptoms during hospitalization are not well understood. Moreover, despite emerging findings that attributes of organizational structure in hospitals, specifically the nurses’ work environment (the nursing unit), contribute to better patient outcomes (Aiken, Clarke, Sloane, Lake, & Cheney, 2008; Friese, Lake, Aiken, Silber, & Sochalski, 2008), work setting factors that foster effective symptom management are not well understood.

**Nurse Participation In Decision Making And Improvements In Care Processes And Outcomes**

The present study focuses on one aspect of organizational structure in hospital nursing units - participation in decision making - and its relationship to organizational effectiveness - patient symptom management. Employee participation in decision making has been found to have significant positive effects on employee job satisfaction and performance (Wagner, 1994) and has been identified as a critical component of professional nursing practice (Laschinger, Sabiston & Kutscher, 1997; Anthony 1999; Havens & Aiken, 1999; Aiken, Sloane, Lake, Sochalski & Weber, 1999).

There is a growing link between patient outcomes and the structural components of hospital work environments where nurses participate in decision making, have control over nursing practice, and engage in collaborative relationships. In nursing units where nurses
participate in decision making they are able to exercise more control over their work environment (Kramer & Schmalenberg, 2006; Mark et al., 2007). Nurse participation in decision making is one of the structural features that is correlated with greater patient satisfaction (Scott, Sochalski, & Aiken, 1999) and has been demonstrated to affect the extent to which patients perceive that their expectations for symptom management have been met (Bacon et al., 2009). Work environments in which nurses participate in decision making and have more control over their work provide more favorable work conditions for nurses, (Aiken et al, 1999) have resulted in positive nurse outcomes including high levels of nurse and work satisfaction (Laschinger, Fingan Shamian & Wilk, 2004; Laschinger, Shamian & Thomson, 2001; Rondeau & Wagar, 2006); Schmalenberg & Kramer, 2008; Smith, Tallman & Kelley, 2006; Ulrich, Buerhaus, Donelan, Norman & Dittus, 2007) and nurse retention (Ritter, 2011), and are expected to positively contribute to nurses’ ability to meet patients’ expectations for symptom management.

Nurses’ involvement in decision making has been linked to improved patient care quality and safety (Meirovich, Brender-Ilan & Meirovich, 2007; Norrish & Rundall, 2001) and higher quality nurse-physician communication (Estabrooks et al, 2005; Mitchell, Armstrong, Simpson, & Lentz, 1989). When nurses participate in decisions on hospital units they perceive that the quality of care that they provide to patients is higher (Havens, 2001) and this has been illustrated in studies where fewer patient complications and lower hospital patient mortality occurred when nurse participation in decisions occurred (Aiken, Smith & Lake, 1999; Baggs, Schmitt, Mushlin, Mitchell, Eldredge, Oakes & Hutson, 1999). Further, nurse participation in decision making has been linked to shorter average lengths of stay and
less use of ICU days in hospitals (Aiken, Clark et al., 1999) as well as fewer patient and family complaints (Cronenwett, Slattery, Corcoran, Mook, Campion & Maloney, 1999).

Although nurse participation in decision making has improved patient outcomes and benefitted patients it is not always easy to implement and sustain in the complex hospital environment. In a qualitative study investigating factors that influenced nurses' involvement in participation in decision making about their patients on oncology units, researchers found that lack of continuity in patient care assignments, staffing shortages and inability of direct care nurses to consistently participate in forums where decisions are made all negatively impacted their ability to participate in decision making for their patients (Barthowa, Moss, McKinlay, McCullough & Wise, 1999). Organizational barriers to nurse participation in decision making include frequent changes in patient volume on the units and rapid patient turnover amidst decreased nurse staffing. These factors pulled nurses away from discussions with the interdisciplinary team necessitating that nurses in senior roles (unit charge nurses) with less direct care knowledge of the patients participate in their stead. In this study direct care nurses expressed frustration with these organizational barriers because of the difficulty they posed in allowing them to fully participate in decision making about their patients despite the fact that they had the motivation and desire to do so. This suggests that there is an association between organizational context and work complexity and nurses' ability to participate in decision making on the nursing units. Moreover, this demonstrates the importance of further study of the impact of organizational influences on nurses' ability to participate in decision making and its resultant patient outcomes.
Linking Research Model Components: Unit Size To Increased Work Complexity To Nurse Participation In Decision Making And Management Of Patient Symptoms

Unit Size and Work Complexity

As was discussed in Chapter 2, unit size is an important environmental contingency because unit size (the number of beds and the number of nursing staff) determines work volume through the number of patients that are admitted to the unit. As work volume - more patients - increases there is increased patient activity and turnover (Unruh & Fottler, 2006) and an increased need for new information about the additional patients (Argote, 1982). When there are more patients on the nursing unit work complexity is expected to increase because more frequent patient transfers and multiple competing patient demands increase the requirements for their nurses to control and coordinate their care (Ford & Slocum, 1977). When there are more nurses on the nursing unit work complexity is expected to increase because it becomes increasingly challenging for larger groups of nurses to effectively communicate and coordinate the work - patient care - that needs to be carried out on the unit (Smith, Smith, Olian, Smis, O'Bannon & Scully, 1994). This suggested a relationship between unit size and work complexity with increased size likely to result in increased work complexity and introduced the first hypotheses as follows:

**Hypothesis 1**: As unit size (the number of beds) increases, work complexity will increase on nursing units.

**Hypothesis 1A**: As unit size (the number of nurses) increases, work complexity will increase on nursing units.

Surprisingly little research in nursing has dealt with unit size. Studies to investigate the relationship between *unit size* and *work complexity* in the nursing unit have been limited.
No studies were found that directly assessed this relationship, however, a few studies have investigated the relationship between unit size and length of stay (LOS), which has been linked to nurses’ workload. Ruttimann, Patel & Pollack (1996) found that pediatric intensive care unit size predicted length of stay, with larger units having shorter lengths of stay.

Decreased LOS increased nursing workload in one study at a large tertiary medical center (Graf, Millar, Feiteau, Coakley & Erickson, 2003). This evidence has prompted researchers to argue that shorter LOS on hospital units necessitates more nursing care for patients (Duffield, Diers, Aisbett & Roche, 2009) which may lead to increased work complexity for nurses. Decreased LOS concentrates the need for nursing care but also allows increases in patient throughput. Decreased LOS places a double burden on nurses to manage patients' concentrated nursing needs in shorter time frames and to manage the movement on and off the unit (Duffield et al, 2009; Unruh & Fottler, 2006).

Duffield and colleagues label the phenomenon of frequent patient turnover on nursing units "churn." In their analysis of medical/surgical patients in 286 nursing units in 27 hospitals they found that medical/surgical patients moved on average more than twice in an average hospital stay of only about 4 days (Duffield et al., 2009). These researchers argue that churn compromises the ability to cohort (keeping the appropriate case mix of patients on the nursing unit) similar patients. In a number of studies, cohorting patients has been found to improve quality and decrease cost (Aiken, Sloane et al., 1999: Czaplinski & Diers,1998; Diers & Potter, 1997; Rimar & Diers, 2006) because nurses are more familiar with the specific needs of their patients when they care for their usual case mix. The researchers also suggest that churn affects nurse staffing, arguing that when there is more churn the nursing unit experiences increased workload which may require additional nursing hours of care.
However, they note that numbers of nurses and churn are rarely part of staffing formulae (Duffield et al., 2009). Based on this research, it can be argued that increasing unit size may lead to increased churn which may increase work complexity for nurses.

**Work Complexity and Nurse Participation in Decision Making**

As was discussed in Chapter 2, complexity in nursing work has important implications for the information processing requirements (the amount of information that has to be processed between decision makers during execution of tasks) at the subunit level and therefore for the structural form that is most likely to result in unit effectiveness (Galbraith, 1974). The greater the work complexity, the greater the amount of information that must be processed among decision makers (nurses) during patient care in order to achieve effective symptom management. Chapter 2 suggested that work complexity increases the need for participation in decision making and that unit size contributed to the increased complexity of nursing work and influences the structure that supports the work, which in turn, may influence the effectiveness of symptom management for patients. The following hypothesis was then introduced:

**Hypothesis 2:** As work complexity increases, nurses participation in decision making will increase.

No studies were found that directly investigated the relationship between *work complexity and nurse participation in decision making* in the nursing unit. Nursing work may be more complex when there is high variability caused by increased patient turnover. Studies have demonstrated that when there is a high variability in work, worker participation in decision making is needed in order to achieve effectiveness (Randolph & Finch, 1977; Schoonhoven, 1981).
Chapter 2 also introduced a third hypothesis:

**Hypothesis 3:** As nurses' participation in decision making increases, patients will report better management of their symptoms.

A number of outcome studies support the link between better work conditions for nurses, which includes nurses' participation in decision making, and improved outcomes for patients. In nursing units where nurses participate in decision making they are able to exercise more control over their work environment (Kramer & Schmalenberg, 2002; Mark et al., 2007) which should make it easier for them to better meet patient needs, including management of their symptoms. This is supported in an outcome study where patients were more likely to state that their expectations for symptom management were met on subunits where the nursing workgroup reported better work conditions (Bacon, Hughes & Mark, 2009).

**Control variables**

In the present study the hospital characteristic of *case mix index (CMI)* and the nursing workgroup characteristics of *unit tenure, years of experience* and *educational preparation* will be statistically controlled for two reasons. First, the unit of analysis in this study is the nursing unit not the hospital and second, unit context in SCT, the supporting theory, SCT, does not specifically consider workgroup characteristics.

**Case Mix Index (CMI)**

Case mix index (CMI) is an indicator of resource utilization in a hospital representing the average relative weight of resource utilization for a specified time period. CMI is used to measure the acuity of the inpatient population and estimate the hospital's reimbursement for services (Adams, 1996). Specifically, CMI is an economic marker (i.e. the total cost weights
of all inpatients per a defined time period divided by the number of admissions) to describe the average patients’ morbidity in individual hospitals (Kuster, Ruef, Bollinger, Ledergerber, Hintermann, Desplazes, Neuber & Weber, 2008). Most outcomes studies use CMI to control for the differences in patient populations across hospitals (Kendall-Gallagher & Blegen; 2009; Staat, 2011; Zinn, Feng, Mor, Intrator, & Grabowski, 2008). Patients in hospitals with higher acuity may be more likely to have higher levels of symptom distress because of their more complex problems. Patient severity as measured by CMI is important to control in this study because it might have an independent effect on symptom management.

Unit Tenure

Tenure within the workgroup has been widely studied in the organizational behavior literature. Pfeffer (1983) made the assumption that individuals in a work group are more likely to identify with one another because their shared experiences will be similar. Based on this assumption, some studies have demonstrated that individuals in a group with similar tenure are more likely to have reduced conflict, better communication and higher job satisfaction (Moreland, 1985). Several outcome studies have demonstrated a positive relationship between group tenure and team performance (Reagans, Argote & Brooks, 2005; Temkin-Greener, Gross, Kunitz & Mukamel, 2004) although evidence is mixed. Other studies have not found a relationship between group tenure and team performance (Smith et al., 1994). Unit tenure has been investigated in some patient outcome studies. Researchers found no relationship between unit tenure and medication errors (Chang, Hughes & Mark, 2006; Chang & Mark, 2009). Only one study was found that investigated the relationship between unit tenure and patient symptom management. These researchers investigated the effects of nurses' work engagement, a construct which included RN unit tenure, nursing
expertise and commitment to care, on patient symptom management (Bacon et al., 2009).
The study by Bacon and colleagues (2009) did not find a relationship between work engagement and patient symptom management but this may be because their interest was in work engagement as a latent variable. Nurses with higher levels of unit tenure would be expected to be more familiar with the specific kinds of problems experienced by patients on the unit than nurses with less tenure within the work group which may affect their ability to manage patient symptoms. Nurses with more unit tenure may be more skilled at handling patient symptom issues than nurses with less unit tenure. Further, nurses with higher unit tenure will have worked together longer than other members of the nursing team and they may be more likely to identify with one another and support one another's efforts including assisting one another's patients with symptom management. For these reasons unit tenure may have an independent effect on symptom management and is important to control in this study.

**Years of Experience**

Nursing experience has been linked to positive nursing outcomes with nurses' knowledge level, clinical judgment and decision-making ability all positively associated with increased experience (Benner, Tanner, & Chesla, 1992; Foley, Kee, Minick, Harvey, & Jennings, 2002). Nursing experience has also been associated with patient outcomes as higher quality care has been demonstrated in units staffed with higher proportions of experienced nurses (Blegen, Vaughn & Goode, 2001). Other patient outcomes studies, however, found no relationship between nurse experience and length of stay (Mark et al., 2003). Although Mark and colleagues (2003) did not find a relationship between years of experience and length of stay as a patient outcome, it is possible that this was because length
of stay was not as sensitive a patient outcome measure as symptom management in relation to nurse experience. As nurses gain experience they are expected to be better able to identify subtle changes in the patient's condition and initiate appropriate action (Minick & Harvey, 2003). Experienced nurses who recognize such changes can take corrective action, prevent further problems and can increase the patient's chances of a positive health outcome (Foley et al., 2002; Minick & Harvey, 2003) such as improved symptom management. For these reasons years of experience may have an independent effect on symptom management and is important to control in this study.

**Educational Preparation**

Researchers have suggested that educational preparation of nurses is important to achieving effectiveness in patient care. Some argue that nurses with baccalaureate degrees are able to practice more independently (Kovner & Shore, 1998), perform high skill functions more often (Young, Lehr & White, 1991) and are more likely to engage in problem solving and effective communication (Aiken, Clarke, Cheung, Sloane & Silber, 2003; Doran, Sidani, Keatings & Doidge, 2002) than graduates of other types of programs and thus may be better prepared to deal with the challenges of the complex patient care environment. Some studies have found a positive relationship between educational preparation and between patient outcomes. Aiken and colleagues found that a 10% increase in the proportion of hospital nurses with a baccalaureate degree was associated with 5% decrease in both the likelihood of a patient dying within 30 days of hospital admission and failure to rescue (Aiken, Clarke, Cheung et al, 2003). Chang and colleagues found that units staffed with a higher proportion of baccalaureate nurses had fewer medication errors (Chang et al., 2006).
Other researchers have not found a relationship between nurses' education preparation and patient outcomes. For example, Blegen and colleagues found that educational preparation of nurses had no effect on adverse event rates (Blegen et al., 2001).

Only one study was found that investigated the relationship between nurses' educational preparation and symptom management. These researchers investigated the effects of unit capacity, a construct which included the proportion of registered nurses (RNs) among the total nursing staff on each nursing unit and the proportion of RNs with a baccalaureate degree in nursing, on patient symptom management (Bacon et al., 2009). No relationship was found between the unit capacity measures and patient symptom management. Although this study did not find a relationship between educational preparation and symptom management this may be because their interest was in unit capacity as a latent variable. Because nurses with baccalaureate degrees are more likely to engage in solving problems, they may be more skilled at managing patient symptoms which might have an independent effect on symptom management and will thus be important to control in this study.

Chapter Summary

In this chapter, a synthesis of the literature supporting this study was presented. Model components discussed included unit size, work complexity, nurses' participation in decision making and patient symptom management. Control variables were presented including case mix index, unit tenure, years of experience and educational preparation. The next chapter will discuss the research methodology that was used to investigate the hypotheses that have been developed.
CHAPTER 4
RESEARCH METHODOLOGY

The overall purpose of this dissertation research was to develop and test a causal model of the relationships among the nursing unit's context (unit size and work complexity), structure (nurses' participation in decision making) and effectiveness (symptom management). In the proposed model, size leads to work complexity which leads to participation in decision making which then impacts the way in which patients' symptoms are managed in the nursing unit (Figure 4). Specifically, the research hypotheses that were proposed in Chapter 2 are as follows:

**Hypothesis 1:** As unit size (the number of beds) increases, work complexity will increase on nursing units.

**Hypothesis 1A:** As unit size (the number of nurses) increases, work complexity will increase on nursing units.

**Hypothesis 2:** As work complexity increases, nurses participation in decision making will increase.

**Hypothesis 3:** As nurses' participation in decision making increases, patients will report better management of their symptoms.

The current chapter outlines the research methodology to answer these questions. This study is a secondary analysis of data from the Outcomes Research in Nursing
Administration II (ORNA-II) project, a multi-site organizational survey study conducted by Dr. Barbara Mark, principal investigator, and her research team. Since the data for the current study were derived from ORNA II, the first section of this chapter begins with an overview of the parent study, including a description of the study and the study purpose, research design, sample, data, and data collection procedures. The second section describes the current dissertation study. The third section describes issues related to analysis and provides justification for model building. The final section describes the statistical approach.

**ORNA-II Study**

The ORNA-II study, titled, “A Model of Patient and Nursing Administration Outcomes,” was a five-year project funded by the National Institute of Nursing Research (grant number 2R01NR031489). Using Structural Contingency Theory as the theoretical framework, ORNA-II was conducted to investigate relationships among context (external environmental, hospital, and nursing unit characteristics), structure (staffing adequacy and professional practice) and effectiveness (administrative, nurse, and patient outcomes). The theoretical model tested in the ORNA-II study is diagramed in Figure 5.
Figure 5. Theoretical framework used in the ORNA project.

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<tr>
<th>CONTEXT</th>
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<td>External environment</td>
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**ORNAA-II Research Design**

The ORNA II research study used a non-experimental, longitudinal causal modeling design. These studies are non-experimental because there is no manipulation of the variables (Brink & Wood, 1998). Research examining causal relationships must meet three specific conditions in order to establish a cause and effect relationship (Brink & Wood, 1998). First, there must be an empirical relationship, that is there must be a demonstrated association between the independent and dependent variables. Second, there must be a temporal relationship - the cause (independent variable) must precede the effect (dependent variable) in time. Third, the relationship cannot be explained by a third extraneous or confounding variable (Brink & Wood, 1998). Establishing causal relationships is important to researchers because it enhances their ability to predict and therefore control phenomena.
In non-experimental studies, association can be established by using statistical tests to determine whether the independent and dependent variable are correlated. Experimental designs, especially those that are randomized, inherently establish a temporal relationship and minimize the impact of confounding variables. Non-experimental studies, however, must incorporate other research design techniques to strengthen the argument for causality. Data collected longitudinally is theorized to be better at reducing the ambiguities in establishing causal relationships than cross sectional data (Brink & Wood, 1998; Rajulton, 2001) because examining measures over time allow for examining changes in the dependent variables(s) and subsequent changes in the independent variable(s) (Rajulton, 2001). Moreover, the study can be designed to strengthen cause and effect relationships through temporal ordering.

ORN-II was designed to establish temporal ordering of data with information on contextual variables obtained during the first round of data collection, information on structural variables collected during the second round of data collection, and information on effectiveness variables collected during the third round of data collection. This was important because it follows the tenets of structural contingency theory upon which the research model is based. In addition, extraneous variables that might otherwise confound these relationships can be controlled for possible alternative explanations (Brink & Wood, 1998). Instituting a theoretically strong research model and collecting data longitudinally demonstrates that this study has put forth efforts to strengthen cause and effect conclusions that may be drawn. However, these conclusions must be viewed with the understanding that because of the use of a non-experimental design there is the possibility than alternative explanations could account for the findings (Brink & Wood, 1998).
ORNAD-II Sample

The ORNA II sample consisted of 320 general and specialty medical-surgical nursing units in 160 randomly selected U.S. hospitals. Two nursing units were chosen from each non-federal, non-psychiatric, non-profit, JCAHO accredited acute care hospital with at least 99 licensed beds. The nursing units in the sample were either general medical-surgical units or medical-surgical specialty units including oncology, orthopedics, neurology, telemetry or step-down. If there were only two eligible nursing units in a hospital, both units participated in the study, however, when there were two or more eligible units, the participating units were selected by the study coordinators, hospital-based RNs who directed the ORNA study on-site. The final sample contained 286 nursing units in 146 hospitals.

In the participating nursing units, all staff RNs who had worked on the unit for a minimum of three months and worked at least 20 hours per week were eligible to take part in the study. In addition, patients were asked to participate in the study if they were age 18 or older, were hospitalized for at least 48 hours and could read and write English. Study coordinators randomly selected ten patients from study units to participate in the study. Figure 6 illustrates the sampling framework for the ORNA II study and the response rates for the nurse and patient surveys.

The nurse surveys were distributed three times over a six month period of data collection. Between 6,144 and 6,562 staff nurses met the eligibility requirements for each of the three nurse surveys. Patient surveys were administered once with 2,991 patients meeting the eligibility requirements. Figure 6 details the sampling framework and response rates from the surveys.
Figure 6. Sampling Framework.

<table>
<thead>
<tr>
<th></th>
<th>Number of eligible sample</th>
<th>Number of actual sample (Response Rate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td>160</td>
<td>146</td>
</tr>
<tr>
<td>Nursing units</td>
<td>320</td>
<td>286</td>
</tr>
<tr>
<td>Nurse Survey Time 1</td>
<td>6,562</td>
<td>4,954 (75%)</td>
</tr>
<tr>
<td>Nurse Survey Time 2</td>
<td>6,389</td>
<td>3,718 (58%)</td>
</tr>
<tr>
<td>Nurse Survey Time 3</td>
<td>6,144</td>
<td>3,293 (54%)</td>
</tr>
<tr>
<td>Patient Survey</td>
<td>2,991</td>
<td>2,722 (91%)</td>
</tr>
</tbody>
</table>

**ORNNA-II Data Collection Procedures**

To facilitate data collection and meet the goals of the research study, each participating hospital appointed a study coordinator who was responsible for overseeing the study. All study coordinators received 1 1/2 days of training with Dr. Mark and her research team. This involved an overview of the project and their roles, including communication with the research team and their institutions, confidentiality, review of all study questionnaires, sampling and the process for data collection. All study coordinators also received a Study Coordinator Manual.

The data for the ORNA II study consisted of four levels: community/market, hospital, nursing unit, and individual. Community/market data were collected from datasets obtained from the American Hospital Association (AHA). Data at this level reflected the external environment of the hospital which included such factors as geographic region and managed
care penetration. Hospital level data were collected by nurse study coordinators during month 1 of the data collection period. Hospital level data included factors such as Magnet status, number of beds and case mix index. Nursing unit level data were collected using several different questionnaires. Personnel data were obtained from nursing unit managers by the hospital study coordinator. These data included nursing care hours delivered by all nursing personnel (RNs, licensed practical nurses or LPNs, unlicensed assistive personnel or UAPs, agency, float, and contract nurses) during the first month of data collection. Data for RN full-time equivalents or FTEs, numbers of patient days, number of patient discharges, and patient length of stay were collected each month during the six month data collection period. The personnel survey also included unit information including number of beds on the unit and kinds of patients who were treated on the unit and these data were collected each month during the six month data collection period.

Individual level data were collected from eligible RNs on each participating unit on three different occasions over a six month period of time. Three different questionnaire sets were completed during the six months of data collection. The first questionnaire set (Time 1) included items measuring demographic characteristics and many contextual variables on the nursing unit including technological and work complexity. The second questionnaire set (Time 2) included many items measuring the structural variables on the nursing unit including nurses' perceptions of autonomy, participation in decision-making and relational coordination. The third questionnaire set (Time 3) included items measuring effectiveness variables including such nurse outcomes as nurses' job satisfaction and job enjoyment.

In order to ensure the highest response rates for the nurse questionnaires, Dillman's (1978) Total Design Method was used. This method calls for three reminders to be given to
study participants, with the first reminder sent to nurses one week after they received the first questionnaire, followed by a second reminder and a duplicate questionnaire sent two weeks after the first questionnaire was distributed, and a third reminder letter sent two weeks later. The RN response rates were 75% at Time 1, 58% at Time 2, and 54% at Time 3 as are illustrated in Figure 6.

Patient data were collected from ten patients on each nursing unit at the end of the six-month data collection period because these data included effectiveness variables that measured patient outcomes. Ten randomly selected patients from each unit completed a questionnaire that asked about satisfaction with nursing care during hospitalization and the extent to which expectations for symptom management were met. Along with these data, demographic information including age, educational level, history of hospitalizations, and perceived health status were obtained. In total, 2,991 questionnaires were distributed with data collected from 2,722 eligible patients, resulting in a response rate of 91% (see Figure 6). The data collection time frame for hospital, unit, nurse and patient data is illustrated in Figure 7.
Figure 7. ORNA-II Data Collection

<table>
<thead>
<tr>
<th>Type of Questionnaire</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Personnel</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 2</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Staff Nurse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 2</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Patient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Current Study

Although the ORNA-II study used a longitudinal design with multiple data collection points, the current study used a descriptive, cross-sectional design because most of the variables included in this study were measured only once. However, temporal ordering of the data collection was guided by the theoretical model. Thus, data on unit size and work complexity were collected first (in January), data on nurses' participation in decision-making were collected in March and data on patients' perceptions of symptom management were collected in June. Table 2 shows the collection points and levels of analysis used in this study. Although three levels of data were collected in the ORNA-II study, this study focuses on unit characteristics and therefore analyzes data at the unit level.
Table 2

*Collection Points and Sources of Data*

<table>
<thead>
<tr>
<th>Study Variables</th>
<th>Data source</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit size</td>
<td>Study Coordinators</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Individual Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work complexity</td>
<td>RNs</td>
<td>T1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurses' participation in decision-making</td>
<td>RNs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients' perceptions of symptom management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T2</td>
</tr>
</tbody>
</table>

T1 = Time 1; T2 = Time 2
Definition and Measurement of Variables

In this section, the definitions and measurement approaches used in this study are presented. Specifically, the major constructs of this study were context, structure and effectiveness (see Figure 3). As discussed in Chapter 2, context incorporates both the environment and technology of the organization. In this study, context was measured using unit size and work complexity. The structural variable measured in this study was nurses' participation in decision making. The effectiveness variable measured in this study was patient perceptions of management of their symptoms while hospitalized. Table 3 summarizes the definition and measurement of these variables and lists sources of data for the selected variables. This is followed by detailed discussion of each variable.
Table 3

*Definition and Measurement of Study Variables and Data Sources*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Measurement</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Context Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Unit Environment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit size</td>
<td>Number of beds</td>
<td>Number of open and staffed inpatient beds</td>
<td>Study Coordinators</td>
</tr>
<tr>
<td></td>
<td>Number of nurses</td>
<td>Number of nurses on the inpatient unit</td>
<td>Study Coordinators</td>
</tr>
<tr>
<td><strong>Unit Technology</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Complexity</td>
<td>RN perceptions of the work related interruptions or unanticipated events</td>
<td>Aggregated scores on Complexity Scale (Salyer, 1996)</td>
<td>Staff Nurses</td>
</tr>
<tr>
<td><strong>Structure Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurses' Participation in Decision Making</td>
<td>Nurse perceptions of their involvement in unit decisions</td>
<td>Aggregated scores on six-item &quot;involvement in decisions&quot; scale (Mark &amp; Hagenmueller, 1994)</td>
<td>Staff Nurses</td>
</tr>
</tbody>
</table>
Table 3 (continued)

**Definition and Measurement of Study Variables and Data Sources**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Measurement</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effectiveness Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patients' Perceptions of</td>
<td>Patient perceptions of the extent which expectations for symptom</td>
<td>Aggregated scores on a modified Symptom Distress Scale (Bacon, et al., 2009)</td>
<td>Patients</td>
</tr>
<tr>
<td>Symptom Management</td>
<td>management have been met</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hospital Characteristic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case Mix Index</td>
<td>Complexity of patient population</td>
<td>Hospital' s CMS designation</td>
<td>Nurse Managers</td>
</tr>
<tr>
<td><strong>Workgroup Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit Tenure</td>
<td>Nurses' unit experience in months</td>
<td>Average number of months of experience on the current nursing unit as reported by RNs on each unit</td>
<td>Staff Nurses</td>
</tr>
<tr>
<td>Years of Experience</td>
<td>Direct patient experience in a nursing role</td>
<td>Average months of direct patient care experience as reported by RNs on the unit</td>
<td>Staff Nurses</td>
</tr>
</tbody>
</table>
Table 3 (continued)

*Definition and Measurement of Study Variables and Data Sources*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Measurement</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Workgroup Characteristics</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational Preparation</td>
<td>Proportion of nurses with BSN degree or higher</td>
<td>Proportion of nurses with BSN degree or higher</td>
<td>Staff Nurses</td>
</tr>
</tbody>
</table>
**Contextual variables**

There were two variables measuring *unit size*. The first was the number of open beds on the nursing unit. The second was the number of nurses on the nursing unit. *Work complexity* was defined as nurses' perceptions of the work related interruptions or unanticipated events and measured by a seven-item Likert-type questionnaire on which nurses rated the extent to which their work was characterized by frequent interruptions or unanticipated events (Salyer, 1996). Sample items for this scale include “frequent movement of patients on and off the unit for diagnostic studies, procedures, etc., makes it difficult for nurses on this unit to do a good job” and "nurses on this unit could do a better job if they had more information about their patients’ conditions." Because these items are anchored by six response options ranging from strongly disagree to strongly agree, scores from 7 to 42 are possible with higher scores indicating greater work complexity. The complete Work Complexity Scale is depicted in Appendix 1. This scale has a Cronbach's alpha of 0.85 (Bacon et al., 2009).

**Structural variables**

*Nurses' participation in decision making* was defined as nurses' perceptions of their involvement in decision making and measured as nurses' scores on the six-item "participation in decision-making" scale developed by Mark & Hagenmueller (1994) utilized in the parent study. The involvement in decisions scale is a six-item five-point Likert-type scale on which nurses rate their involvement in unit decisions (Mark & Hagenmueller, 1994). Sample items from this scale include "to what degree do nurses on this unit participate in decisions about: evaluating nursing care; planning and organizing care on a daily basis; and participating in discharge planning for patients." Scores on this scale could range from 6 to 30 with higher
scores indicating greater participation in decision making. The complete Nurses' Participation in Decision Making Scale is depicted in Appendix 2. This scale had a Cronbach's alpha of 0.78 (Bacon, et al., 2009).

**Effectiveness variables**

The degree to which patients' expectations for symptom management were met was measured using a modification of the Symptom Distress Scale (McCorkle & Young, 1978). The modification addressed the following symptoms commonly experienced during hospitalization: nausea, pain, difficulty sleeping, headache, mobility issues, and lack of energy. Sample items from this scale include: "how much have the nurses done to help you when you felt nauseated." Items on this scale were rated using five response options ranging from much less than expected to much more than expected. Total scores on this scale can range from 6 to 36, with higher scores indicating a more positive evaluation of the extent to which expectations for symptom management have been met. The complete Symptom Management Scale utilized in this study is depicted in Appendix 3. The Symptom Distress Scale is one of the most commonly used instruments to measure symptom distress with evidence of content and concurrent validity and a reported Cronbach's alpha of 0.86 (Bacon, et al., 2009).

**Definition and Measurement of Control Variables**

Control variables for this study consisted of hospital and workgroup characteristics. As discussed in chapter 3, certain hospital characteristics will be controlled for because this study will consider the nursing unit as the unit of analysis not the hospital. Moreover, certain workgroup characteristics will be controlled for because they are thought to have
independent effects on patient symptom management. These control variables will be held constant to test the relative impact of the independent variable

**Hospital characteristics**

At the nursing subunit level in organizations, the hospital in which these units are embedded can be considered the external environment (Leatt & Schneck, 1982). As such, characteristics of the hospital can be thought of as contextual characteristics that may influence nurses’ work on their units. For this reason, case mix index, a indicator of the complexity of the patient population, will be controlled in this study. Case mix index was measured using the Medicare case mix index for each hospital (see Table 3).

**Workgroup characteristics**

Characteristics of the nursing workgroup can also influence nurses’ work on their units. These factors are important because they provide information about the workers who transform patients from hospitalized patients into discharged persons but are not factors considered by the supporting theory used in this study. Therefore, the workgroup characteristics of unit tenure, nursing experience and educational preparation will be controlled in this study (see Table 3). Unit tenure was measured as the average number of months of experience on the current nursing unit as reported by RNs on each unit. Nursing experience was measured as the average number of months of nursing experience as reported by RNs on each nursing unit. Basic educational preparation was measured as the proportion of RNs on each unit with a baccalaureate degree in nursing or higher.

**Unit of Analysis and Data Aggregation**

Data on two variables in the study (work complexity, participation in decision making) were collected based on individual nurse perceptions, but since this study uses the
nursing unit as the unit of analysis, aggregation to that level was required. Justification for data aggregation was based on evidence that homogeneity of variance in individual ratings was greater within than between nursing units. Several statistical methods were used to justify aggregation of individual data to the unit level, including the rwg, intraclass coefficient or ICC (1), and mean rater reliability using ICC (2) (Klein & Kozlowski, 2000a; 2000b). Table 4 lists values for these statistics obtained from the variables used in this study. In the section that follows, each of these methods and the interpretation of values will be discussed.

Justification for data aggregation was based on achieving values equal to or greater than .70 for the rwg statistic, which estimates within-group agreement (James, Demaree & Wolf, 1984; 1993). The rwg was developed by James and colleagues (1984) to measure score variability within a single unit (i.e., a nursing unit). The rwg is calculated by comparing within-unit variance to an expected random variance. If within-unit variability is smaller than the variability that can be expected by chance, the resulting rwg suggests that it is justifiable to aggregate individual ratings to the group (nursing unit) level. Values of the rwg can range from 0 to 1. Generally, an rwg value that is equal to or greater than 0.70 indicates high consistency within groups and, therefore, justifies data aggregation (Klein & Kozlowski, 2000a). The rwgs calculated for this study ranged from 0.69 for work complexity to 0.83 for nurses' participation in decision making and were considered adequate.

Reliability of the aggregated data was evaluated by calculating the proportion of variance explained by group membership using the intraclass correlation coefficient or ICC (1) and mean rater reliability using ICC (2). The ICC (1) estimates the percent of variance in individual scores that can be explained by group membership (James et al., 1984). According
to James (1982), some studies have suggested that ICC (1) values within the range of 0.00 to 0.50, with a median of about 1.2 are adequate for data aggregation, however, there is no widely accepted agreement upon the target for the ICC (1). It is generally accepted that the larger the ICC (1), the greater the similarity among the raters (James, 1982). For work complexity, ICC (1) was 0.14 suggesting that 14% of RN score variability could be explained by nursing unit membership. For nurses' participation in decision making, ICC (1) was 0.30 suggesting that 30% of RN score variability could be explained by membership on the nursing unit. The ICC (2) determines the reliability of the means within a group-level sample (Klein & Kozlowski, 2000b). ICC (2) is a function of both ICC (1) and group size (Bleise, 2000). Generally, ICC(2) values are higher among larger groups because group means are obtained from more individuals and, thus, tend to be more stable than is usually the case with smaller groups. For this reason, estimates of mean rater reliability of aggregated data using ICC (2) typically are higher for larger rather than smaller groups. The average number of nurses per unit who participated in the ORNA-II study was 17.32. In this study, ICC (2) values for work complexity were 0.74 and for nurses' participation in decision making were 0.85 which met the 0.70 criterion recommended for data aggregation (Bleise, 2000).
Table 4

*Statistics for Data Aggregation*

<table>
<thead>
<tr>
<th>Study Variables</th>
<th>Cronbach's alpha α</th>
<th>ICC (1)</th>
<th>ICC (2)</th>
<th>rwg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Complexity</td>
<td>.85</td>
<td>.14</td>
<td>.74</td>
<td>.69</td>
</tr>
<tr>
<td>Nurses' Participation in Decision Making</td>
<td>.78</td>
<td>.30</td>
<td>.85</td>
<td>.83</td>
</tr>
<tr>
<td>Patients' Perceptions of Symptom Management</td>
<td>.86</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Nursing Units and Clustering**

A important issue that must be addressed related to the ORNA II data involves the fact that the unit of analysis - the nursing units - are embedded or clustered within hospitals. This violates the independence assumption because standard regression approaches assume that each observation in a data set is independent (Cohen, Cohen, West & Aiken, 2003). This is because observations from subjects (nursing units) in the same cluster (hospitals) tend to be more similar than observations from different clusters, therefore, analyses of clustered data must take intercluster correlation into account rather than assuming independence among all observations (Cohen et al., 2003). The standard errors will be incorrect unless this correlation is addressed and accounted for. In the instance where a positive correlation existed between two nursing units within a hospital, the standards errors for the regression coefficients would be underestimated and statistical inferences using these underestimated standard errors would yield more significant results than they would using standard errors (Cohen et al., 2003). Therefore, the statistical approach utilized in this study must address this clustering issue.

**Model building/Statistical approach**

When the sampling scheme uses a random sample of clusters (i.e. hospitals) with independent observation (i.e. nursing units) within each cluster as was done in the ORNA II study, this clustering can be accounted for by using random effects for the clusters (Cohen et al, 2003). Clustering by hospitals is treated as a random effect which allows a separate intercept for each hospital and controls for the unobserved effects of hospital membership on scores obtained from nursing units in that hospital (Litrell, Milliken, Stroup, Wolfinger & Schabenberger, 2006; Sashegyi, Stephen Brown & Farrell, 2000). Therefore, a mixed effects...
linear regression model with a random intercept to account for within-hospital dependence will be used in this study.

The present study used mixed effects linear regression and added the random effect for hospital to address the clustering issue. Regression is a statistical procedure used to determine the strength of a relationship between a dependent variable (usually denoted by Y) and a series of independent variables (denoted by X) to predict an outcome. The general form is depicted as \( Y = \beta_0 + \beta_1 \cdot X_1 + \beta_2 \cdot X_2 + \beta_3 \cdot X_3... \) where \( \beta_0 \) denotes the intercept and \( \beta_1 \) denotes the slope. Adding the random effect \( r_i \), where \( i=\text{hospital} \), then yields the following equation:
\[
Y = \beta_0 + \beta_1 \cdot X_1 + \beta_2 \cdot X_2 + \beta_3 \cdot X_3... + r_i \quad (\text{Cohen et al., 2003}).
\]
To fit the mixed effects linear model with a random intercept to account for the within-hospital interdependence, the current study employed the PROC MIXED procedure using SAS version 9.2. This modeling procedure provides appropriate standard errors for all specified estimable linear combinations of fixed and random effects (http://support.sas.com/documentation).

**Chapter Summary**

This chapter described the specific research methodologies used in this study. It began with an overview of the parent study, the ORNA II study, which included an introduction of the study and study purpose, research design, sample, data, and data-collection procedures. The chapter continued with a description of the current study, followed by an introduction of the dependent and independent variables and their reliability and validity. It then provided the rationale for model building and closed with a summary of the data analysis methods used. The next chapter reports a summary of the results.
CHAPTER 5
STUDY RESULTS

The purpose of the current study was to explore the relationship between nursing unit context, work complexity and the structural mechanisms needed to achieve effective symptom management for patients. Specifically, this study investigated a model in which environmental contingencies were theorized to lead to technological contingencies for which the organization must structure itself. In this model, unit size (number of beds and number of nurses) was theorized to lead to increased work complexity which would then lead to increased nurses' participation in decision making which would then positively influence symptom management for patients. This chapter provides descriptive statistics about the study sample and the study variables and presents the results of the statistical analysis.

Description of Sample

As discussed in chapter 4, the ORNA-II sampling frame consisted of general and specialty medical-surgical nursing units selected from 160 U.S. hospitals. The 160 hospitals were randomly selected, and where there were more than two eligible units, they were randomly sampled. Two nursing units were chosen from each 160 JCAHO accredited acute care hospitals with at least 99 licensed beds with a final sample of 143 hospitals and 286 nursing units. The nursing units in the sample were either general medical-surgical units, general medical units including oncology, surgical units, or medical-surgical specialty units including cardiac, telemetry or step-down. As is summarized in Table 5, nursing units in the current study sample served a wide range of patients with combination medical-surgical units
comprising 34% of the sample, general medical units comprising 27% of the sample, surgical units comprising 24% of the sample, and step-down/telemetry and cardiac units comprising 12% and 3% respectively of the sample.

Table 5

Types of units in sample

<table>
<thead>
<tr>
<th>Type of unit</th>
<th>Number of nursing units (286 total nursing units)</th>
<th>% of total sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical-surgical</td>
<td>96</td>
<td>34%</td>
</tr>
<tr>
<td>General medical</td>
<td>77</td>
<td>27%</td>
</tr>
<tr>
<td>Surgical</td>
<td>69</td>
<td>24%</td>
</tr>
<tr>
<td>Step-down/telemetry</td>
<td>34</td>
<td>12%</td>
</tr>
<tr>
<td>Cardiac</td>
<td>10</td>
<td>3%</td>
</tr>
</tbody>
</table>
From these nursing units, registered nurses were surveyed to solicit information about work complexity and their participation in decision making and patients were surveyed to solicit their perceptions of management of their symptoms. Registered nurses (RNs) were the primary caregivers on the nursing units with on average, a mean of 29.56 (range=6-143) RNs employed involved in direct patient care on each unit. There were 6,562 nurses who were eligible to participate in the survey at Time 1 where the work complexity data were collected. Of these 6,562 eligible nurses, 4,954 (75%) responded to the survey. Within these nursing units there were 6,389 nurses who were eligible to participate in the survey at Time 2 where the nurses' participation in decision making data were collected. Of these 6,389 eligible nurses, 3,718 (58%) responded to the survey.

Table 6 describes the age, ethnicity, experience, tenure and educational preparation of the registered nurses in the sample. The average unit had a mean RN age of 40.5 years (range=26.5-51.6) and a mean overall nursing tenure of 138.48 months (range=43.57-322.8). However, tenure on their current units was not as lengthy as their overall tenure in the nursing profession as the average unit had a mean unit tenure of 74.76 months (range=9.0-199.88). On average, nursing units had 37% of their nurses with BS degrees and 19% described their ethnicity as non-white.
Table 6
Descriptive Statistics for Registered Nurses on Units

<table>
<thead>
<tr>
<th>Study Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of RNs</td>
<td>29.56</td>
<td>14.73</td>
<td>6.00</td>
<td>143.00</td>
</tr>
<tr>
<td>RN age</td>
<td>40.54</td>
<td>4.11</td>
<td>26.50</td>
<td>51.67</td>
</tr>
<tr>
<td>RN experience in months</td>
<td>138.49</td>
<td>45.38</td>
<td>43.57</td>
<td>322.80</td>
</tr>
<tr>
<td>Unit tenure in months</td>
<td>74.77</td>
<td>33.05</td>
<td>9.00</td>
<td>199.88</td>
</tr>
<tr>
<td>Proportion of nurses w/BS or higher degree</td>
<td>0.37</td>
<td>0.19</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Proportion of non-white ethnicity</td>
<td>0.19</td>
<td>0.23</td>
<td>0.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 7 depicts descriptive statistics for the patient sample. On average, the mean patient age was 56.9 years (range=36.7-78.2) and the majority of patients were female (55%). On average, nursing units had patients who were not ethnic minorities with only 25% describing their ethnicity as non-white. On average, nursing units had more patients who reported being hospitalized in the past year (53%) than not, but most rated their health status as moderate to good. On average, nursing units had 50% of their patients with a high school degree or above.
Table 7
Descriptive Statistics for Patients on Units

<table>
<thead>
<tr>
<th>Study Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average patient age in years</td>
<td>56.91</td>
<td>7.53</td>
<td>36.71</td>
<td>78.25</td>
</tr>
<tr>
<td>Proportion of patients with high-school degree or above</td>
<td>0.50</td>
<td>0.21</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Proportion of non-white patients</td>
<td>0.25</td>
<td>0.25</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Percentage of female patients on the unit</td>
<td>0.55</td>
<td>0.19</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Percentage of patients hospitalized in last year</td>
<td>0.53</td>
<td>0.21</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Average of patient health status</td>
<td>3.46</td>
<td>0.45</td>
<td>2.00</td>
<td>5.00</td>
</tr>
</tbody>
</table>
Study Variables

The current section provides information about the means, standard deviations, observed ranges, and correlations among the variables used in this dissertation study. These results are detailed in table 8. Units in this study had an average of 34 beds and 29.5 nurses. The average unit had a mean work complexity score of 26.84 (range=15.9-37.4) and a mean nurses' participation in decision making score of 15.71 (range=9.44-21.88). The average unit had a patient symptom management score of 27.38 (range=15.5-34.4).
Table 8.

Descriptive Statistics for Study Variables

<table>
<thead>
<tr>
<th>Study Variables</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Study Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of beds</td>
<td>33.53</td>
<td>11.16</td>
<td>13.00</td>
<td>80.00</td>
</tr>
<tr>
<td>Number of nurses</td>
<td>29.56</td>
<td>14.73</td>
<td>6.00</td>
<td>143.00</td>
</tr>
<tr>
<td>Work Complexity</td>
<td>26.84</td>
<td>3.50</td>
<td>15.79</td>
<td>37.40</td>
</tr>
<tr>
<td>Nurses’ Participation in Decision Making</td>
<td>15.71</td>
<td>2.06</td>
<td>9.44</td>
<td>21.88</td>
</tr>
<tr>
<td>Patient Symptom Management</td>
<td>27.38</td>
<td>2.46</td>
<td>15.50</td>
<td>34.40</td>
</tr>
<tr>
<td><strong>Control Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case Mix Index</td>
<td>1.44</td>
<td>0.32</td>
<td>0.89</td>
<td>3.67</td>
</tr>
<tr>
<td>RN Experience (in months)</td>
<td>138.49</td>
<td>45.38</td>
<td>43.57</td>
<td>322.80</td>
</tr>
<tr>
<td>Unit Tenure (in months)</td>
<td>74.77</td>
<td>33.05</td>
<td>9.00</td>
<td>199.89</td>
</tr>
<tr>
<td>Educational preparation (proportion with BS or more degree)</td>
<td>36.52</td>
<td>19.36</td>
<td>&lt;.0.01</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Correlations Between Study Variables

Correlations among study variables are presented in table 9. None of the correlations exceeded the value of 0.70, providing evidence that multicollinearity was not a concern in these data (Cohen, Cohen, West & Aiken, 2003). Number of nurses was significantly positively correlated with number of beds ($r=0.46; p<0.01$) as expected because as the number of beds increased the number of nurses required to care for them should continue to increase. Work complexity was significantly positively correlated with both of the unit size variables with work complexity increasing as both number of beds ($r=0.23; p<0.01$) and number of nurses ($r=0.13; p<0.05$) increased. Work complexity was significantly negatively correlated with nurses' participation in decision making ($r=-0.30; p<0.01$). A relationship between these variables had been hypothesized, but the observed correlation was not in the expected positive direction. Nurses' participation in decision making was significantly correlated with only one of the unit size variables - number of beds - but not in the expected positive direction. Nurses' participation in decision making decreased as the number of beds increased ($r=-0.13; p<0.05$). Nurses' participation in decision making was not correlated with patient symptom management ($r=0.05$). Patient symptom management was not significantly correlated with any of the variables, however, there was a negative relationship approaching significance between work complexity and symptom management ($r=-0.11, p=0.07$).
Table 9 Correlations Among Study Variables

<table>
<thead>
<tr>
<th>Major Study Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of beds</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Number of nurses</td>
<td>0.46**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Work Complexity</td>
<td>0.23**</td>
<td>0.13*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Nurses' Participation in Decision Making</td>
<td>-0.13*</td>
<td>-0.22</td>
<td>-0.30**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Patient Symptom Management</td>
<td>-0.14</td>
<td>-0.01</td>
<td>-0.10</td>
<td>0.05</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Control Variables

| 6. Case Mix Index    | -0.03 | 0.08 | -0.09 | 0.18* | <0.01 | 1.00 |       |       |    |
| 7. RN Unit Tenure    | 0.04  | -0.06 | -0.17* | 0.21** | <0.01 | 0.07 | 1.00 |       |    |
| 8. RN Experience     | 0.11  | <0.01 | -0.05 | -0.00 | -0.07 | <0.01 | 0.62** | 1.00 |    |
| 9. RN Educational Preparation | <0.01 | -0.02 | -0.06 | 0.09 | -0.07 | 0.26** | -0.04 | -0.05 | 1.00 |

Note: *p<0.05; **p<0.01
Testing for Assumptions Underlying Multiple Regression

In multiple regression, it is assumed that the residuals (predicted minus observed values) follow the normal distribution (Cohen et al., 2003). Figures 8-11 illustrate residual plots for each of the regression models in this study.

Figures 8 and 9 illustrate residual plots for the mixed models for work complexity. Figure 10 illustrates residual plots for the mixed model for nurses’ participation in decision making. Figure 11 illustrates residual plots for the mixed model for patient symptom management. In all four figures, the graphs in the upper left-hand corner of the panels display residuals against the predicted mean, the graphs in the upper right-hand corner of the panels show a histogram with overlaid normal density and a Q-Q plot is shown in the lower left-hand corner of the panels. Overall, the residual plots indicate that the residuals of the models were approximately normally distributed. This is evidenced by scatterplots for the residuals vs. predicted means where the plots are gathered in a cloud-like shape, by the histograms which look approximately normally distributed, and by the Q-Q plot where the points fall approximately along the line (Cohen et al., 2003).
Figure 8. Residual Plot for the Mixed Model for Work Complexity - Hypothesis 1.
Figure 9. Residual Plot for the Mixed Model for Work Complexity - Hypothesis 1A.
Figure 10. Residual Plot for the Mixed Model for Nurses' Participation in Decision Making - Hypothesis 2.
Figure 11. Residual Plot for the Mixed Model for Patient Symptom Management - Hypothesis 3.
Missing Data

Missing data in the ORNA II was minimized by utilizing the on-site study coordinators. After data were collected and sent to the ORNA-II team, study coordinators were contacted if data discrepancies were found. Prior to any data analysis, the ORNA II data were examined for patterns of missing data. The general approach was regression imputation utilizing means when there was less than 10% missing data. The specific mean used depended on the level at which the missing data occurred. For example, if data were missing at the individual level, the person mean was used; if data were missing at the unit level, the unit level mean was used. When more than 10% of the data were missing and a rationale could be developed for identifying theoretically relevant predictor variables, regression techniques were used to impute missing values (Roth & Switzer, 1995).
Hypothesis Testing

Results from the analysis of the mixed-effects linear model for work complexity as the dependent variable are reported in Tables 10 and 11.

**Hypothesis 1.** This hypothesis stated that as unit size (number of beds) increased, work complexity would increase on nursing units. Work complexity was significantly and positively associated with the number of beds and hypothesis 1 was supported ($\beta=0.07$, $p=0.0004$).

Table 10

Mixed Model for Work Complexity

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>26.76</td>
<td>1.33</td>
</tr>
<tr>
<td>Number of beds</td>
<td>0.07***</td>
<td>0.01</td>
</tr>
<tr>
<td>Control Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMI</td>
<td>-0.66</td>
<td>0.71</td>
</tr>
<tr>
<td>RN Unit Tenure</td>
<td>-0.02**</td>
<td>0.007</td>
</tr>
<tr>
<td>RN Experience</td>
<td>0.004</td>
<td>0.005</td>
</tr>
<tr>
<td>RN Education Preparation</td>
<td>-0.71</td>
<td>1.09</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001
**Hypothesis 1A.** This hypothesis stated that as unit size (number of nurses) increased, work complexity would increase on nursing units. Work complexity was positively associated with the number of nurses. In other words, as the number of nursing staff increased on the nursing unit work complexity increased, however, although the direction of the relationship was consistent with that hypothesized, the parameter estimate was not statistically significant so Hypothesis 1A was not supported ($\beta=0.007$, $p=0.6285$).

Table 11

Mixed Model for Work Complexity

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>28.72</td>
<td>1.28</td>
</tr>
<tr>
<td>Number of nurses</td>
<td>0.007</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Control Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMI</td>
<td>-0.78</td>
<td>0.75</td>
</tr>
<tr>
<td>RN Unit Tenure</td>
<td>-0.02**</td>
<td>0.008</td>
</tr>
<tr>
<td>RN Experience</td>
<td>0.007</td>
<td>0.005</td>
</tr>
<tr>
<td>RN Education Preparation</td>
<td>-0.52</td>
<td>1.14</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001
Results from the analysis of the mixed-effects linear model for nurses' participation in decision making as the dependent variable are reported in Table 12.

**Hypothesis 2.** This hypothesis stated that as work complexity increased on the nursing units, nurses' participation in decision making would increase. Work complexity was significantly associated with nurses' participation in decision making but not in the expected direction. The results indicated that as work complexity increased on the nursing units, nurses' participation in decision making decreased. There was a significant relationship between increased work complexity and nurses' participation in decision making however, this relationship ($\beta=-0.1487$, $p<.0001$) was the opposite from that which was hypothesized therefore hypothesis 2 was not supported.

Table 12

Mixed Model for Nurses' Participation in Decision Making

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>17.69</td>
<td>1.18</td>
</tr>
<tr>
<td>Work Complexity</td>
<td>-0.14**</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Control Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMI</td>
<td>0.84*</td>
<td>0.41</td>
</tr>
<tr>
<td>RN Unit Tenure</td>
<td>0.01**</td>
<td>0.004</td>
</tr>
<tr>
<td>RN Experience</td>
<td>-0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>RN Education Preparation</td>
<td>0.58</td>
<td>0.63</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001
Results from the analysis of the mixed-effects linear model for patient symptom management as the dependent variable are reported in Table 13.

**Hypothesis 3.** This hypothesis stated that as nurses’ participation in decision making increased on the nursing units, patients would report better management of their symptoms. Patient ratings of management of their symptoms was positively associated nurses’ participation in decision making. However, although the direction of the relationship was consistent with that hypothesized, the parameter estimate was not statistically significant so Hypothesis 3 was not supported ($\beta=0.06549$, $p=0.3828$).

Table 13
Mixed Model for Patient Symptom Management

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>27.15</td>
<td>1.31</td>
</tr>
<tr>
<td>Nurses’ Participation in Decision Making</td>
<td>0.06</td>
<td>0.07</td>
</tr>
<tr>
<td><strong>Control Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMI</td>
<td>0.12</td>
<td>0.48</td>
</tr>
<tr>
<td>RN Unit Tenure</td>
<td>0.004</td>
<td>0.005</td>
</tr>
<tr>
<td>RN Experience</td>
<td>-0.006</td>
<td>0.004</td>
</tr>
<tr>
<td>RN Education Preparation</td>
<td>-1.11</td>
<td>0.78</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001
Chapter Summary

In this chapter, findings were reported from the analysis of the hypotheses in which work complexity, nurses' participation in decision making and patient symptom management were specified as the dependent variables. Mixed models with hospital specified as a random effect were used to test the hypotheses. In this analysis, work complexity was significantly and positively associated with the number of beds and Hypothesis 1 was supported. However, although work complexity was positively associated with the number of nurses, and the direction of the relationship was consistent with that hypothesized, the parameter estimate was not statistically significant so Hypothesis 1A was not supported. Further, work complexity was significantly negatively associated with nurses' participation in decision making but not in the expected positive direction making Hypothesis 2 not supported. Finally, patient ratings of management of their symptoms was positively associated nurses' participation in decision making. However, although the direction of the relationship was consistent with that hypothesized, the parameter estimate was not statistically significant so Hypothesis 3 was not supported.
In Chapter 6, the findings from this study will be summarized and discussed. In addition, the theoretical implications of this study as a test of SCT will be described. Following this discussion, study limitations and recommendations for future research will be presented.
CHAPTER 6
DISCUSSION

This chapter discusses the findings for the hypotheses presented in the previous chapter. It begins with the discussion of the results of hypotheses testing, followed by theoretical and practice and policy implications of the findings. It then provides limitations of the study and closes with suggestions for future research.

Hypotheses Testing

The following section discusses results for each of the hypotheses.

Unit Size and Work Complexity

Unit size was operationalized two different ways - number of beds and number of nurses - and resulted in two separate hypotheses. Hypothesis 1 purported that increased size, measured as number of beds, would be associated with significantly increased work complexity for nurses. The analysis supported this hypothesis. When there were more patients on the nursing unit, nurses' perceptions of work complexity increased as theorized in structural contingency theory. This is also supported in the literature because more beds means more patients which can lead to increased work complexity for nurses due to higher numbers of patient transfers and multiple competing patient demands, which then increases the requirements for their nurses to control and coordinate their care (Ford & Slocum, 1977).

Hypothesis 1A proposed that increased number of nurses would be significantly
associated with increased work complexity for nurses. Although work complexity was positively associated with the number of nurses, and the direction of the relationship was consistent with that hypothesized, the results were not statistically significant and the hypothesis was not supported. The reason for these results is not clear because prior research has found that when there were more nurses on the nursing unit work complexity increased because of the increasing challenges placed on nurses to effectively communicate and coordinate the patient care that needed to be carried out on the unit (Smith et al., 1994). One possible explanation for the lack of a significant relationship between unit size, as operationalized as number of nurses, and work complexity may be that not all unit size measures are equally relevant or sensitive in their influence on work complexity; i.e. the extent to which the work complexity measure is sensitive to changes in the number of nurses. Work complexity may be more sensitive to changes in number of beds/patients than number of nurses.

Alternatively, it may be that there were other factors on the nursing units that lessened or mitigated the effects of the increased number of nurses on work complexity such as improved team work. When work becomes increasingly complex, nurses may be more willing or apt to pull together as a team and work more effectively with one another. For example, it is possible that when there are more nurses, the nurses anticipate the need for increased communication among themselves and may alter their communication patterns and routines to communicate more frequently with one another. In this manner, nurses may be able to more fully share their knowledge with one another and gain more information about their patients' conditions which may increase their ability to control and coordinate the patient care and help them better address the needs of all of the patients on the nursing unit.
Such practices could ease the increased work complexity that can occur when there is an increased number of nurses on the nursing unit.

**Work Complexity and Nurses' Participation in Decision Making**

As discussed in Chapter 2, Hypothesis 2 stated that there would be a significant positive relationship between the complexity of nursing work and nurses' participation in decision making. Increasingly complex work would require more information sharing among nurses which could be accomplished by nurses' increased decision making and problem solving in their work groups (Kramer & Schmalenberg, 2002; Wagner, 1994). However, Hypothesis 2 was not supported. The relationship between work complexity and nurses' participation in decision making was highly significant but in the opposite direction from that which was hypothesized. These results indicated that as work complexity increased on the nursing units, nurses' participation in decision making decreased.

Nurses' participation in decision making was assessed in this study by a six-item, five-point Likert-type scale which is described in chapter 4 (see p. 74) and depicted in appendix 2. These items assessed nurses' decisions affecting both direct care of patients and unit operations/administrative functions. For example, items 1, 2 and 5 ask nurses to assess the degree to which they participate in administrative decisions affecting unit operations including determining the budget, hiring nursing staff and adopting new care programs. Items 3, 4 and 6 ask nurses to assess the degree to which they participate in decisions about the evaluation of nursing care, planning and organizing care on a day-to-day basis and participating in discharge planning for patients on the unit.

There may be both a conceptual explanation and a measurement explanation for these findings. Nurses' participation in decision making has traditionally been conceptualized as
nurses' involvement in both administrative and clinical decisions on the nursing unit. In this study, a single scale was used to measure both kinds of decisions which may have masked the distinctiveness of administrative and clinical decisions. Measuring nurses' participation in decision making as a single construct encompassing both clinical and administrative decisions may not have been the best method to use to capture the effects of nurses' participation in decision making on the patient outcome measure - patients' perceptions of their symptom management. Measuring decision making as two different constructs, one that includes clinical decisions and one that includes administrative decisions, might have been a more appropriate approach.

To determine if nurses' participation in decision making was comprised of these two different constructs, a factor analysis of the Decision Making Scale was computed using the PROC CORR and PROC FACTOR procedures in SAS version 9.2. The scale was determined to have only one factor. The factor pattern is detailed below in table 14.

<table>
<thead>
<tr>
<th>Table 14. Factor Analysis for Decision Making Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor Pattern</td>
</tr>
<tr>
<td>Central3 The evaluation of nursing care?</td>
</tr>
<tr>
<td>Central5 Adopting new nursing policies on this unit?</td>
</tr>
<tr>
<td>Central4 Planning and organizing care on a day-to-day basis?</td>
</tr>
<tr>
<td>Central2 Hiring nursing staff on this unit?</td>
</tr>
<tr>
<td>Central6 Participate in discharge planning for patients on this unit?</td>
</tr>
<tr>
<td>Central1 Determining the budget for the unit?</td>
</tr>
</tbody>
</table>
It is possible that when assessing patient outcomes, the items on the decision making scale that pertain to decisions affecting patient care may be more sensitive to patient outcomes, whereas the items on the decision making scale that pertain to both administrative decisions affecting unit operations and clinical decisions affecting patient care may be more sensitive to nurse outcomes. It would have been informative to re-run the analyses using only the patient relevant items, but there were too few of them to accomplish this.

Alternatively, it is possible that as work becomes more complex, nurses may be unable to participate in formal processes where patient care decisions are made such as patient rounds, multi-disciplinary group discussions or case meetings because they cannot be freed from their direct care responsibilities. If this is the case, better methods are needed to free nurses to participate in forums with physicians and other nurses where decisions are made. When work complexity increases on the nursing units, rather than creating other mechanisms for nurses to participate in decisions, it is possible that physicians and administrators make decisions with limited nursing input. This would tighten hierarchical control and reduce nurses’ input into decision making which would explain the opposite effect obtained in Hypothesis 2.

As work becomes more complex, nurses may also be unable to fully participate in the informal decision making processes that occur on nursing units such as nurse rounds, developing nursing care plans and revising/updating patient progress in multi-disciplinary team care plans. Methods to increase such informal decision making are also needed.
Nurses' Participation in Decision Making and Patient Perceptions of Symptom Management

Hypothesis 3 purported that as nurses' participation in decision making increased, patients were expected to report better management of their symptoms. Although the direction of the relationship was positive and consistent with that hypothesized, the parameter estimate was not statistically significant and the hypothesis was not supported. Patient symptom management scores were good overall (mean scores were 27.4 out of a possible range of 6-36) which may be related to the fact that the patient sample was relatively homogeneous across hospital units with average health status ratings of fair to good. There was limited variability among the nursing units and as such patients may have been more likely to have similar needs and levels of symptom distress. SCT suggested that high variability in patient needs would make it more difficult for nurses to meet patient needs for symptom management. Thus, the limited variability among the nursing units may have contributed to the non-significant results because patient needs were more likely to be similar and more easily managed by the nurses.

It is possible that limited precision in terms of the measurement of the effectiveness variable - patient perceptions of symptom management - may have contributed to the non-significant results. It is possible that the use of the symptom management scale as modified for this study may have been insufficiently sensitive to capture the relationship between the structural variable - nurse' participation in decision making - and patient perceptions of symptom management. Perhaps simply asking patients whether nurses met their expectations for relief of symptoms such as nausea, pain and difficulty sleeping was not enough. Perhaps what was needed was to solicit patient feedback on specifically what nurses did to manage
their symptoms and if these mechanisms were effective or not. This might be a better indicator of how nurses' participation in decision making contributes to effective symptom management for patients.

Even though Hypothesis 3 was not supported, in retrospect, the argument may be advanced that conceptualizing patient symptom management as the effectiveness variable was an appropriate choice. It has been well established in the literature that effective management of symptoms is important to patients in evaluating their illness experiences and encounters with the health care system (Committee on Quality of Health Care in America, 2001), however, research on organizational factors that foster effective symptom management has been limited and many unanswered questions remain. Given the current emphasis on patient centered outcomes, it may be argued that further research on effective symptom management for patients is needed in order to foster conditions which may facilitate effective symptom management in hospitals.

It may be that items on the nurses' participation in decision making scale that relate to administrative decisions including determining the budget, hiring nursing staff and adopting new programs are not as sensitive to patient outcomes whereas the items that relate to clinical decisions including the evaluation of nursing care, planning and organizing care on a day-to-day basis and participating in discharge planning for patients on the unit are more sensitive to patient outcomes.

Although the factor analysis confirmed that the decision making scale only had one factor, it is possible that better measurement could be developed that would try to take advantage of what might be two different types of decisions. As described in chapter 2, nurses' participation in decision making has been studied in terms of its effects on both nurse
and patient outcomes. Both administrative and patient related decision making have been shown to be important to nurses however, nurses report that they want more decisional authority over decisions about unit operations and resources than they have traditionally been given (Scherb, Specht, Loes & Reed, 2011). When nurses have input into both administrative and patient related decisions they have reported improved nurse outcomes including increased communication with their nurse colleagues, improved negotiation and problem-solving skills, and increased job satisfaction (Dunbar, Park, Berger-Wesley, Cameron, Lorenz, et al, 2007; Hoffart & Willdermood, 1997; Specht, 1996). In contrast, most patient outcomes focused research has focused on nurses' input into clinical patient care decisions rather than administrative decisions. Nurses' participation in clinical decision making has resulted in improved patient outcomes including lower patient mortality (Aiken, Smith & Lake, 1994), fewer patient complications (Baggs, et al, 1999), shorter length of stay (Aiken, et al, 1999), less use of ICU beds (Aiken et al, 1999) and fewer patient and family complaints (Havens, 2001).

**Theoretical Implications**

Traditional interpretations of SCT consider the environment and technology to be co-occurring factors independently affecting the organization’s structure. In Chapter 2, it was argued that the key environmental variable in this study – unit size – would affect the complexity of work on nursing units (the technology). Therefore, increased size was expected to influence work complexity through its affects on patients and the nursing care that they require. This assertion yielded mixed results in the data analysis. When size was conceptualized as number of beds, there was a significant positive effect on work complexity, however, when size was conceptualized as number of nurses the effect on work
complexity was not significant, but the relationship was positive. It could be argued, then, that this interpretation of SCT is valid as the environmental variables did influence the technology. It could also be argued that not all contextual factors on nursing units are equally important in their influence on work complexity. This study suggests that unit size is an important influence on work complexity in nursing units, but that number of beds/patients is a more important influence on work complexity than number of nurses.

This study lends support to the notion that investigation of single variable relationships may be of limited benefit in assessing the relationships between context, structure and effectiveness. In this study, for example, technology was assessed using a single variable and the relationships among environment and technology structure and effectiveness were tested using single variables. Some SCT researchers now argue that effectiveness in organizations results from the combination of multiple contextual and structural variables (Betts, 2003; Ellis, Almor & Shenkar, 2002). Based on this approach, it is possible that testing hypotheses using variable clusters that represent multiple contextual and structural factors, would be helpful in assessing effectiveness outcomes on nursing units. For example, if this study were to be replicated using this combination approach, contextual factors might include not only number of beds, but also churn (patient turnover), patient acuity and nurse staffing variables and structural factors might be expanded to include not only nurses' participation in decision making, but autonomy and relational coordination as well because these factors encompass the working conditions that support professional nursing practice.

A relatively new approach appearing in the organizational literature is the configurational approach which is rooted in contingency theory but differs from it in that
while contingency theorists utilize a "reductionist mode of inquiry which seeks to explain how order is designed into the parts of an organization," configurational theorists try to explain "how order emerges from the interaction of those parts as a whole" (Meyer, Tsui & Hinings, 1993, p. 1178). Configuration theorists assume a holistic view, asserting that "the parts of a social entity take their meaning from the whole and cannot be understood in isolation" (Meyer, Tsui & Hinings, 1993, p. 1190). Thus, all components of the system, including contextual and structural factors, must jointly work together for an organization to achieve effectiveness (Meyer et al, 1993). This provides further support for the earlier assertion that that testing hypotheses using variable clusters that represent multiple contextual and structural factors would be helpful in assessing effectiveness outcomes on nursing units.

**Practice Implications**

This study supports findings from previous research which found that increased numbers of patients on the nursing unit leads to increased work complexity for nurses (Ebright, 2010). This study provides support for further study into the effects of work complexity on nurses' capacities to process the information needed to effectively carry out the transformation process in which their patients become discharged persons (Alexander & Bauerschmidt, 1987). When work complexity increased nurses' participation in decision making did not increase suggesting that there may be barriers that may negatively impact this transformation process. Therefore, nurse administrators must determine if barriers exist and if so, ways to overcome the obstacles that prevent nurses from full participation in the decision making that occurs on nursing units.
If nurses have limited input into decisions that are made about their patients, the information available to the patient care team will be incomplete and may result in decisions that do not fully meet patients' needs. For example, a physician may assume that a patient is ready for discharge, when in fact, the patient has not yet demonstrated competence in performing the procedures that they will assume at home that nurses have been doing while they are hospitalized. Or, in another example, a patient who was able to ambulate without assist devices or staff assistance on admission to the hospital may now be having difficulty getting around without a walker and has new onset vertigo. If nurses are aware of these problems but are unable to share this information with the multidisciplinary team the patient may be at risk for falling and may not receive the additional support at discharge that they require. In times of increasing work complexity, nurse leaders must implement strategies to temporarily free nurses from other work tasks so that they can participate in forums with physicians and other nurses where decisions are made. For example, aligning nurse and physician schedules so that nurses can participate in both formal mechanisms of decision making such as in rounds with physicians on their nursing units, or utilizing a float nurse to cover a nurses' patients while she meets with the multidisciplinary patient care team in case conferences, as well as informal mechanisms of communication with other nurses that occur on-the-fly on an ongoing basis throughout a nurse's shift.

The study results indicated that as work complexity increased on the nursing units, nurses' participation in decision making decreased. Since work complexity had a negative impact on nurses' participation in decisions, this suggests that the chaotic environment that is typical on many nursing units may contribute to the perception that work conditions are not conducive to enacting professional nursing practice. Therefore, nurse leaders should explore
putting into place the mechanisms that would contribute to better work conditions for nurses. Improving work conditions may increase nurses' ability to participate in decision making on the nursing units.

Methods to increase informal decision making by nurses on units are needed such as building into staffing assignments a "nurse buddy" to assist their assigned "buddy" nurse with the on-the-fly decision making that occurs on an ongoing basis in hospital patient care. Although no information was found in the research literature supporting this practice, Vanderbilt University Medical Center nurses utilize such a system for nurses who are new to the units (http://www.mc.vanderbilt.edu). In the Vanderbilt system, buddy nurses are assigned to new nurses for six weeks after formal orientation has ended. The experienced nurse buddy functions to assist the new nurse with problem solving and any circumstances that arise during the shift. This "buddy" concept could be used on an ongoing basis on all nursing units and allow nurse pairs (buddies) to cover one another for breaks and assist with patient care when needed which can facilitate increased informal nurse participation in decision making. Charge nurses can assign nurses to a buddy whose patients are in close proximity to one another. Thus, a nurse's buddy can assume patient care tasks such as answering patient calls for her colleague's patients to allow her buddy nurse time to provide her input into the multi-disciplinary care plan addressing a particular patient problem.

Further, nurse leaders may find that implementing an integrated medical record where all disciplines document in a shared record accessible to all team members results in improved communication and decision making among the team because all disciplines can easily access and contribute to a common document of the patient's progress. Finding ways to foster increased informal decision making may reduce the burden of formal decision-making
processes. For example, if a nurse participates in a high degree of informal decision making with her nurse colleagues this may enable her to consistently document a patient's progress with his discharge goals in the team's care plan assuring that the information will be available to team members at formal patient meetings if the nurse is unable to attend.

This study did not show a relationship between nurses' participation in decision making and patient ratings of their symptom management but it does suggest that patients' expectations for symptom management were met since patient symptom management scores were high. It may be helpful for nurse managers to more closely examine the mechanisms that support effective symptom management on their nursing units because it may be possible to improve patient care as a result. For example, qualitative research through patient interviews may assist nurse leaders to better understand effective symptom management from the patient perspective so that nursing care can be designed to achieve symptom management that patients desire.

**Policy implications**

The most important policy implication of this study relates to transforming patient care so that nurses' participation in decision making may be facilitated, particularly under conditions of increasing work complexity. The practice implications for nurse participation in decision making have already been discussed but there are also policy implications which are part of a much broader issue which is the role of nursing in patient care. With the aging population and changes to the U.S. health care delivery system looming on the horizon, there has been much discussion and debate regarding expanded roles for nurses, particularly allowing nurses to practice to the full extent of their scope of practice. Nurses need to be full partners with their colleagues in planning and designing care for patients (IOM Future of
Nursing Report, 2010) but are often prevented from doing so because of system barriers and organizational policies. The IOM report stresses that nurses working on the front lines of patient care play a vital role helping to realize the objectives set forth in the 2010 U.S Affordable Care Act legislation but only if these barriers are removed. Barriers to nurses' participation in decision making must be overcome to ensure that nurses are well-positioned to lead change and advance health.

**Study Limitations**

The findings from this study must be interpreted in light of several limitations. First, this study was conducted using data that were collected for a larger study. Some variables that may have been relevant to this study were not utilized from the larger study. For example, computer information systems have changed the manner in which workflow occurs on the nursing unit. Computerized provider order entry (CPOE) systems enable providers to enter medical orders into a computer system which improves communication between prescribers and providers of care (Dixon & Zafar, 2009). These systems can also provide real-time clinical decision support (CDS). When CPOE and CDS are implemented together they can improve quality of care for patients (Chertow, Lee, Kuperman, Burdick, Horsky, Seger, et al, 2001; Dexter, Perkins, Maharry, Jones & McDonald, 2004; Peterson, Kuperman, Shek, Patel, Avorn & Bates, 2005) as well as the efficiency of hospital workflow (Lee, Teich, Spurr & Bates, 1996; Peterson et al, 2002). Thus, information on the impact of such systems on work complexity and nurses' participation in decision making in the nursing units may comprise important contextual and structural information relevant to this study that was available in the ORNA dataset but not utilized in this study. Future research in this area should consider these relationships.
Second, the data were collected in 2003-2004 and includes conceptualizations of some variables that may now be considered outdated, particularly the measurement of unit size. The measure of unit size in this study was a very static measure that assumed one patient per bed. This conceptualization does not capture the patient turnover or churn that occurs on nursing units. Churn is measured by the turnover that occurs on the units where a patient may receive care on a given day (Duffield, et al., 2009). For example, a common scenario involves a patient who is admitted to a medical-surgical unit and then makes multiple trips to and from the unit throughout the day for tests and treatments including trips to radiology, ultrasound, physical therapy and dialysis. This patient travels to and from five areas in one day which is highly labor intensive for the nursing staff, yet these frequent transfers to and from the unit are rarely accounted for when staffing the nursing unit (Duffield et al., 2009). Churn also includes the patient discharges, admissions and transfers from one nursing unit to another that occur frequently throughout a 24-hour period on nursing units. A common example of transfers involves surgical patients. When a patient is admitted to the hospital for same-day surgery, he will receive nursing care in the pre-operative holding area, operating room, post-anesthesia care unit and post-operative medical-surgical unit. Frequently, this patient will be discharged home after a few hours on the post-operative unit and another patient will be admitted in his place thus turning these beds over multiple times in a 24-hour period. Information that can be obtained from the churn that occurred on the nursing units would have an impact on all of the variables in this study but cannot be examined because it was not collected.

Third, medical-surgical units were recruited in the ORNA-II study as sites for data collection, resulting in a homogeneous sample of nursing units. As a result, there was limited
variability in these data for the work complexity variable in this study. For example, the mean and standard deviation for work complexity was 26.84 and 3.5 respectively, and the range was 15.79-37.4 suggesting that there was limited variability in work complexity across these units. Future research in this area should include nursing units with higher variability among the sample such as intensive care units.

Another limitation of this study was that it was not possible to evaluate social desirability as a potential source of bias in patients’ responses to the symptom management scale. Further, this study did not collect information about patients’ hospital experience such as duration of hospital stay, their primary diagnosis or their clinical condition. These factors affect symptom severity, duration, and distress, which, in turn, contribute to patients’ evaluation of symptom management (Hargraves, et al. 2001; Kroenke, 2001).

Another limitation relates to the cross-sectional design of this study. A weakness of cross-sectional designs is that they only provide a snapshot of the variables included in the study, at one particular point in time. To strengthen the study's design, data were collected at multiple points over a six month period. A longitudinal design collects data over long periods of time and can measure change in variables over time. Although the ORNA study collected the data in a temporal order, enabling some causal arguments, the design does not completely eliminate the possibility of endogeneity problems. Endogeneity problems are particularly relevant in the context of analyses of causal processes because there can be a loop between the independent and dependent variables of a model (Cohen et al, 2003). For example, this study argued that increased unit size leads to increased work complexity which leads to increased nurses' participation in decision making which will result in patient reports of better management of their symptoms. It is possible that nursing units with a previous history of patient complaints
regarding management of their symptoms intentionally increased their involvement in decision making or that a nursing unit with consistently high levels of satisfaction with management of their symptoms do not feel the need to participate more fully in decisions. Therefore, this study’s inability to provide exact accounts of what might have happened should be viewed as a limitation.

Another design related limitation involves the lag time between data collection periods. As mentioned earlier, longitudinal data collection helped to strengthen the study design, however, the magnitude of a relationship between constructs measured at different occasions will often depend upon the amount of time that passes between the measurement of the variables, or lag (Cohen et al, 2003). For example, if a variable was measured in January, February and March there would be a one month lag time. The problem is that the lag time selected may not adequately capture the change in the variable. If, for example, if some items are measured in January and some in March, it is difficult to know if two months is a sufficient lag time to capture the effects of the first set of variables on the second. In this study, unit size and work complexity data were collected at time 1 (January), data from nurses regarding participation in decision making were collected at time 2 (March) and data from patients were collected at time 3 (June). It is unclear whether these lag times were appropriate for making causal inferences for example, in determining the relationship between work complexity and nurses' participation in decision making, it is impossible to be certain that the two month lag was sufficient to adequately capture the affects of work complexity on nurses' participation in decision making.

A final study limitation relates to possible historical threats to internal validity. Events outside of the study may affect participants’ attitudes and behaviors such that it becomes impossible to determine whether any change on the dependent measures is due to
the independent variable, or the historical event (Cohen et al, 2003). It is unknown whether there were any such events that occurred in the study units, however, if there were major historical changes in the nursing units during the data collection period, for example, the addition of a new and unfamiliar patient population, this could affect study results.

**Recommendations for Future Research**

Several recommendations for future research are suggested. First, any future outcomes research studies examining the effects of unit size in hospital nursing units must include the concept of churn. Churn is pervasive in the hospital, yet it is rarely accounted for in nurse staffing despite the fact that it touches most every nursing unit (Duffield et al., 2009). Duffield and colleagues found that medical/surgical patients moved on average more than twice in an average hospital stay of only about 4 days (2009). As hospital lengths of stay continue to shorten, churn is expected to increase but the provision of more nursing resources to meet this increased patient movement has not occurred in most hospitals (Duffield et al, 2009). Research is needed to study and quantify the effects of churn on both nurse and patient outcomes. It is possible, for example, that churn is one of the factors on nursing units in this study that lessened the effects of increased numbers of nurses on work complexity.

Another area that requires future research is in the conceptualization of nurses' participation in decision making. It is possible that nurse outcomes and patient outcomes are influenced differently by different types of nurses' decision making. For example, whereas research previously discussed indicates that nurse outcomes are influenced by nurses' participation in both administrative and clinical decision making, the results from this study suggest that relationship between nurses' participation in decision making and patient outcomes is less clear. It is possible that patients may be more influenced by nurses'
decisions that are only relevant to clinical decision making. Future study should examine the manner in which nurses' participation in decision making is conceptualized and its resultant effects on outcomes research. Scales should be developed with more attention to the conceptual linkage between the types of decisions that nurses make and specific patient outcomes.

Another area that requires future research relates to sources of obtaining patient data. Despite the effort to minimize reporting bias problems by using random sampling to recruit patients, sampling bias remains a concern. Researchers have found that patients who complete hospital surveys are more likely than nonrespondents to have positive perceptions of their hospital experience (Mazor, Clauser, Field, Yood, & Gurwitz, 2002; Perneger, Chamot, & Bovier, 2005), consequently, the patients who participated in this study may not be representative of all patients admitted to the same unit. Therefore, designing and utilizing a sampling method that is sensitive but less likely to be subject to reporting bias problems would be helpful for future research with hospitalized patients.

Future outcomes research using SCT to examine unit-level effects should include the use of variable clusters. SCT theorists suggest that using this approach would more clearly delineate the multiple contextual and structural factors that affect nurse and patient outcomes and be more helpful in assessing effectiveness. Future research should also include the use of mediators and moderators to assess their possible effects on the relationship between unit size, work complexity, nurses' participation in decision making and effective symptom management. It is possible that exploring the effects of mediators and moderators in the conceptual model might explain why the expected hypotheses were not supported in this study.
It is possible that there were other factors on the nursing units that lessened or mitigated the effects of increased number of nurses on work complexity such as better teamwork or other attributes that were not looked at in this study. For example, the availability of support services for nurses such as patient transporters may moderate the relationship between unit size and work complexity because transporters can assist with mobilizing patients for trips on and off the unit for tests and diagnostic procedures that increase work complexity for nurses. Further, the availability of unit-based discharge coordinators and case managers for nurses may moderate the relationship between work complexity and nurses’ participation in decision making because nurses’ may be able to participate in patient care decisions through the use of these resource personnel.

There may also be work design factors that were not explored in this study that may be related to how well patients perceive that their symptoms have been managed, for example, consistency of providers. When nurses work schedules are arranged so that they are assigned to patients on a consistent basis over a period of several days, they have more time and opportunity to build relationships with their patients, are more familiar with their patient's specific needs which has the potential to improve symptom management (Bacon et al, 2009). Therefore, consistency of nurse providers may mediate the relationship between nurse' participation in decision making and patient symptom management because consistent nurse providers may be more knowledgeable about their patients' needs and more able to provide input into decisions that affect how well patients' symptoms are managed.

Summary

In this chapter, significant findings from this study were compared with finding from the literature, and both theoretical and methodological explanations for the insignificant
findings were identified. Further, limitations of this study and recommendation for future research were discussed. Three of the four hypotheses in this study were not supported suggesting that continued research is needed to explain the relationship between nursing unit context, work complexity and the structural mechanisms needed to achieve effective symptom management for patients.

Despite the limitations of this study, it has contributed to the literature by highlighting the importance of the effects of unit size on work complexity for nurses that is often not accounted for when determining nurse staffing in hospitals. This study also illustrates the important effects of work complexity on nurses' ability to participate in decision making on nursing units. Nurses' participation in decision making was found to be significantly negatively impacted by increasing work complexity which reinforces the importance of nurse leaders' facilitation of work conditions that support nurses' full participation in decisions on nursing units. Finally, this study provides support for continued research to identify organizational contexts and structures that foster the delivery of hospital care that is consonant with patients’ expectations for symptom management.
Appendix One

WORK COMPLEXITY SCALE

Response Options:
- Strongly disagree
- Moderately disagree
- Slightly disagree
- Slightly agree
- Moderately agree
- Strongly agree

1. Nurses on this unit could do a better job if they had more control over the types of patients they were assigned.

2. Physicians change their orders so frequently that nurses on this unit have difficulty doing a good job.

3. Nurses on this unit could do a better job if they had more information about their patients’ conditions.

4. Frequent movement of patients on and off the unit (for diagnostic studies, procedures, etc.) make it difficult for nurses on this unit to do a good job.

5. Frequent discharges from the unit make it difficult for nurses on the unit to do a good job.

6. Frequent admissions to the unit make it difficult for nurses on the unit to do a good job.

7. Frequent patient transfers from this unit to another unit, or vice versa, make it difficult for nurses on this unit to do a good job.

Note: Scores from 7 to 42 are possible with higher scores indicating greater work complexity.
Appendix Two

NURSE PARTICIPATION IN DECISION MAKING SCALE
Response options:  Do not participate at all
                 Participate rarely
                 Participate to some degree
                 Participate to a great extent
                 Participate to a very great degree.

To what degree do nurses on this unit participate in decisions about:
1. Determining the budget for the unit?
2. Hiring nursing staff on this unit?
3. Evaluating nursing care?
4. Planning and organizing care on a day-to-day basis?
5. Adopting new nursing care programs on this unit?
6. Participating in discharge planning for patients on this unit?

Note: Scores from 6 to 30 are possible with higher scores indicating greater nurse participation in decision making.
Appendix Three

**SYMPTOM MANAGEMENT SCALE**

Response options: Much less than I expected  
Somewhat less than I expected  
About as much as I expected  
Somewhat more than I expected  
Much more than I expected  
Did not have this problem

How much did the nurses do to help you:

1. When you felt nauseated.
2. When you were in pain.
3. When you couldn’t sleep.
4. When you had difficulty getting around.
5. When you had a headache.
6. When you didn't have very much energy.

Note: Total scores on this scale can range from 6 to 36, with higher scores indicating a more positive evaluation of the extent to which expectations for symptom management have been met.
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