THE EFFECTS OF ENVIRONMENTAL TURBULENCE ON NURSE PERFORMANCE

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DEDICATION

The professional accomplishment assocaited with this dissertation is dedicated, with love, to my parents, Harry and Jeanette Salyer for their confidence in my ability and encouragement, and to C. J. and Whiskers for their companionship.

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ABSTRACT

THE EFFECTS OF ENVIRONMENTAL TURBULENCE ON NURSE PERFORMANCE

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The purpose of this study was to determine the effects of environmental turbulence on nurse performance. The conceptual model of environmental, sociodemographic, and personal factors affecting performance was derived from Elliott and Eisdorfer's (1982) generic model depicting potential stressors, mediators of stress, psychological consequences, and behavioral outcomes. The potential stressors are characteristics of the internal (hospital) environment; the mediators include personal characteristics of the nurse and unit technical support systems; the psychological consequence is perceived environmental uncertainty; and the behavioral outcome is self-rated quality of nurse performance. The sample (N = 95) was randomly selected from among staff registered nurses working on 19 medical-surgical and pediatric units in a state-supported medical center hospital. Environmental turbulence, the potential stressor, was operationalized as: day-to-day change in acuity and occupancy, and number of admissions to/discharges from and number of transfers on and off a unit in a 24-hour period. Experience was operationalized as number of roles and clinical areas a nurse had worked in since graduation. Education reflected educational level attained. Five instruments were used: the **Tolerance-Intolerance**

of Ambiguity Scale measured ambiguity tolerance, the **Hardiness Scale** measured personality hardiness, the **Technical Support Services Questionnaire** measured availability and responsiveness of technical support services, the **Perceived Environmental Uncertainty Scale** measured the nurse's perception of uncertainty in the work environment, and items from the **Six-Dimension Scale of Nursing Performance** measured ability to implement nursing process, perform technical skills and prioritize care, and communicate effectively and maintain interpersonal relationships with patients, families, and other health care personnel.

Contextual regression revealed that individual variables (alone) had a greater effect on each of the performance measures than did group level variables (alone). Group level variables (alone) exerted a significant effect only on implementation of nursing process. In each performance model the R^2 differences were significant when the models with group level variables (alone) were compared to models with group and individual variables (together). The R^2 difference when models with individual variables (alone) were comapred to models with group and individual variables (together) were nonsignifciant, indicating that individual level variables significantly contribute to explained variance in performance when added to the effects of group level variables.

Path analysis showed that one measure of environmental turbulence (the number of admissions and discharges in a 24-hour period), had a significant negative effect on each performance measure; however, tolerance for ambiguity and perceived environmental uncertainty effectively buffered the negative impact on both implementation of nursing process and performance of skills and prioritizing care. The direct

negative impact of admissions and discharges on interpersonal relations/ communication skills was not buffered by the effects of mediating variables. Personality hardiness emerged as a predictor of performance, not as a mediator of stress and had a positive effect on both implementation of nursing process and skills performance by increasing the perception of uncertainty. Level of education had a negative effect on each performance measure as a result of its negative effect on ambiguity tolerance. Technical support services had a positive effect on both implementation of nursing process and skills performance. Findings from this study have theoretical and practical implications and give direction for further research.

Chapter 1

STATEMENT OF THE PROBLEM

The decade of the 1980s was one of change, uncertainty, and challenge in the health care environment. Changes in the regulatory environment, which occurred as a result of concern over health care costs approaching an unprecedented 11% of the Gross National Product (Saywell, Zollinger, Chu, Macbeth, & Sechrist, 1989), led federal and other third party payers to alter their method of reimbursement for care or implement other cost control measures. These changes in the external regulatory environment affected the internal health care environment by changing the characteristics of the patient population, the delivery of care, and the resources available to deliver the care. For example, length of stay decreased in general hospitals, while, at the same time, patient acuity increased (Gutterman, Eggers, Riley, Greene, & Terrell, 1988). The impact of these changes on nurse performance, however, has not been widely investigated. Nursing administrators, who must create and maintain clinical environments that support practice, will be hampered in management decision-making unless the effect of these changes on clinical performance is understood.

Numerous factors influence nurse performance, defined in this investigation as the quality of implementation of the nursing process. Of all factors thought to affect nurses' job performance, those most often examined can be classified into seven major categories: academic

achievement, characteristics of the nurse's family of origin, demographic characteristics, employment characteristics, nursing school characteristics, personal characteristics, and nurse career behavior (Schwirian, 1981). Of these, three have received significant attention from investigators: academic achievement, nursing school characteristics, and nurse career behavior. Less attention has been paid to employment and personal characteristics (Schwirian, 1981).

Less attention still has been given to the effects of the dramatic changes in the health care environment on nursing. Turbulence, or instability and rapid change, in this environment has been a major feature of the past decade. Thus, the question that must be answered is **"What is the effect of environmental turbulence on the job performance of nurses?"**

To provide direction for nursing and health administrators, research is needed on the impact of turbulence in the hospital internal environment on nurses' performance. Thus, following the recommendations of Haussmann, Hegyvary, and Newman (1976), who suggested that investigations of the quality of job performance focus on environmental, organizational, and human relations variables, and Schwirian's (1981) conclusion that employment and personal characteristics of nurses are both under-investigated and potentially fruitful areas of investigation, the present study examined characteristics of the internal hospital environment, sociodemographic factors, and psychological or personality characteristics of nurses thought to contribute to individual nurse performance. This chapter presents background information on trends in theory development and research on the influence of the environment on

performance. The chapter also presents the statement of purpose for this study, definitions of terms, and the hypothesized relationships and effects among the concepts of the proposed model.

Background and Significance

Enormous effort has been expended over the past five decades in attempts to identify variables related to job performance. Organizational researchers have concentrated their efforts on the relationships between and among job performance and the variables of job satisfaction, job attitudes, personality, motivation, leadership, and, to a lesser extent, on group process and organization design (Blumberg & Pringle, 1982). Similarly, nurse researchers have concentrated on these, and other, variables thought to predict performance (Schwirian, 1981). In spite of these parallel efforts, little empirical work has been done on elements in an individual's environment that facilitate or impede performance (Blumberg & Pringle, 1982; Dachler & Mobley, 1973; Peters & O'Connor, 1980).

The importance of environmental variables in job performance models is widely acknowledged but often dismissed in theories of performance. Porter and Lawler (1968), who suggested that the effort-performance relationship is moderated by abilities, traits, and role perceptions, acknowledged that many environmental factors intervene to influence performance. They failed, however, to incorporate these variables in their model because they "represent 'spurious' factors in understanding the psychological and human determinants of performance" (p. 32-33).

Cummings and Schwab (1973) argued that environmental variables such as the performance of other workers and the quality of equipment and supplies can influence performance, but minimized the importance of these factors by suggesting that performance is ultimately an individual phenomenon; thus, environmental variables influence performance through their effect on the individual determinants of performance--ability and motivation. In contrast to Cummings and Schwab (1973), Dachler and Mobley (1973) not only recognized the importance of environmental variables, but also incorporated them into their model of work motivation. In this model, the effort-performance relationship initially proposed by Porter and Lawler (1968) is moderated not only by the employee's ability but also by situational constraints. In spite of this acknowledgement, no attempt was made to operationalize and measure these constraints on performance.

In a model which is conceptually similar to Dachler and Mobley's (1973) as well as to that of Porter and Lawler (1968), Aldag and Brief (1979) proposed that the effort-performance relationship is moderated by aptitude, skills, ability, and role perceptions. Additionally, Aldag and Brief (1979) recognized the importance of such nonmotivational constraints on performance as technology and market demand, which may reduce or enhance the relationship between an employee's effort and subsequent performance.

Peters and O'Connor (1980) presented a conceptual framework specifying hypothesized influences of situational constraints on work outcomes. These theorists suggested that eight classes of situational research variables impact on effective performance. The classes of

variables identified included: (a) job-related information; (b) tools and equipment; (c) materials and supplies; (d) financial resources; (e) required services and help from others; (f) education, training, and experience; (g) time availability, and (h) work environment. Each of these resources was described as varying along three dimensions, with poor performance attributed to unavailability, inadequate quantity, or inadequate quality of the needed resource. This taxonomic work, which acknowledged the potential impact of environment on performance, is considered tentative and requires empirical testing.

Another model, proposed by Blumberg and Pringle (1982), posited that three dimensions interact to affect performance. These dimensions include capacity, willingness, and opportunity to perform. Capacity affects and is affected by such factors as ability, age, intelligence, education, knowledge, skills, health, and endurance; while willingness to perform is thought to affect and be affected by motivation, job status and satisfaction, role expectations, task characteristics, and personality. Opportunity, a missing dimension in most performance models, affects and is affected by factors in the environment thought to facilitate or impede performance. These include equipment and supplies, working conditions, leader behavior, mentorism, information, coworker performance, pay, and organizational policies and procedures. The interdependent dimensions will vary from setting to setting and, therefore, it may not be possible to generalize results across settings; however, empirical testing may support the relationships proposed in the model.

Following the examination of the research on social, task, and situational factors that influence motivation, performance, and the

appraisal process, Mitchell (1983) developed a comprehensive model specifying relationships between motivation and behavior, behavior and performance, and performance and appraisal. In specifying the motivation-behavior relationship, one frequently investigated factor influencing behavior is ability. Less frequently studied factors include (a) social factors such as interdependence, cooperation, competition, and group strategies; (b) administrative technology such as staffing, scheduling, and role clarity; (c) machine technology; and (d) the work environment. Performance, reflecting behavior over time, and the performance-appraisal relationship, has been a focus of investigation. Influencing the appraisal of performance, yet infrequently investigated are (a) task factors including ambiguity and experience; (b) environmental factors that facilitate or impede the appraisal process, as well as turbulence in the task environment; and (c) contextual factors such as similarities between evaluator and evaluatee, power, interdependence among group members, and role in the group. Mitchell (1983) calls attention to these factors because they need to be considered in order to provide a more powerful analysis of performance. A major limitation of this model is that it fails to specify the functional relationships among the variables, making it difficult to use them theoretically (Goodman & Fichman, 1983).

In the health care environment, health services and nursing researchers, using theories borrowed from other disciplines, have investigated a variety of factors thought to affect nurses' job performance. Following investigations of the effects of nursing care delivery structures on productivity (Shukla, 1982a, 1982b, 1983a, 1983b), Shukla (1987) developed a systems model of nursing performance. Defining

performance as productivity, factors affecting performance were classified in three categories: (a) competency of employees, (b) efficiency of support systems, and (c) motivation of employees thought to be affected by attitudes toward work, the nature of the work, work design, compensation, and management policies and practice. These factors affect performance both directly and interactively. This model is built on the premise that person-environment interaction impacts performance and clearly differentiates employee factors from work environment factors.

Recently, conceptual models of nursing administration have been developed in order to guide research and theory development in nursing (Johnson, Gardner, Kelly, Maas, & McCloskey, 1989; Neidlinger & Miller, 1990; Scalzi & Anderson, 1989). Two of these models acknowledge the potential effect of environment on performance. The conceptual model proposed by Neidlinger and Miller (1990) specifies that "the general environment includes elements outside the organization that may indirectly, or at times directly, affect the internal environment and the delivery of nursing care" (p. 45). The authors caution that the model is not intended to be directly tested; instead, existing, more precise and testable theories should be used to test the model.

The model developed by Johnson et al. (1989) depicts two domains of nursing administration knowledge: systems and outcomes. Levels for knowledge development within these domains include patient aggregates, the organization, and the health care system. System concepts at the organization and health care system levels are structure, process, resources, controls, and environment; and the outcome concepts are performance of the system, performance of personnel, cost, and quality.

The strength of this model is the focus on outcomes and the reciprocal relationship between systems and outcomes. Like the model developed by Neidlinger and Miller (1990), this model is in the early stages of development and requires testing to determine its usefulness in advancing nursing administration knowledge.

Determining factors that impact on nurse performance in the delivery of care is imperative since nursing care accounts for 20% to 30% of the total cost of hospitalization (Halloran & Kiley, 1985). Thus, this investigation proposes and tests a model of environmental, sociodemographic, and personal characteristics that influence nurse performance, and is significant because it (a) explores the relationships among characteristics that have not been explored since the emergence of the new clinical environments created as a result of changes in the external health care environment; (b) follows recommendations that environmental variables be incorporated in models of job performance and explores those underinvestigated factors thought to influence nurses' job performance; and (c) gives direction to nursing and hospital administrators regarding efforts and resources required to support nurse performance and the delivery of care.

Statement of Purpose

The purpose of this investigation is to determine the effects of environmental turbulence on nurse performance. Characteristics of the health care environment thought to produce turbulence in the internal environment are proposed. As well, the sociodemographic and personal characteristics of nurses, and unit support services that mediate the

effects of turbulence on nurse performance in the clinical environments of today's health care environment are incorporated. Figure 1 presents the conceptual-theoretical-empirical structure that guided the investigation. In Chapter 2, a conceptual definition of each of these variables is developed and a review of the empirical work examining the relationships among them is provided.

Definition of Terms

In the present investigation, the variables were defined as follows:

Nurse performance was defined as staff nurse self-evaluation of the quality of implementation of the nursing process and operationalized using items from four subscales of the **Six-Dimension Scale of Nursing Performance:** Critical Care/Skills, Teaching/Collaboration, Interpersonal Relationships/Communication, and Planning/Evaluation (Schwirian, 1978, 1981).

Environmental turbulence was defined as instability and random change in the internal (clinical) environment, and measured by (a) day-to-day change in patient acuity, (b) day-to-day change in patient occupancy, (c) number of patient admissions to and discharges from a nursing unit in a 24-hour period of time, and (d) number of patient transfers on/off the nursing unit in a 24-hour period of time.

Personality hardiness was defined as stress tolerance and measured by the extent to which an individual is committed, controlled, and challenged. Commitment is measured by 12 items of the Alienation from Self, Alienation from Work, and the Powerlessness scales of the **Alienation Test** (Maddi, Kobasa, & Hoover, 1979). Locus of control is measured by

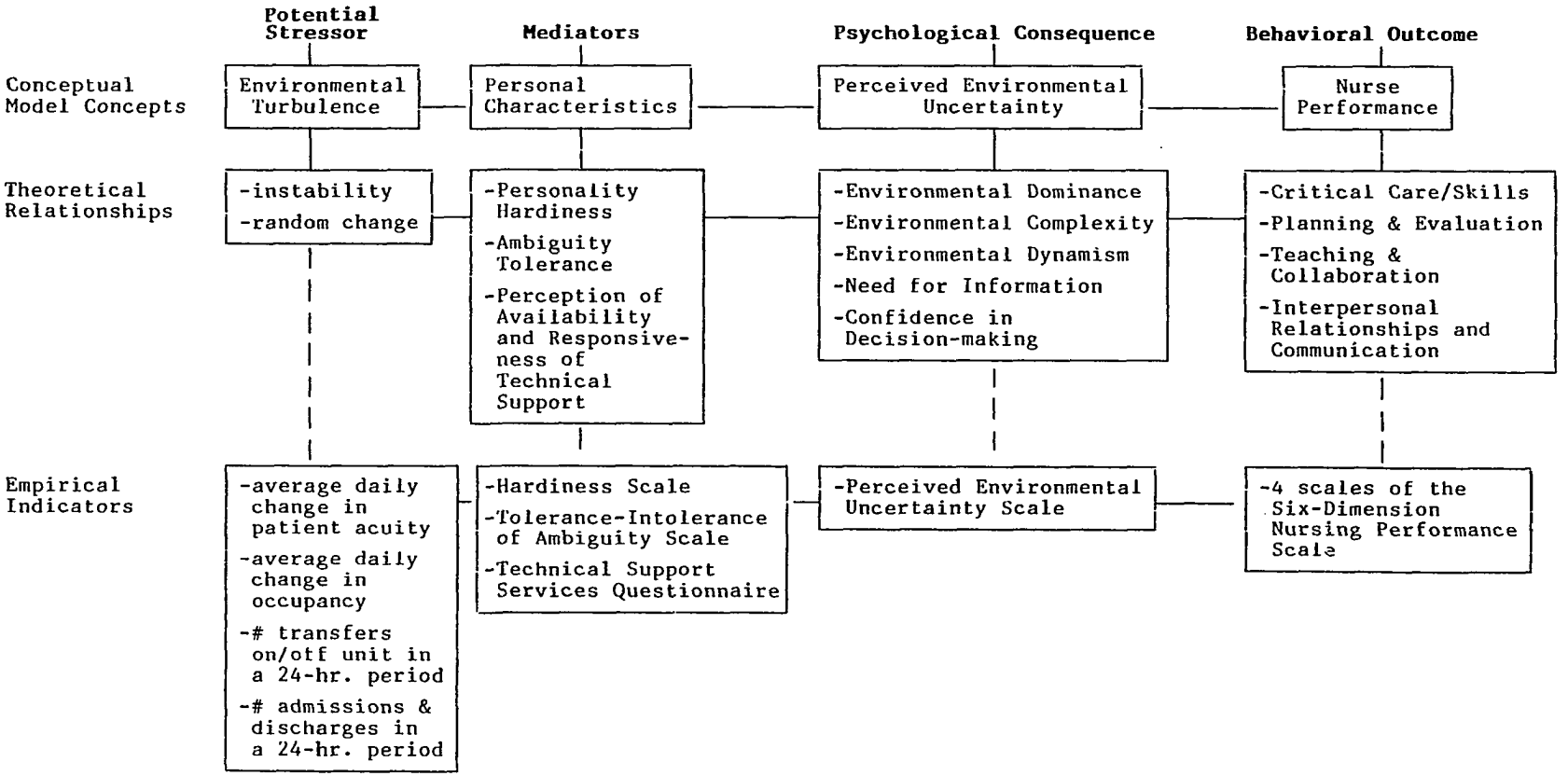

Figure 1. Conceptual-theoretical-empirical framework

11 items on the **External Locus of Control Scale** (Rotter, Seeman, & Liverant, 1962), 4 items of the Powerlessness Scale of the **Alienation Test** (Maddi et al., 1979), and one item of the Cognitive Structure Scale of the **Personality Research Form** (Jackson, 1974). Challenge is measured by 3 items of the Security Scale of the **California Life Goals Evaluation Schedule** (Hahn, 1966) and 5 items of the Cognitive Structure scale of the **Personality Research Form** (Jackson, 1974).

Ambiguity tolerance was defined as the tendency to perceive ambiguous situations as desirable (Budner, 1962); conversely, intolerance of ambiguity is considered a tendency to interpret ambiguity as threatening (Budner, 1962). This variable was operationalized using a 16-item **Tolerance-Intolerance of Ambiguity Scale** (Budner, 1962) which consists of items characterizing novelty, complexity, and insolubility.

Technical support services were defined as processes that affect how work is performed and how care is delivered and was operationalized using a 27-item questionnaire that is a modification of a 35-item questionnaire that measures availability and responsiveness of support services (Mark, 1992).

Perceived environmental uncertainty is an individual rather than an environmental attribute. Uncertainty arises as a result of unpredictable change (Lorenzi, Sims, & Slocum, 1981) and was defined as the inability to predict consequences of one's actions in a changing environment. The perception of uncertainty in the environment was operationalized using an investigator-developed instrument that assesses perceptions of (a) environmental dynamism, (b) environmental complexity, (c) environmental dominance, (d) need for information, and (e) confidence in decision making.

Experience as a registered nurse was defined as the variety of roles and clinical areas in which the nurse has worked since graduation from a nursing program.

Education was defined as highest education in nursing.

Summary

The purpose of this investigation was to determine the effects of environmental turbulence on nurse performance. This chapter presented background information on trends in theory development and research on the influence of the environment on performance. The disparity between theoretical foundation and empirical evidence supporting the impact of environmental factors on performance clearly justifies efforts to answer the research question **"What are the effects of environmental turbulence on nurse performance?"**

In the following chapters, the conceptual framework that led to the proposed model is discussed. A review and critique of the empirical work relevant to the relationships among the variables is presented. The plan for data collection and analysis is described, and the findings presented and discussed. In addition, the implications for nursing administration practice and recommendations for further research are incorporated.

Chapter 2

CONCEPTUAL FRAMEWORK AND REVIEW OF LITERATURE

The purpose of this research is to determine the effects of environmental turbulence on nurse performance. The conceptual-theoretical-empirical framework for this research was developed from a generic model proposed by Eliott and Eisdorfer (1982) in the report of the Institute of Medicine summarizing research on stress and human health. According to this model, the stress continuum includes the potential stressor, mediators of stress, psychologic reactions, and consequences or outcomes (see Figure 2). The model suggests an interactive process between the individual and the environment (Lowery, 1987).

In this investigation, the **potential stressor** is environmental turbulence. The **mediators of stress** are personality hardiness, ambiguity tolerance, and quality of technical support systems. The **psychological reaction** is the perception of environmental uncertainty, and the **behavioral consequence**, or outcome, is the self-reported quality of staff nurses' performance.

In this chapter, each concept in the model is discussed and relationships among the concepts proposed. Figure 3 presents the causal model of environmental, sociodemographic, and personal characteristics thought to affect nurse performance. A review of literature, which is presented immediately following the conceptual definition of each variable, incorporates the concepts of the model, as well as their effects on nurse performance.

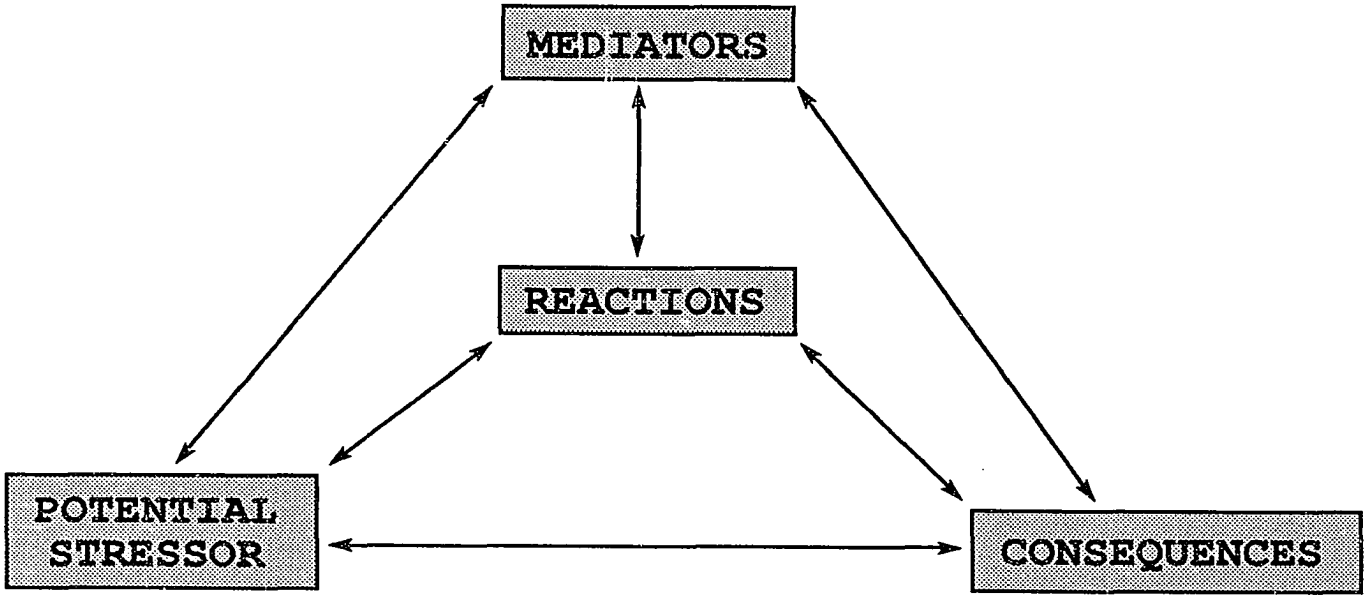

Figure 2. A Framework for Interaction Between the Individual and the Environment

Source: Elliott, G., & Eisdorfer, C. (Eds.). (1982). Stress and Human Health (p. 19). New York: Springer Publishing Company.

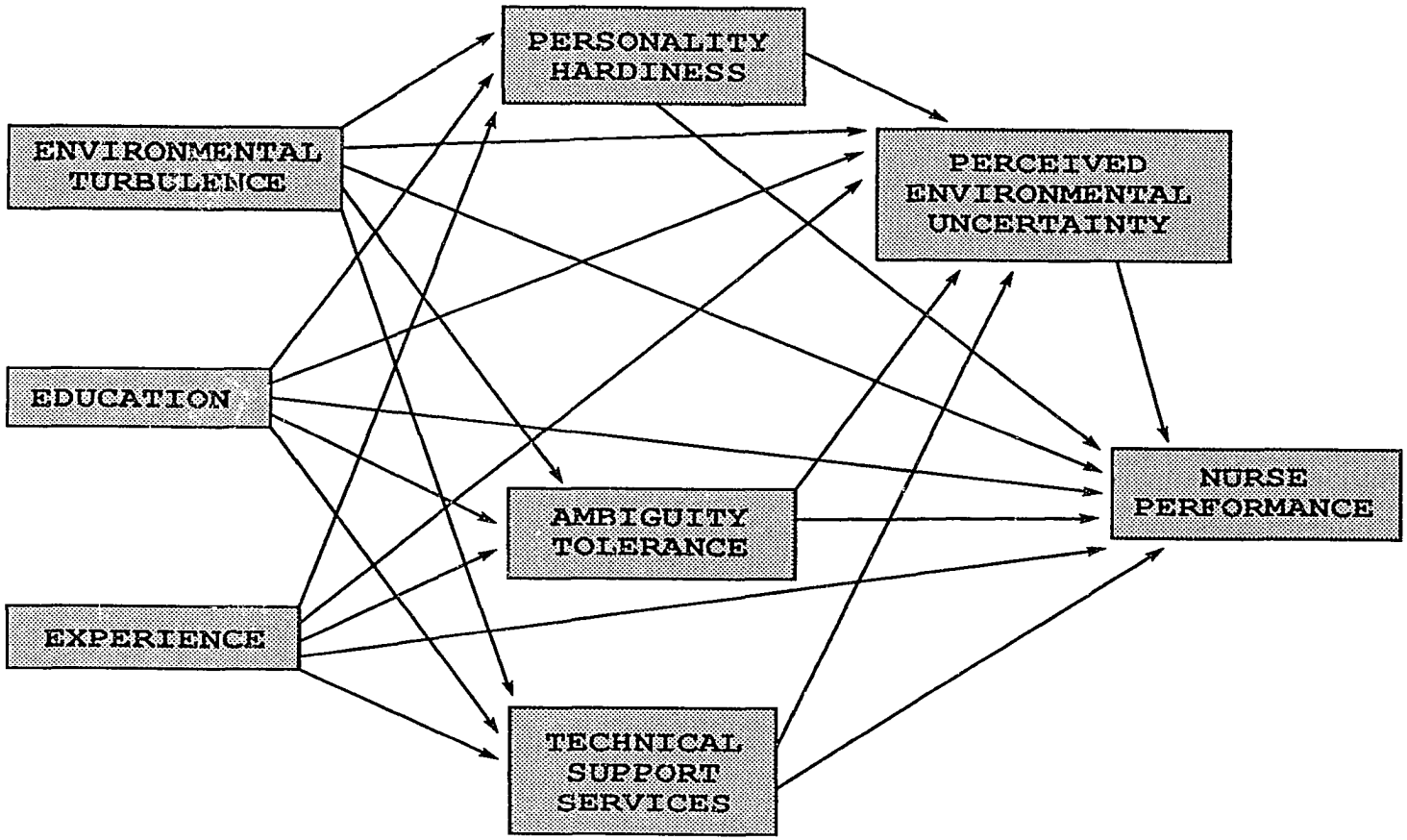

Figure 3. Causal Model of Environmental, Sociodemographic, and Personal Characteristics Affecting Nurse Performance

The Stressor: Environmental Turbulence

The environment has always been viewed as having a significant impact on individuals. Florence Nightingale viewed the environment as the external conditions that directly affect individuals and their state of health (Dunbar & Dolan, 1969). She also recognized the relationship between the environment and both the physical and psychological well-being of individuals (Dunbar & Dolan, 1969).

Within nursing's metaparadigm, the concept of environment has most often been discussed as it relates to the recipients of nursing care. Pointing out that the term "environment" is ambiguous, diffuse, and blurred as a concept, Chopoorian (1986) argued that "environment" needs to be reconceptualized to encompass the environment of organizations in which nurses work. In this context, environment would be considered all the conditions, circumstances, and influences affecting the individual nurse or groups of nurses (Jackson, Morgan, & Paolillo, 1986).

This section describes the concept of environmental turbulence and discusses its hypothesized impact on nurse performance. First, however, the concepts of environment, and the environments of organizations, are discussed.

Organizational Environments

To understand organizational environments and their potential impact on individuals, a review of the literature about organizational environments is necessary. Environments have been categorized as external environments, task environments, and internal environments. The **external environment** refers to forces operating outside the organization, such as

customers, competitors, suppliers, government and regulatory agencies, unions, and professional associations (Duncan, 1972). **Task environment**, a term initially used by Dill (1958), denotes parts of the external environment considered relevant or potentially relevant to organizational goal setting and attainment. Specifically, the task environment is considered the external stimuli to which an organization is exposed and may respond (Dill, 1958); thus, not every aspect of the external environment is relevant to an organization (Neidlinger & Miller, 1990). The task environment includes (a) customers; (b) suppliers of materials, capital, equipment, and work space; (c) competition for both markets and resources; and (d) regulatory groups (Dill, 1958). The **internal environment**, bounded by the organization, refers to forces operating within the organization, such as goals and objectives, the nature of products and services, communication processes, and intraorganizational networks (Duncan, 1972).

The internal environments of organizations are affected by conditions in the external environment. Terreberry (1968) proposed that organizations, as open systems, face turbulence and complexity in the internal environment in response to external environmental stimuli. Thompson (1967) viewed organizations as being both open and closed to environmental stimuli. Necessarily, organizations must be open to environmental stimuli at the institutional level in order to acquire information from the external environment, but closed at the level of the technical core in order to buffer the effects of environmental turbulence and reduce uncertainty.

Environmental Turbulence

Emery and Trist (1965) were the first theorists to use the term "turbulent" to refer to an organizational environment that is changing at an increasing rate and toward increasing complexity under the impact of technological change. This conceptualization was developed using the concept of "causal texture" of the environment that was originally described by Pepper (1934) and reintroduced by Tolman and Brunswick (1935). According to Emery and Trist (1965), causal texture is a process through which parts of the environment become related to each other. This progressive texturing results in four types of environments: (a) random, placid environments; (b) clustered, placid environments; (c) disturbed, reactive environments; and (d) turbulent field environments (Emery & Trist, 1965).

Environmental turbulence can be viewed in terms of causative or generating forces in the external environment over which there is very little control (DeGreene, 1982), and can be thought of as having two components: (a) instability, and (b) randomness (Huber & Daft, 1987). **Instability** refers to the frequency of change, while **randomness** refers to the inability to predict the frequency and direction of change (Huber & Daft, 1987). Inability to predict changes in the environment, as well as lack of control over the frequency and direction of change, create uncertainty in the organizational environment (Huber & Daft, 1987).

The external environment has been characterized as "turbulent" since the late 1960s (Emery, 1978). Events in the health care environment that produced turbulence, particularly the 1965 amendment to the 1935 Social Security Act that established Medicare and Medicaid programs, parallelled

the emergence of turbulent environments in other United States industries. However, the effects in the health care industry have been felt more profoundly since the 1983 implementation of the prospective payment system using diagnosis related groups. Changes imposed on the health care system as a result of changes in the regulatory environment include fixed pricing per discharge based on diagnosis (Balinsky & Starkman, 1987); reduced hospital length of stay and increasing patient acuity in general hospitals (Gutterman et al., 1988); and alternative treatment modalities and care delivery sites (Balinsky & Starkman, 1987). In addition, the growth in enrollment in health maintenance organizations, which attempt to reduce costs of health care through prevention, early diagnosis and treatment, and reduced hospitalization, has been attributed to pressures in the regulatory environment to control the costs of health care. Therefore, the effects of turbulence in the health care environment require investigation since individual and organizational stress are thought to decrease performance (McGrath, 1981).

Two hypothesized relationships have emerged thus far. First, environmental turbulence, the **stressor** in the proposed model, is thought to increase the perception of uncertainty. Second, performance is thought to decrease as a result of environmental turbulence. A summary of the empirical work examining these relationships follows.

Review of Literature: The Stressor

Research specifically examining the effects of environmental turbulence on individuals is scarce in both organizational and nursing literature. The empirical work examining stressors in the work environment

focuses to a great extent on relationship between stress and burnout. Few studies have incorporated performance and perceived environmental uncertainty in investigating the consequences of worksite stressors. The review of literature that follows incorporates research examining the effects of worksite stressors on performance. Empirical work describing turbulent environments and the consequences for individuals and organizations is included in the literature review of perceived environmental uncertainty.

Parasuraman and Alutto (1981) proposed and tested a model for investigating the relationship of contextual, task, and role-related variables to stressors in the work environment (N = 217). Seven stressors, considered the external demand or stimulus factors perceived as undesirable, were identified: (a) interunit conflict, such as communication difficulties and lack of interdepartmental cooperation; (b) technical problems, a measure of resource inadequacy; (c) efficiency problems, considered difficulty achieving productivity standards; (d) role frustration, denoting excessive workload, inadequate supervisor instruction, favoritism by supervisor, and low status; (e) staff shortages, considered inadequacy of human rather than technical resources; (f) short lead times, also considered inadequacy of human resources; and (g) too many meetings. In a preliminary correlation analysis, done to determine the propensity of the stressors to produce psychological strain and other attitudinal and behavioral reactions, these stressors were found to be significantly positively correlated with felt stress, and negatively related to measures of job satisfaction and organizational commitment.

Some of the stressors showed weak to moderate negative relationships with performance and turnover. These results lend some empirical support to the hypothesized effect of environmental turbulence on performance since the stressors identified are conceptually compatible with measures of turbulence in the proposed model.

Deckard, Rountree, and Hicks (1988) examined the effects of work and organizational stress, positive affect, and dysphoria on burnout phases in nursing employees working in a long-term care facility for the elderly (N = 322). They reported both direct and indirect effects of worksite stressors on burnout. Both positive affect and dysphoria mediate the effects of worksite stressors on burnout. Positive affective states decrease the emotional exhaustion, depersonalization, and lowered feelings of personal accomplishment associated with burnout, while dysphoria accentuates these effects. These results support the contention that environmental factors are determinants of behavior in organizations (Barker, 1963; Holahan & Moos, 1982). The authors suggest that the means through which nurse managers can influence performance is through manipulation of worksite stressors (Deckard et al., 1988).

Nelson and Sutton (1990), using a longitudinal design, examined the relationship between chronic work stressors, coping techniques, distress symptoms, and work performance in organizational newcomers (N = 97). Contrary to expectations, coping techniques failed to account for significant variance in distress symptoms, mastery, or performance. Distress symptoms reported prior to beginning a new job accounted for 32% of the variance in distress symptoms reported 9 months after beginning the job. This suggests that individuals may not have disengaged from

stressors in a previous work environment or other stressful situations before beginning a new job (Nelson & Sutton, 1990). While virtually all previous research on occupational stress has assumed that symptoms experienced on a job are related to work stress, the Nelson and Sutton (1990) study suggests that researchers need to be cautious in making this assumption. They recommend that further consideration should be given to the interaction between attributes of the individual that influence attitudes and behaviors and to situational characteristics affecting job attitudes (Nelson & Sutton, 1990). Of concern in their research is the use of a single-item performance measure. Also of concern is the use of instruments designed to measure strategies for coping with stressful life events. These instruments may simply not be appropriate for measuring coping in work settings.

Cleland (1965) used four levels of situational stressors as predictors of nurse performance measured by the **Nursing Achievement Test** and the **Social Interaction Test** in her study of diploma nurses (N = 60) working on medical-surgical units. Findings included:

1. A curvilinear relationship between performance and the magnitude of the perceived situational stress.

2. More deterioration in social interaction test scores than in nursing achievement test scores as the level of stressor increased.

3. As the level of stress increased, nurses with a high need for social approval showed greater deterioration in nursing achievement test scores than did nurses with lower needs.

4. Quality of performance increased with lower levels of situational stressors.

These empirical works suggest that stress has a detrimental effect on performance. Since environmental turbulence is thought to be a stressor in the health care environment, further investigation is required to support the hypothesized relationship specified in the model.

The Mediators of Stress: Personality Hardiness, Ambiguity Tolerance, and Quality of Technical Support Systems

For many years, psychologists have recognized the importance of variables that mediate between a stimulus and a response. A variable may be said to function as a mediator to the extent that it accounts for the relationship between the predictor, or independent variable, and the criterion or outcome variable (Baron & Kenny, 1986). Where the individual is the relevant unit of analysis, mediators represent properties that transform the effect of the predictor variable on the criterion variable (Baron & Kenny, 1986). In the proposed model, the stress caused by turbulence is thought to be mediated by personality hardiness and ambiguity tolerance, as well as by the availability of technical support systems, thereby ameliorating the effects of turbulence on the perception of uncertainty, and ultimately on performance.

Personality Hardiness

The concept of hardiness has been demonstrated to be a positive mediating variable in stress research (Pollock, 1989). Hardiness refers to a constellation of personality characteristics that function as a resistance resource when stressful life events are encountered.

The hardy personality style encourages transformational coping, which involves an amalgam of cognition, emotion, and action aimed not only at survival but enrichment through personal development (Kobasa, 1979). The "stress tolerant" or hardy personality is one characterized by commitment rather than alienation, internal rather than external locus of control, and the perception that change is challenging, not threatening (Kobasa, 1979). Individuals characterized as "stress tolerant" or hardy tend to perceive life changes as challenges rather than threatening to security; have a higher sense of purpose or commitment to work and self; and, because of a sense of control over one's life, they intervene in their own behalf when necessary (Kobasa, 1979).

Commitment versus alienation. Alienation was first described by Marx (1963 trans.) in his early writings on the alienation of workers. Marx believed in the self-fulfillment of mankind that takes place only through productive or creative labor. Labor should give value to the objects it creates, but as a worker loses control over the product and the production process, it becomes alien (Marx, 1963 trans.).

Seeman (1959) viewed alienation as multifaceted and identified five forms pervasive in contemporary society: (a) powerlessness, (b) meaninglessness, (c) normlessness, (d) isolation, and (e) self-estrangement.

Powerlessness is considered loss of control over the important events that affect the lives of individuals (Seeman, 1959). **Meaninglessness** refers to the individual's understanding of the events in which he is engaged. An individual may experience this variety of alienation if

minimal standards for clarity in decision-making are not met or if the individual is unsure about who or what ought to be believed (Seeman, 1959). **Normlessness** refers to situations in which there are no effective norms or rules for behavior (Seeman, 1959). As used in contemporary society, normlessness has come to mean circumstances in which there are no legitimate means to achieve socially prescribed goals (Faunce, 1968). **Isolation** can be defined in terms of reward values. Individuals who assign low reward value to goals or beliefs that are highly valued by society are considered isolated from this society. **Self-estrangement** is the inability of individuals to find self-rewarding activities. A person is considered self-estranged when he/she engages in activities that are not meaningful in themselves, but are simply means to other ends (Seeman, 1959). Powerlessness and self-estrangement are the two forms of alienation that have great meaning in the workplace (Seeman, 1959).

Just as there are varieties of alienation, there are varieties of consequences experienced by individuals. Apathy has been described as a consequence of powerlessness, lowering of goals as a consequence of normlessness, and overconformity as a consequence of meaninglessness (Faunce, 1968). These consequences can affect performance if workers are alienated from the process and product of their work (Marx, 1963 trans.).

At the other end of the continuum is **commitment**, expressed as a tendency to be involved in whatever one is doing rather than experiencing alienation (Kobasa, 1979). Committed persons have a generalized sense of purpose that allows them to identify with and find meaning in the events, things, and persons in their environment. They are invested enough in

themselves and their relationships that they do not easily give up under pressure (Kobasa, 1979).

Locus of control. The opposite of powerlessness, control allows an individual to perceive stressors as predictable consequences of the activities the person has become involved in (Kobasa, 1979). **Locus of control** refers to the degree to which a person believes that personal action can influence outcomes of life (Bush, 1988).

Locus of control was described by Rotter et al. (1962) as being internal or external. Individuals with an **internal locus of control** believe that most of what happens to them is under personal control. A high degree of internality relates closely to the perception of personal well-being. Persons with a strong belief in internal control are more confident and assertive (Phares, 1976), actively search for information that will help them achieve their objectives, and are attracted to situations that offer opportunity for achievement. Individuals with an internal locus of control are committed to those activities they are involved in and act as if they can influence situations through the exercise of imagination, knowledge, skills, and choice (Kobasa, 1982; Kobasa, Maddi, & Kahn, 1982). Stress resistance is enhanced by increasing the likelihood that events will be experienced as a natural outgrowth of one's actions and not as foreign, unexpected, and overwhelming experiences. A sense of personal control also leads to development of a broad variety of responses to stress, which can be drawn on even in threatening circumstances (Averill, 1973).

Individuals with an **external locus of control** believe in the influence of external forces, such as chance or luck, controlling their

lives. These individuals believe that their fate is in the hands of more powerful others (Rotter et al., 1962). They react to their environment, and see themselves as pawns or victims of circumstances beyond their control. They also feel that success or failure on the job depends on outside forces (Tseng, 1970). Additionally, individuals who are externally controlled tend to be more alienated from the work environment (Barth, 1976; Kasperson, 1982; Mitchell & Green, 1975). Control is expressed as a tendency to feel and act as if one is influential rather than helpless, implying the perception of oneself as having influence through the exercise of imagination, knowledge, skills, and choice (Kobasa et al., 1982).

Challenge. Challenge is expressed as the belief that change rather than stability is normal in life and that the anticipation of changes are incentives for growth rather than threats to security (Berlyne, 1964; Csikzentmihalyi, 1975; Maddi, Propst, & Feldinger, 1965). Challenge mitigates the stressfulness of events by coloring them as stimulating rather than threatening. Perceiving events as challenging leads to attempts to transform oneself and grow rather than conserve and protect what one can of the former existence. By fostering openness and flexibility, challenge allows the integration and effective appraisal of incongruent events (Moss, 1973).

Ambiguity Tolerance

Ambiguity can be defined as a lack of situational clarity (Lazarus & Folkman, 1984). When the information necessary for interpreting a situation is unclear or insufficient, the environment is ambiguous (Lazarus & Folkman, 1984). As ambiguity increases, characteristics of

the individual become more influential in determining the meaning of the situation; that is, personal characteristics rather than the objective situation shape the understanding of the environment (Lazarus & Folkman, 1984). Ambiguity can be a source of threat (Budner, 1962; Lazarus & Folkman, 1984), or it can intensify existing threat by limiting control over the situation (Lazarus & Folkman, 1984). Ambiguity does not always result in threat, but will do so if there is a predisposition to feel threatened; that is, if a person has a low tolerance for ambiguity, or if there is some other cue present that leads the person to anticipate harm (Lazarus & Folkman, 1984).

An ambiguous situation may be defined as one that cannot be adequately appraised by an individual because of insufficient cues (Budner, 1962). Budner (1962) identified three types of situations that can be considered ambiguous: (a) a completely new situation in which there are no familiar cues, (b) a complex situation in which there are a great number of cues to be taken into account, and (c) a contradictory situation in which different elements or cues suggest different alternatives--that is, situations characterized by **novelty**, **complexity**, or **insolubility**. **Intolerance of ambiguity**, then, may be viewed as a general tendency to perceive ambiguous situations as threatening, and **ambiguity tolerance** implies that ambiguous situations are desirable (Budner, 1962). Ambiguity tolerance can be thought of as willingness to accept alternate interpretations or outcomes, and being comfortable when faced by complex issues in which opposing principles are intermingled (English & English, 1958).

Novelty. People inevitably find themselves in situations that are novel, meaning situations with which the person has not had previous experience. If a situation is completely novel and no aspect of it is considered harmful, it will not result in an appraisal of threat. Similarly, if no aspect of the situation is associated with mastery or personal gain, it will not result in an appraisal of challenge (Lazarus & Folkman, 1984). Conversely, situations associated with harm may be perceived as threatening and those associated with mastery or personal gain result in an appraisal of challenge.

Most situations are not completely novel. Facets of a situation may resemble those of another situation. Inferences about the meaning of situations are based in part on knowledge and experience. General rather than specific knowledge permits a person to interpret events even if the particular situation has not been experienced before (Lazarus & Folkman, 1984).

A novel situation is ambiguous to the extent that the person is not clear about the significance or meaning of the situation or event. Interpretation of the situation requires inference. The more inference that is required, the greater the possibility of an error in interpretation. If a person is aware of the increased risk of error that accompanies the interpretation of a novel, ambiguous event or situation, he/she may experience a high degree of uncertainty and threat.

Complexity. Considerable work has been done that delineates cognitive complexity as a variable that influences a person's perception and evaluation of events (Barron, 1953; Berkowitz, 1957; Bieri, 1955; Leventhal, 1957; Lundy & Berkowitz, 1957; Mayo & Crockett, 1964; Scott,

1962, 1963; Sechrest & Jackson, 1961; Zajonc, 1960). Although different meanings have been applied to the concept, it is believed that some people are prone to employ few dimensions when they perceive and evaluate events, or are inclined to make only very gross discriminations among dimensions. Other people are thought to employ many dimensions and/or make fine discriminations along the dimensions they employ (Vannoy, 1965).

There has been controversy about whether or not cognitive complexity is a general personality trait or varies over different domains, depending upon the amount and kind of knowledge the person has and upon the functional demands of the situation. Bieri and Blacker (1965) investigated the generality of cognitive complexity across personal and nonpersonal situations and suggested that relatively consistent, enduring modes of cognitive functioning characterize a person's behavior across situations. Allard and Carlson (1963) also supported the generality of cognitive complexity in cognitive functioning; however, neither of these investigations used a wide variety of methods for evaluating complexity; thus, the proposition that cognitive complexity is a unitary, consistent mode of functioning can be questioned (Vannoy, 1965).

Gardner and Schoen (1962) assert that the term cognitive complexity is too general. These authors pointed out that most people are relatively "complex" in some areas of cognition, and "simple" in others.

Scott (1963) contends that there is little evidence that cognitive complexity is a unitary trait that pervades all areas of a person's cognitive functioning. The degree of cognitive complexity-simplicity probably varies over different cognitive domains depending upon the amount and kind of knowledge the person posseses, and upon the level of

functioning required in daily life. This view implies that cognitive complexity is not a general personality trait (Vannoy, 1965). Even if people are predisposed to respond in either complex or simple ways, these predispositions are limited ones that have application to narrow categories of situations (Vannoy, 1965). This may be the result of having general knowledge regarding some situations and specific knowledge in other situations, and may be affected by education and experience (Lazarus & Folkman, 1984).

Insolubility. Insoluble situations can be threatening as a result of the fact that differing cues suggest different, conflicting alternatives and consequences (Folkman & Lazarus, 1984). If the ambiguity created by insoluble situations or events is threatening, the person may seek to reduce it by searching for more information. If it becomes evident that the event or situation is insoluble, uncertainty will result (Lazarus & Folkman, 1984).

Life events are complex because of multiple environmental and personal facets that have to be evaluated. In dealing with ambiguous situations, the ability of the person to tolerate the ambiguity determines the level of threat perceived and the behavior exhibited. Therefore, individuals with low tolerance for ambiguity are characterized by tendencies to perceive situations as black or white (Budner, 1962; English & English, 1958) and exhibit rigid coping behaviors (Budner, 1962), while individuals with a high tolerance for ambiguity (a) seek out ambiguity, (b) enjoy ambiguity, and (c) excel in the performance of ambiguous tasks (MacDonald, 1970).

Research on the impact of individual differences upon perceptions of environmental uncertainty was recommended by Duncan (1972), who suggested that an individual's tolerance for ambiguity might play an important role in the interpretation of situations and events. How environmental uncertainty is perceived may be an important intervening variable between organization and environment and little is known about the process. It may be that because of personality attributes, different people see the same environment quite differently (McCaskey, 1976; Starbuck, 1976).

Quality of Technical Support Systems

Processes that affect the clinical nurse's ability to provide patient care in today's health care environment are of paramount concern to nursing and health administrators. Of importance is the question of what can be done to enhance ability to provide care in a potentially stressful environment.

Mechanic (1962) suggested that there are four main factors that determine whether a situation or event produces a stressful response: (a) individual abilities and skills, (b) group skills and processes, (c) experiences and practices, and (d) resources of the social and organizational environment, including norms regarding how and when individuals may use the resources. Social support is one such factor, or resource, that researchers have considered in studies related to nursing occupational stress (Constable & Russell, 1986; Cook & Mandrillo, 1982; Norbeck, 1985a, 1985b), and is considered a mediator of occupational stress and burnout (Kobasa, 1982a, 1982b; Topf, 1989). Following this line of reasoning, resources such as technical support systems may serve

to mediate the effects of a stressful environment on the performance of nurses in the practice environment.

Technical support systems include those factors that are related to the design of work and how the work is performed (Shukla, 1987). In the theory of support systems and nursing performance, Shukla (1987) proposed that structural and technical support systems can improve the efficiency and effectiveness of nurse performance. In Shukla's (1987) conceptual model, **structural support systems** include the patient care assignment system, such as team or primary nursing. In addition to structural support systems, the model specifies the **technical support systems** thought to affect care delivery. These include medication distribution systems, materials distribution systems, food and linen distribution systems, patient transportation, interdepartmental and on-unit communication systems, order entry and retrieval, and result reporting systems (Shukla, 1987).

The strategy of improving technical support systems has the potential to improve the amount of professional care provided by nurses as well as the quality of that care (Shukla, 1987). The availability and quality of technical support has yet to be empirically tested as a mediator between the stressors in the organizational environment and performance.

The following literature review examines the empirical work evaluating the hypothesized relationships presented above.

Review of Literature: The Mediators

The literature review incorporating variables thought to mediate the effects of environmental turbulence on perceptions of environmental

uncertainty and performance summarizes the empirical work on personality hardiness, ambiguity tolerance, and quality of technical support systems.

Personality hardiness. For some time, the focus of stress research has been on resistance resources that potentially prevent the tension of everyday life from becoming debilitating. Some of these resistance resources include the individual's physiological adaptability, social support, cultural context, and personality (Antonovsky, 1979). Following the logic of this line of inquiry, Kobasa (1979) developed the construct of personality hardiness. On the basis of a survey of 670 public utility executives, Kobasa (1979) reported that the hardy executive was more internally controlled, more committed to work and self, and more oriented to challenge than the nonhardy executive. Additionally, Kobasa and her associates (Kobasa et al., 1982; Kobasa & Pucetti, 1983) have shown that hardiness is associated with decreased reports of physical and mental symptomatology in individuals who are experiencing stressful life events. This evidence supports the hypothesis that personality hardiness may serve to decrease the potentially detrimental effects of life stressors.

Several investigators (Cronin-Stubbs & Rooks, 1985; MacNeil & Weisz, 1987) have agreed that specification of factors contributing to burnout in nurses is pertinent to promoting optimal patient care. Conceptual models (Gray-Toft & Anderson, 1985; Moos & Schaefer, 1987; Sheridan, Vrendenburgh, & Abelson, 1984) and research (Cronin-Stubbs & Rooks, 1985; Eaton & Gottselig, 1980; Gray-Toft & Anderson, 1981; Jaco, 1979; Kelly & Cross, 1985; Lambert & Lambert, 1987; Norbeck, 1985b; Topf & Dillon, 1988) have specified links between work and nonwork variables influencing nursing staff performance and morale and patient outcomes; however, no

empirical work has examined the impact of these nonwork variables, such as personality hardiness, on performance. Therefore, in the absence of empirical work on the effects of personality hardiness on nurse performance, the studies describing the hardiness characteristic in nurses as well as those specifying relationships among hardiness, burnout, and other relevant variables are presented in the literature review.

Maloney and Bartz (1983) conducted a descriptive survey that compared the personalities of critical care and noncritical care nurses. Subjects were female officers (N = 68) in the Army Nurse Corps. A battery of tests similar to those used by Kobasa (1979) including the Interesting Experience Scale of the **California Life Goals Evaluation Schedule** (Hahn, 1966), the **Internal vs. External Locus of Control Scale** (Rotter et al., 1962), and the **Alienation Test** (Maddi et al., 1979) were used. Results of this study indicate that critical care nurses are more externally controlled than noncritical care nurses, who are more internally controlled. Critical care nurses, however, seek more challenge than noncritical care nurses, and were more alienated than noncritical care nurses. The researchers concluded that the mixed results seem to indicate some degree of stress tolerance in both groups rather than verification of stress tolerance in either group. When considering categories of the **Alienation Test**, the critical care nurses were more alienated from self and felt less powerful. This seems to indicate that these nurses may have found that to survive in the environment requires detachment or denial to allow the nurse to fend off stress (Maloney & Bartz, 1983). This conclusion is supported in work done by Esteban, Ballesteros, and Caballero (1983) who found that critical care nurses use defense mechanisms, such as denial,

to deal with harmful environmental stimuli and the high level of anxiety produced by the setting.

Further support for Maloney and Bartz's (1983) results is found in DeFriese's (1967) work. In a comparison of critical care and noncritical care nurses working in the same hospital, DeFriese (1967) found that alienation was positively associated with structural complexity of the work environment; however, there was no reported association between alienation and measures of work performance quality. While this study is the only reported research establishing a relationship, a limitation to interpreting these results is the use of a study-specific, investigator-developed questionnaire to measure alienation and nurse performance.

To test the hypothesis that hardiness buffers the effects of stressors on burnout, McCranie, Lambert, and Lambert (1987) investigated whether hardiness mediates the impact of job stressors on burnout among hospital nurses (N = 260). They reported that burnout was significantly associated with higher levels of perceived job stress and lower levels of hardiness. Furthermore, hardiness had beneficial main effects in reducing burnout, but did not appear to prevent high levels of job stress from leading to high levels of burnout (McCranie et al., 1987). In contrast to Kobasa and colleagues (Kobasa, 1979; Kobasa, Maddi, & Courington, 1981; Kobasa, Maddi, & Pucetti, 1982), these investigators studied a predominantly female sample. Thus, the question of whether gender interacts with hardiness in moderating the negative effects of stressors was raised. This study also focused on work stressors as

opposed to life change stress and raised the issue of whether hardiness is less effective as a stress moderator in the work environment.

Rich and Rich (1987) used an all-female sample of registered nurses (N = 200) in their investigation of the predictors of burnout in hospital nurses. Using a multiple correlational analysis, the relationships between hardiness, selected demographic variables, and burnout were examined. Results of the multiple regression revealed that only hardiness and age were significant predictors of burnout. Additionally, results suggested that hardiness and age are independent and additive in burnout-buffering effects.

Topf (1989) investigated personality hardiness, occupational stress, and burnout in 100 critical care nurses. Using instruments currently used in hardiness research, Topf (1989) found that only one of the three dimensions of hardiness, commitment to work, accounted for a significant amount of variance in burnout. This study failed to provide support for the stress-buffering effects of hardiness; that is, the interaction term (hardiness x occupational stress) was not predictive of burnout in nurses.

Ambiguity tolerance. Little empirical work has been done following Duncan's recommendation to establish a relationship between ambiguity tolerance and the perception of uncertainty in the organizational environment. McCaskey (1976) expanded upon Duncan's (1972) line of inquiry by studying the ways in which tolerance for ambiguity affects organization design variables. McCaskey (1976) hypothesized an inverse relationship between ambiguity tolerance and perceived environmental uncertainty and proposed that structure was determined by uncertainty in the organizational environment. The sample (N = 40) was divided into

two groups according to level of ambiguity tolerance. An additional group was randomly formed without regard for level of ambiguity tolerance. Results for the whole sample showed no relationship between the two variables. However, when the groups formed on the basis of their level of ambiguity tolerance were examined, a moderate positive relationship was found. This relationship held when the randomly formed group was examined. As a result, McCaskey (1976) concluded that further research is required before the strength of the relationship can be stated with confidence.

Gifford, Bobbitt, and Slocum (1979) investigated the moderating effect of intolerance of ambiguity on the relationship between message characteristics and reports of uncertainty in complex decision environments. The sample (N = 84) was split into thirds based on tolerance of ambiguity scores. Individual differences in perceptions of uncertainty were tested by comparing perceptions of uncertainty in the subgroups of the sample. No differences were found in mean uncertainty scores for the groups split on the basis of tolerance for ambiguity; that is, individual differences did not moderate the relationship between message quality and perceived uncertainty. There were substantial differences in perceived environmental uncertainty, but ambiguity tolerance did not appear to explain these differences. The work of Schroeder, Driver, and Streufert (1967) may shed some light on these findings. They found that individuals, facing the same environment, differ in the amount of complexity they process. More integratively complex individuals, that is, individuals who take multiple factors into account, process information and make decisions at a higher level of

information processing. Tolerance for ambiguity may affect individuals such that individuals with a high tolerance for ambiguity may see more uncertainty in the same environment as individuals with a low tolerance because they are more integratively complex.

Quality of technical support systems. Environments can place demands on individuals that represent potential sources of stress; however, social support mechanisms which act as buffers may mediate the impact of organizational stress on individuals (Katz & Kahn, 1978). Leatt and Schneck (1985) studied sources of stress in nursing units (N = 157 units in 24 hospitals) and examined the importance of unit characteristics such as technology, size, environment, context, structure, and internal unit processes in contributing to the stress. In their model, work circumstances were sources of stress. The outcome variables were the types of stress identified by the staff nurses. The modifying effects were structural and process variables. The structural variables included unit complexity, formalization, and decentralization, while the process variables were leadership, formal and informal control, group cooperation and communication. Their definitions of the process variables were closely related to social support as defined by French (1974). The highest ranking stress situations, or sources of stress, were the heavy workload, physicians not available when needed, and insufficient resources to complete the required work. Organizational structures and processes identified as support systems modified the effects of physician/nurse relationship stress and workload stress (Leatt & Schneck, 1985); however, processes to modify the lack of resources to complete the required work

were not addressed. It was interesting, and not unexpected, that social support did not modify this type of stress.

Shukla (1987) proposed that technical support systems can affect the efficiency and effectiveness of nurse performance. Following investigations of nurse-utilization in settings using different nursing care structures (Shukla, 1981, 1982a, 1982, 1983a, 1983b), Shukla concluded that the more efficient the technical support systems the less time is needed for nursing staff to perform indirect care and a higher percentage is devoted to direct patient care. In one hospital, with centralized support systems, which had implemented an all-registered nurse model of primary nursing, the nurses spent 4% less time giving direct care than did nurses on a team unit. At a hospital with decentralized support services, however, nurses spent 12% more time with patients than the nurses on the team unit when primary nursing was implemented. This suggested that the differences may be due to the technical support systems available rather than the nursing structure used in care delivery. The increased time in direct care, then, has the potential to improve the effectiveness of care and the efficiency of the nurse.

Shaiman, Hagen, Hu, and Fogarty (1992), in a study that was conducted in 58 hospitals in the United States and was part of a larger study to examine factors related to hospital length of stay and nursing resource consumption, examined the effects of professional, nonprofessional, and technological support services on nursing care hours per patient day and in medical-surgical (N = 527) and critical care (N = 270) units. Professional support services included a 24-hour pharmacy, a centralized cardiopulmonary resuscitation team, and a centralized intravenous therapy

team. Nonprofessional support services included 24-hour housekeeping, hospital-wide messenger service, and a central supply exchange cart system. Technological support services were provided by unit computerization. On the medical-surgical units, availability of 24-hour housekeeping services, exchange cart services, messenger services, intravenous therapy teams, and cardiopulmonary resuscitation teams were significantly related to patient care hours per day. The relationship was inverse between hours per patient day and 24-hour housekeeping services, exchange cart services, messenger services, and the availability of the intravenous therapy team. Surprisingly, availability of a 24-hour pharmacy was not related to hours per patient day, nor was computerization on these units. The latter finding was somewhat unexpected. Since nursing professionals are considered to have high information processing requirements, it was assumed that computerization would introduce time efficiencies into daily activities; however, the results of the study do not support this assumption. The model, however, explained approximately 72% of the variance in hours per patient day in medical-surgical units.

In critical care units, the availability of an exchange cart system, cardiopulmonary resuscitation team, 24-hour pharmacy, unit computerization, and messenger services were significantly related to hours per patient day. With the exception of availability of 24-hour pharmacy services, the relationships were inverse, reflecting that hours per patient day decreased with these support services in place. This model explained approximately 66% of the variance in hours per patient day in critical care units. These results suggest that different types

of units may have different resource requirements to support patient care. Reducing the amount of indirect care the nurse provided on behalf of the patient should decrease nursing care hours per patient day; however, the researchers did not report the number of hours of direct care per patient day. While it was assumed that the ratio of direct care hours to total care hours increased because indirect care hours decreased, this information was not provided. Thus, no inference can be made regarding the impact of the support systems on effectiveness of patient care.

The impact of technical support systems has not been widely investigated. Therefore, the direct effects of technical support systems on nurse performance, and their effects as mediators of stress in a turbulent environment, require investigation in order to test the theory of support systems and nurse performance and add to the body of knowledge on this important phenomenon.

The Psychological Reaction: Perceived Environmental Uncertainty

Uncertainty is a central, critical concept in organization theory and generally refers to events arising in the internal and/or external environment that organizations cannot forecast. It is not simply change or the rate of change, but unpredictable change that affects organizational decision-making (Lorenzi et al., 1981). Decision-makers' perceptions are influenced by internal factors that mediate the relationship between uncertainty and external environmental factors (Jauch & Kraft, 1986). Thus, the perception of environmental uncertainty is a psychological reaction that is mediated by characteristics of the

individual, and is, as well, an individual personality attribute (Lorenzi et al., 1981).

Perceived environmental uncertainty has been generally defined as the inability to assign probabilities to events (Knight, 1921; Luce & Raiffa, 1957). More specifically, it refers to a lack of information about future events so that alternatives and their outcomes are unpredictable (Hickson, Hinnings, Lee, Schneck, & Pennings, 1971). Lawrence and Lorsch (1967) characterized environmental uncertainty in terms of clarity of information, degree of clarity of cause-effect relationships, and time span of feedback from the environment. Similarly, Duncan (1972) characterized uncertainty as arising from lack of information from the environment, lack of information about the outcomes of decisions, and an inability to assign probabilities. Building on these definitions and characteristics, Lorenzi et al. (1981) characterized perceived environmental uncertainty as having five dimensions: environmental dominance, environmental complexity, environmental dynamism, need for information, and confidence in decision-making. These perceptual approaches to conceptualizing environmental uncertainty are consistent with Dill's (1958) emphasis on cognitive activities of organizational participants as a link between environmental stimuli and behavior (Schmidt & Cummings, 1976).

Uncertainty enters the organization by affecting the work that organizations perform (Galbraith, 1973, 1977). Galbraith (1973, 1977) argues that the greater the perceived task uncertainty, the greater the amount of information that must be processed by decision-makers during task execution in order to achieve a given level of performance

(Galbraith, 1973, 1977). Thus, Galbraith (1973, 1977) implies that environmental uncertainty affects the work of the organizations by affecting individuals in the performance of their jobs. The hypothesis that uncertainty affects individuals in the performance of their jobs is examined in the review of the literature.

Review of Literature: The Psychological Reaction

In this review, two perspectives are examined. The first perspective reflects the proposition that the perception of environmental uncertainty is an attribute of the individual, and the second reflects the perspective that uncertainty directly affects performance.

Lawrence and Lorsch (1967) and Duncan (1972) were among the first investigators to analyze environments of organizations from the perspective that uncertainty is perceived by the individual. Lawrence and Lorsch (1967) used conventional economic data and expert opinion to classify environments and the demands placed on organizations (N = 6) in their investigation of plastics, food, and container industries that existed in environments that differed in the amount of technological and market change, as well as in the degree of internal differentiation and integration. They argued that environmental characteristics exert a direct impact on the perceived uncertainty within the organization (Lawrence & Lorsch, 1967). In their analysis, low-performing organizations did not meet the requirements imposed by their respective environments, while high-performing organizations maintained states of integration and differentiation that reduced the uncertainty in their respective environments.

In an investigation of manufacturing and research and development firms, Duncan (1972) classified organizational decision units (N = 21) by the environmental characteristics to which the organization was exposed. Using simple-complex and static-dynamic dimensions, he developed four typologies of organization environments and hypothesized relationships between these environments and the perception of uncertainty in the organizational environment. Duncan's (1972) results confirmed that different organizations operate in different environments. Further analysis determined that 70% of the variance in perceived uncertainty was explained by type of environment, and only 30% was explained by organization type (Duncan, 1972). From these results, he concluded that the environment is the most important factor in explanations of perceived uncertainty in decision units. Duncan's (1972) complexity-dynamism hypothesis, stating that decision units with complex-dynamic environments will experience the greatest perceived environmental uncertainty, was supported, as was the hypothesis that decision units in simple-static environments will experience the least perceived environmental uncertainty. However, when decision units in simple-dynamic and complex-static environments were examined, the hypothesis that decision units in simple-dynamic environments will experience greater perceived environmental uncertainty than those in complex-static environments was not supported. Perhaps these environments share common factors that make differentiation of their characteristics difficult to measure.

These empirical works (Duncan, 1972, Lawrence & Lorsch, 1967) have been both widely acclaimed and criticized. Tosi, Aldag, and Storey (1973) criticized Lawrence and Lorsch's uncertainty instrument because of a lack

of congruence between uncertainty scores obtained using the instrument and objectively measured environmental attributes. Using a sample of 51 division managers of a major United States conglomerate, Downey, Hellriegel, and Slocum (1977) examined the conceptual and methodological adequacy of Lawrence and Lorsch's (1967) and Duncan's (1972) uncertainty instruments, compared the two, and replicated Duncan's analysis of his complexity-dynamism hypothesis. Results reflected that the two instruments were only weakly correlated, indicating that they apparently measured different attributes of the construct of uncertainty. As well, when Duncan's complexity-dynamism hypothesis was tested, results suggested that perceived environmental complexity might be inversely related to perceived environmental uncertainty. These results do not support the positive relationship between these variables reported by Duncan (1972).

Support for the proposition that uncertainty is influenced by attributes of the individual can be found in the work done by Hunsaker (1975) and Gifford et al. (1979). Hunsaker (1975) found that individuals (N = 203) scoring high on the general incongruity adaptation self-description test were found to perceive incongruent decision environments as less risky, incorporated more risk in the decisions they made, and responded to changes in environmental turbulence in more rational ways than did lower scoring individuals. These results suggest that in turbulent or uncertain environments, decision-makers should have an incongruity adaptation level that would allow the person to cope with the environment without panic or withdrawal. Gifford et al. (1979), however, failed to confirm the importance of general incongruity adaptation affecting perceptions of uncertainty.

Further work on perceived environmental uncertainty was done by Downey & Slocum (1975). Following Duncan's (1972) recommendation to focus on the interface between individual differences and organizational properties, these investigators proposed that uncertainty is a psychological state. In their conceptualization, sources of uncertainty variation included environmental characteristics of complexity and dynamism, individual differences in cognitive processes, availability of and individual capacity to display appropriate behavioral responses to uncertainty, and social expectations regarding these responses (Downey & Slocum, 1975). Based on this conceptualization, Downey et al. (1977) examined individual characteristics of managers (N = 51) as a source of variability in perceived uncertainty. Both Duncan's (1972) and Lawrence and Lorsch's (1967) perceived uncertainty instruments were used since these instruments are thought to measure different attributes of uncertainty. Using Duncan's perceived uncertainty instrument, a significant inverse relationship between perceived environmental uncertainty and perceived environmental complexity was found and was thought to indicate that those managers who considered large numbers of factors in major decisions experienced lower perceived uncertainty. When Lawrence and Lorsch's instrument was used, scores were significantly higher among managers who did not see superordinate value systems as providing behavioral guides. These results suggested ambiguity as a source of perceived uncertainty in the internal environment (Downey et al., 1977).

The antecedents of perceived environmental uncertainty were examined by Lorenzi et al. (1981) to explore the relationship of uncertainty to

environmental and individual characteristics. Individual characteristics examined included locus of control, cognitive complexity-simplicity, general incongruity adaptation level, and need achievement. Items designed to measure characteristics of the environment included dynamism, complexity, confidence in ability to forecast profit, probability of actual forecast being within a specified range, difficulty versus ease of assigning probability, and unpredictability. Results clearly demonstrated that perceived environmental uncertainty is a consequence of the combination of objective environmental stimuli, individual characteristics, and the degree of task specificity (Lorenzi et al., 1981). The results of this investigation support the relationships specified in the proposed model.

To test the proposition that individual differences are related to perceptions of uncertainty, Downey and Slocum (1982) examined the effects of uncertainty, cognitive complexity, independence of judgement, anomie, and the perceived environmental dimensions of complexity and dynamism on performance (N = 73). Results suggested an inverse relationship between performance and perceived environmental uncertainty--that is, elements in the environment that elicit uncertainty pose a threat to performance; however, the cross-sectional design of this investigation does not eliminate the consideration that the relationship is opposite from the proposition. As well, it appeared that cognitive complexity mediated the relationship between perceived environmental uncertainty and performance. This investigation raised a rival explanation for the results of Tosi et al. (1973) and Downey et al. (1977). Perhaps the lack

of observed association reported by these researchers stemmed from the mediating effects of cognitive complexity (Downey & Slocum, 1982).

In a study of the impact of dimensions of environments on organization structure, Tung (1979) included a routineness of problem variable in addition to complexity and change rate variables, perceived environmental uncertainty, and organizational characteristics of structure, time perspective taken in planning, and frequency of changes to plans and policies. Findings reflected that change rate was the most important contributor to variances in perceived environmental uncertainty, time perspective taken in planning, and frequency of changes in plans and policies (Tung, 1979). These findings support the relationship between environmental turbulence, defined as instability and randomness, and perceived environmental uncertainty specified in the proposed model.

Pennings (1975) attempted to relate perceived environmental uncertainty to performance. In a study of Merrill Lynch branch offices, he found no relationship among environmental uncertainty, performance, and structure. Aldrich (1979) and Lorenzi et al. (1981) have criticized Pennings' measurement of uncertainty, noting that market-related environmental variation, such as stock market prices and volume, probably occurs across the nation and not between or among offices. Therefore, the branch offices were responding to homogeneous environments.

These investigations represent the major work done to examine effects of individual and environmental attributes on perceptions of uncertainty and objectively measured environmental uncertainty as well as on the performance of individuals in organizations. It is the relationship between man and the environment that leads to perceptions of uncertainty

and ultimately affects performance. As Downey et al. (1977) pointed out, environments and environmental attributes are not inherently certain or uncertain without regard to individual and organizational attributes.

The Behavioral Consequence: Performance

The performance of an organization is contingent upon how well people in that organization do their jobs. While it is generally acknowledged that performance is ultimately an individual phenomenon (Cummings & Schwab, 1973), it is also widely accepted that multiple factors influence performance through their effects on individual determinants of performance (Aldag & Brief, 1979; Blumberg & Pringle, 1982; Cummings & Schwab, 1973; Dachler & Mobley, 1973; Johnson, Gardner, Kelly, Maas, & McCloskey, 1989; Mitchell, 1983; Neidlinger & Miller, 1990; Peters & O'Connor, 1980; Shukla, 1983a, 1983b; Waldman & Spangler, 1989).

In general, **performance** can be defined as behavior over time (Mitchell, 1983). Goodman and Fichman (1983) believe that performance is a socially defined output or product. As such, it has value in and for society. When social cues or information about expected work attitudes or behavior are shared and agreed upon by group members, these expectations are called norms (Schachter, Ellertson, McBride, & Gregory, 1951).

Waldman and Spangler (1989) integrated the factors thought to affect job performance into a model incorporating aspects of the individual performer and the immediate organizational environment in which the individual is performing. Aspects of the individual included in the model were: general cognitive and psychomotor abilities, job experience;

motivation and effort thought to be affected by leader behavior; and group processes which can affect individual beliefs, values, and effort. Job performance feedback is thought to affect beliefs and goal-setting and develop job knowledge and skill to improve performance. Aspects of the organizational environment included were: job complexities, and resources and constraints. A strength of the model is the consistent effort that was made to specify and define the concepts for use in empirical testing.

In order to sharpen the concept of performance, two other elements must be considered: process and structure (Goodman & Fichman, 1983). **Process** refers to those activities that contribute to the final output, and **structure** refers to the factors of production (Goodman & Fichman, 1983). The primary inputs, or factors in the production function are labor, technology, organizational arrangements, and environments. **Labor** includes the characteristics of the worker and the work itself; while **technology** characterizes the machinery, technological processes, and knowledge required in the process. And **environments** include the external marketplace and the (internal) work environment (Goodman & Fichman, 1983). These four factors apply at the individual, group, and organizational levels, as well as across industries and professions.

In the health care industry, nursing contributes to the outcomes of patient care through implementation of the **nursing process.** This process--assessment, nursing diagnosis, planning and implementation of goal-directed care, and evaluation of the plan and the patient's progress toward the goal—represents a systems model of input, throughput, output, and feedback. The structures, or factors of production include characteristics of the nurse, the technology in the environment and the

knowledge required to function in the setting, the model of care, and the internal work environment that is affected by conditions and pressures in the external environment. These structures in the health care environment exist prior to and are the cause of the process and performance (Goodman & Fichman, 1983). The nursing process reflects the standards of practice as defined by the American Nurses' Association (1975); therefore, it is appropriate to define nurse performance as the **quality of implementation of the nursing process.**

The relationships specified in the model include effects of educational preparation, experience, personal characteristics, and environment on performance. These relationships are explored in the review of literature.

Review of Literature: The Behavioral Consequence

Educational preparation. The relationship between type of nursing program attended and aspects of nurse performance has been examined frequently. Some investigators found little or no differences among duates from different educational backgrounds (Counts, 1975; Highriter, ; McCloskey, 1983; Smoyak, 1970), while others reported that there differences (Dyer, Monson, & Van Drimmelin, 1975; Hogstel, 1977; over, 1975; McCloskey & McCain, 1988; Nelson, 1978; O'Neil & Maddus, 1966; Schwirian, 1978).

Highriter (1969) examined the relationship between level of educational preparation and performance of public health nurses and found no differences between performance ratings, measured by patient progress, of baccalaureate (N = 31) and diploma (N = 30) nurses. Study-specific rating scales dealing with patient progress and identification of family

needs were used in evaluating performance. In the medical-surgical setting, Counts (1975) found no difference in performance between diploma and baccalaureate graduates. These studies are interesting in light of the fact that diploma programs do not incorporate public health nursing in curricula, while both diploma and baccalaureate programs incorporate medical-surgical nursing.

In a panel study that compared self-reports of baccalaureate and diploma nurses (N = 291) before graduation and after their first work experience, Smoyak (1970) reported that there were some demographic differences between the two groups, but concluded that they were more alike than different. Both groups ranked "giving good bedside nursing care" as most important to a hospital nursing career, while managerial skills were ranked last both in career importance and felt competence.

McCloskey (1983) and Bassett (1977) compared associate degree and baccalaureate nursing graduates and found no difference in problem-solving ability and creative thinking. As well, in McCloskey's (1983) investigation, educational background did not correlate with ratings done of job performance. This particular finding supported that of Welches, Dixon, and Stanford (1974).

Investigators who reported that there were differences in performance examined a variety of factors in reaching this conclusion. Dyer et al. (1975) reported small but significant positive correlations between educational preparation, quality of patient care, and performance (N = 387). Using a sample of 429 registered nurses, competency in technical, communication, and administrative skills was investigated by Nelson (1978). She reported that diploma graduates rated themselves

higher in overall competence, technical, and administrative skills than associate degree or baccalaureate graduates. Baccalaureate graduates rated themselves higher in communication; however, supervisors rated the baccalaureate graduates' overall competence, technical, communication, and administrative skills higher than those of either associate degree or diploma graduates. These findings were supported by Hogstel (1977) and Schwirian (1978).

Hogstel's research (1977) lent partial support to Nelson's research; she reported that baccalaureate graduates were evaluated by their supervisors to have better preparation than associate degree nurses in the dimensions of interpersonal relations, leadership, decision-making, and community health care; however, no differences in physical care and technical skills were found between the two groups. Additionally, there were no differences in orientation to role, position, promotion, or salary based on educational preparation.

Schwirian (1978) found that when recent graduates rated their own performance, associate degree graduates rated themselves lower than baccalaureate graduates on leadership skills, technical skills, communication skills, teaching/collaboration, planning and evaluation, and professional development. The baccalaureate graduates rated themselves higher than associate degree and diploma graduates in teaching/collaboration and planning/evaluation. When supervisors rated the graduates' performance, significant differences based on educational preparation were found. Baccalaureate graduates were rated higher than either diploma or associate degree graduates on the teaching/collaboration and planning/evaluation dimensions of performance.

McCloskey and McCain (1988), using the **Six-Dimension Scale of Nursing Performance**, found that education distinguished top and medium performers from poor performers. Additionally, the effect of more years of education was seen on the performance of all of the subscales of the instrument except the technical skills subscale.

The conflicting results of these investigations support the importance of continued investigation of the relationship between educational preparation and performance.

Experience. Across occupations and professions, there is concern regarding the effects of experience on performance. Avolio, Waldman, and McDaniel (1990) examined the effects of experience, age, and occupational type on work performance (N = 24,219). Occupations were classified by work performed or product produced and by skill and intellectual level required. Performance ratings were done by immediate supervisors and included quantity, quality, and accuracy of work, job knowledge, efficiency, and overall performance. Across occupations there was a tendency for experience to be more highly correlated with performance than age. There was a difference by type of occupation, with higher correlations between performance and age or experience occurring with job requiring more skill complexity than jobs requiring less skill. In the regression analysis, experience added significantly to the prediction of performance beyond contributions of age. As well, age and experience in highly complex jobs explained more variance in performance than did age and experience in less complex jobs. A strength of this research is that it supports results of previous work that found that experience was a better predictor of work performance than age (Giniger,

Dispenzieri, & Eisenberg, 1983; McDaniel, Schmidt, & Hunter, 1988; McEnrue, 1988; Schwab & Heneman, 1977). This research also adds new information by providing empirical evidence that there is a modest moderating effect for occupational type in that both age and experience predicted performance better for jobs requiring higher levels of complexity or mastery (Avolio et al., 1990).

In nursing, numerous studies have examined the impact of experience on performance. Results have often been conflicting and confusing. In an investigation (N = 1,018) conducted in 31 Veterans Administration hospitals, Dyer, Cope, Monson, and Van Drimmelin (1972) found that experience correlated negatively with performance. In the community health setting, Koerner's (1981) results supported an inverse relationship between these variables. In an exploratory analysis of nurse performance, McCloskey and McCain (1988), using the **Six-Dimension Scale of Nursing Performance**, found that experience was the best predictor of technical skills, leadership skills, and planning/evaluation skills. Results of these studies suggest that individual attributes may contribute to performance to a greater degree than experience, or that type of work experience may have an effect.

Personal characteristics. While Schwirian (1981) reported that personal characteristics of nurses were an underinvestigated category in nurse performance research, study of personal characteristics affecting performance in organizations in general is applicable to nursing. The following review and critique incorporates selected empirical work from nursing and organization literature.

Using a sample of 200 registered nurses, Dyer (1967) developed a criterion measure that purports to define effective nurse performance. In Dyer's (1967) performance measure, items defining the construct differentiate the most effective from the least effective nurse. The characteristics a nurse brings to the work situation were found to influence clinical abilities as well as ability to work with and through people. Age, intelligence, and personality characteristics such as sociability, tolerance, and desire for achievement were most commonly found to differentiate effective performance.

Kahn (1990), using a grounded theory approach designed to generate a framework within which to understand "self-in-role" processes reflective of people's psychological engagement and disengagement, identified three conditions that influenced people to engage and disengage at work: (a) meaningfulness, (b) safety, and (c) availability. Psychological meaningfulness was associated with work elements that created incentives or disincentives to personally engage. People experienced a feeling of meaningfulness when they felt worthwhile, useful, and valuable. They felt able to give to others and to the work itself and also able to receive. Lack of meaningfulness was associated with feeling that little was asked or expected of them and there was little room for them to give or receive in work role performance. Meaningfulness as described by Kahn (1990) appears to be the opposite of one form of alienation, meaninglessness, described by Seeman (1959) which can result in lowering of goals and thereby affect performance (Faunce, 1969).

Psychological safety was associated with elements of social systems that created more or less nonthreatening, predictable, and consistent

social situations in which to engage. It was experienced as feeling able to show and employ one's self without fear of negative consequences to self-image, status, or career (Kahn, 1990).

Psychological availability was associated with individual distractions that preoccupied people to various degrees and left them more or less resources with which to engage in role performance (Kahn, 1990). Clearly, specific situations as well as individual differences influence how people engage or disengage given their experiences of psychological meaningfulness, safety, and availability. Future empirical work should further describe the interaction between meaningfulness, safety, and availability; individual differences promoting engagement and disengagement; and the relationship of personal engagement and disengagement to concepts used to explore personrole relationships (Kahn, 1990).

Environment. Harrington and Theis (1968), using the functions of professional nursing as identified by Simms (1964), compared perceptions of two groups of baccalaureate-prepared staff nurses (N = 46) in relation to the influence of institutional factors on performance. Their results suggested that the attitudes and experience of administrative and supervisory personnel, work assignment, and communication were major factors influencing performance. These authors also pointed out that the organizational structure of the hospital, with its focus on routines, technical proficiency, and productivity, fosters an image of the nurse as a dependent practitioner. The emphasis focuses on the physical components of care and medically delegated activities rather than on the

ability of the nurse to independently plan care that meets patient needs (Harrington & Theis, 1968).

Welches et al. (1974) studied 650 staff nurses with the aim of identifying factors believed by practicing nurses to influence the performance of a staff nurse working on a hospital unit and developing profiles of dimensions that were predictive of head nurse performance ratings. The instrument developed for the study included 70 items culled from 1,890 items elicited from practicing nurses. These items were classified into 10 categories and then subgrouped to reflect personal attributes and environmental variables thought to affect performance on a hospital unit. Personal attributes included in the instrument were: (a) professional competence, (b) demographics, (c) commitment to nursing, (d) experience in nursing, (e) nursing education, and (f) personality. Personality was measured with a separate instrument, the **California Personality Inventory** (Gough, 1969). Environment attributes included were: (a) milieu of the unit, (b) relationships, (c) staffing and assignment, and (d) staff development. A major finding of this study was that the clusters of personality variables accounted for almost half the variance in nursing performance as measured by head nurse ratings. This was interesting in light of the fact that personality factors are often mentioned as important in the evaluation of performance, but are seldom mentioned in head nurse rating scales (Welches et al., 1974). Environmental attributes and the nurse's evaluation of her own performance were also predictive of head nurse performance rating. That these variables differentiated nurse performance was encouraging since these

dimensions are amenable to staff development and administrative changes (Welches et al., 1974). The major limitation of this study was the head nurse rating of performance. The instrument was modeled after evaluation forms in use at the time the study was conducted and covered the same general areas believed to influence a staff nurse's performance; however, no alpha reliability or interobserver reliability estimates were provided by the researchers. As a result, it is impossible to determine whether or not this instrument (a) actually measured nurse performance, and (b) provided an objective evaluation of performance.

Summary

Numerous factors must be considered when examining the performance of professionals working in organizations. In nursing, a great deal of effort has been expended examining such variables as educational preparation, experience, and career behaviors such as satisfaction and turnover. While the potential effects of conditions in the environment have been generally acknowledged and incorporated in conceptual models, the effects on performance have not been examined. In as much as this information is critical in the current health care environment, this investigation focused on determining the effects of environmental turbulence on nurse performance. Following Schwirian's (1981) recommendation, structural equation modeling, using manifest variables, was used to examine the relationships proposed in this conceptual framework. The following chapter describes the methodology that was used to answer the research question.

Chapter 3

RESEARCH METHODS

The purpose of this investigation was to determine the effects of environmental turbulence on nurse performance. This chapter describes the research design, setting for data collection, sample, measurement of variables, and the analytic methods used. In the section that describes measurement of variables, the instrumentation review incorporates discussions of the concepts or dimensions measured by each tool, reliability of the instruments, procedures used to evaluate content and construct validity, scoring of the items, and computation of the scale scores for use in model testing.

Research Design

The design for this investigation is a nonexperimental cross-sectional design. It is cross-sectional because all measurements are taken within one time period (Spector, 1981). Since no variables were deliberately manipulated in the setting, the design is nonexperimental.

Data Setting, Sample, Sources, and Data Collection

Setting and Sample

The study was conducted on 19 inpatient units at a 1,058 bed, state-supported university general hospital in a southeastern city. Units on which data were collected include medical, surgical, medical-surgical subspecialty, and pediatric units.

Permission to conduct the investigation was obtained from the Research Committee, School of Nursing, Virginia Commonwealth University/Medical College of Virginia and the Medical College of Virginia Hospitals.

The sample consisted of randomly selected staff registered nurses who had been employed full time in the institution for at least 4 months prior to data collection. A sample size was selected that represented a minimum 10:1 ratio of subjects to independent variables (Marasculio & Levin, 1982). To ensure an adequate return, a sample size of 135, representing a ratio of 15 subjects for each independent variable, was selected to test the model.

In order to select the random sample, a sequentially numbered alphabetical list of all staff nurses who met the above inclusion criteria was obtained by the investigator from Nursing Personnel Services. Using the Epistat RANDOMIZ program, a list of 135 numbers was generated. The numbers and names of the staff nurses that corresponded to the randomly generated numbers constituted the sample for the research.

Data Sources

Data for this investigation were obtained from two sources. Primary data were collected using survey questionnaires. Registered staff nurses responded to pencil and paper questionnaires measuring nurse performance, personality hardiness, ambiguity tolerance, availability and responsiveness of technical support services, perceived environmental uncertainty, number of years and variety of experiences as a nurse, and education preparation. For those measures considered objective indicators of environmental turbulence, secondary data were obtained from the **Medicus**

Patient Classification System and **unit and/or hospital departmental records.** The **Medicus Patient Classification System** provided an estimate of daily patient acuity and occupancy by unit. **Unit and/or hospital department records** provided the number of admissions, discharges, and transfers on/off each unit in a 24-hour period. These data were collected during a 2-month period of time that immediately preceded questionnaire distribution in order to reflect **time prior to** the perception of uncertainty in the environment.

Data Collection

Use of a questionnaire is a method of gathering self-report information from respondents through self-administration of questions in a pencil and paper format (Polit & Hungler, 1983). In this investigation, a survey questionnaire measuring personality hardiness, ambiguity tolerance, availability and responsiveness of technical support services, perceived environmental uncertainty, nurse performance, and demographic data including variety of roles and experiences in nursing and educational preparation was administered to respondents (staff nurses). Two weeks prior to initiating data collection, a letter was sent to those staff nurses who were chosen in the random selection process to participate in the research. This letter invited them to participate and sought their cooperation in the data collection process. Nurse managers were then contacted and times and locations arranged for the investigator to distribute the questionnaire to staff nurses selected to participate. Staff nurses were allowed to complete the questionnaire at a later time and return it to the investigator in a sealed, self-addressed envelope. Subjects who had not responded within 1 week

from initial contact were sent a reminder letter requesting completion and return of the questionnaire. All nurses who completed and returned the questionnaire were sent a letter thanking them for participating in the research. Code numbers were used on individual questionnaires in order to follow-up on subjects who did not complete the questionnaire, send thank you letters to subjects who completed and returned the questionnaire to the investigator, and for use in data management. Confidentiality was maintained by placing completed questionnaires in a sealed envelope. Completion and return of the questionnaire to the investigator was considered consent to participate in the investigation. See Appendix A for the sample consent form. Appendix B presents the questionnaire distributed to the staff nurses who were selected to participate in the research.

Measurement of Variables

In order to understand individual behavior in organizations, it is necessary to study models that include variables at the individual, subunit, and organizational levels (Mark, Lamb, & Verran, 1990); however, few nursing studies have been conducted that consider the effects of organizational or subunit characteristics on phenomena of interest to nursing (Hermansdorfer, Henry, Moody, & Smyth, 1990; Mark et al., 1990). While multilevel research involves new analytic methods with which many nurse researchers are unfamiliar, it is becoming more important within the discipline of nursing to investigate factors that affect nursing practice (Mark et al., 1990). This investigation incorporated variables measured at two levels to answer the research question: **"What are the effects of environmental turbulence on nurse performance?"**

Rousseau (1985) developed a typology of models for use in multilevel research: (a) the composition model, (b) the cross-level model, and (c) the multilevel model. In **composition models**, the focus is on specifying concepts and testing relationships of nondependent variables at two levels (Rousseau, 1985). In **multilevel models**, it is the relationships among independent and dependent variables across two or more levels that are of interest (Rousseau, 1985). In **cross-level models**, the effects of variables occurring at one level on variables occurring at another level is the focus (Rousseau, 1985). The interest is in the relationship of a variable or group of variables at one level, and a dependent, or group of dependent variables at another level (Rousseau, 1985). In this investigation, four characteristics of the nursing unit and two characteristics of the individual nurse were the independent variables. Characteristics of the nursing unit included: (a) average daily change in patient acuity, (b) average daily change in occupancy, (c) number of transfers on/off the unit in a 24-hour period, and (d) number of admissions to and discharges from the unit in a 24-hour period. Characteristics of the individual nurse included: (a) educational preparation, and (b) variety of experiences (roles and clinical areas of practice) as a registered nurse. The first four are measures of subunit environmental turbulence and are considered stressors that affect nurse performance. The dependent variables, measured at the individual nurse level are: (a) implementation of nursing process, (b) technical skills and prioritization of patient care, and (c) communication and interpersonal relationships. The other individual nurse variables thought to mediate the effect of the stressor on performance, include: (a) ambiguity

tolerance, (b) personality hardiness, (c) perception of availability and responsiveness of technical support services, and (c) perceived environmental uncertainty. Thus, the level of measurement, that is, where the measurement takes place, is at both the individual (nurse) and (nursing) subunit levels. The level at which the data will be analyzed is the individual (nurse) level; and the focal unit, the level to which generalizations will be made, is the individual (nurse) level. Table 1 presents the variables of the model and the level each is assigned.

Instrumentation

Personality Hardiness

Kobasa's (1979) original personality hardiness measure used all or part of six different instruments to operationalize the components of hardiness. The 71 items measured control, commitment, and challenge. These dimensions have been retained even as measurement of the construct has been refined.

The **Hardiness Scale** measures the personality hardiness construct. **Commitment** was measured using items from the Alienation from Self, Alienation from Work, and Powerlessness scales of the 33-item **Alienation Test** developed by Maddi et al. (1979). The 12 items are measured using a 4-point Likert scale (0 = not at all true; 3 = completely true). High scores on the Alienation from Self scale reflect a lack of involvement with one's distinctive skills, sentiments and values, as well as a passive attitude toward personal decision-making and goal-setting (Kobasa et al., 1981). Strong agreement with the items of this scale indicate a lack of the self-recognition and sense of purpose associated with the committed

Table 1

Variable Name and Level of Measurement

Variables*		Level of Measurement
Dependent		
Y_1	Nurse performance	Individual
Independent		
$\bar{X}1_2$:	Average daily change in acuity	Group
$\bar{X}2_2$:	Average daily change in occupancy	Group
$\bar{X}3_2$:	Average number of transfers on/off a unit in 24 hours	Group
$\bar{X}4_2$:	Average number of admissions to and discharges from a unit in 24 hours	Group
$X5_1$:	Highest education in nursing	Individual
$X6_1$:	Number of clinical areas a nurse has worked in since graduation from a school of nursing	Individual
$X7_1$:	Number of clinical roles a nurse has had since graduation from a school of nursing	Individual
Mediators		
$X8_1$:	Personality Hardiness	Individual
$X9_1$:	Ambiguity Tolerance	Individual
$X10_1$:	Perceived Environmental Uncertainty	Individual
$X11_1$:	Perceived Quality of Technical Support Systems	Individual

Note: Subscripts denote level to which variable is assigned.
1 = individual level; 2 = group level.

person (Kobasa et al., 1981). High scores on the Alienation from Work scale indicate a lack of personal investment in work life. To the extent that the items of this scale depict work as linking individuals to society, they portray a sense of meaninglessness, apathy, and detachment (Kobasa et al., 1981). Strong agreement with the items on this scale signals an absence of engagement and accountability that defines commitment to work (Kobasa et al., 1981).

The Alienation from Self and Alienation from Work scales have shown an average internal consistency reliability of .85 and .79, respectively (Maddi et al., 1979). Stability of the scales was evaluated using test-retest reliability. The two scales show test-retest correlations of .77 and .70, respectively, over two administrations separated by a 3-week period of time (Maddi et al., 1979).

Construct validity of these scales has been demonstrated by the negative correlations with variables such as empathy, endurance, achievement, motivation in life, and role consistency (Maddi et al., 1979). Additionally, a positive relationship between alienation from work and leisure activities, and between alienation from self and watching television (Csikozentmihalyi, 1975) is also reflective of construct validity.

Commitment was measured using 11 items from Rotter's **External Locus of Control Scale** (Rotter et al., 1962), 4 items from the Powerlessness Scale of the **Alienation Test** (Maddi et al., 1979), and 1 item of the Cognitive Structure Scale of the **Personality Research Form** (Jackson, 1974). The **External Locus of Control Scale** consists of 23 pairs of items in a forced-choice format. High scores indicate a belief in the

predominant influence of external forces and a lack of personal (internal) control over one's life (Maddi et al., 1979). Considerable research has shown that this scale is a valid and reliable index of belief in whether one is controlled by external forces (Lefcourt, 1980; Phares, 1976). Kuder-Richardson 20 reliability estimates for this instrument range from .69 to .76 on different samples (Rotter et al., 1962).

The Powerlessness Scale measures the degree to which an individual feels lack of control over one's life. High scores indicate that the individual indeed feels a lack of control over life events. This scale has shown an average internal consistency of .88 and a test-retest correlation of .71 over a 3-week interval (Maddi et al., 1979). Construct validity has been demonstrated by a negative correlation with dominance and positive correlations with trait anxiety, external locus of control, and conformism (Maddi et al., 1979).

Challenge was measured by 3 items of the 15-item Security Scale of the **California Life Goals Evaluation Schedule** (Hahn, 1966) and 5 items of the Cognitive Structure Scale of the **Personality Research Form** (Jackson, 1974). The Security Scale of the **California Life Goals Evaluation Schedule**, which also uses a 4-point Likert format (0 = not at all true; 3 = completely true), assesses the degree to which safety, stability, and predictability are perceived as important to individuals. Persons scoring high on this scale are unlikely to perceive change as a stimulating challenge to growth, but instead view changes as a threat. This scale has been used widely and has internal consistency reliability estimates of .89 to .92 and test-retest correlations of .71 to .86 (Hahn, 1966). The Cognitive Structure Scale, a 19-item scale of the **Personality**

Research Form (Jackson, 1974), also uses a 4-point Likert format (0 = not at all true; 3 = completely true). This scale appears to emphasize inflexibility of cognitive categories and intolerance of ambiguity, which may render change threatening (Jackson, 1974). Kobasa (1982) reported that the scale has been widely used and has established validity and reliability.

The six scales measuring hardiness are scored negatively; that is, the higher the score, the less the individual is characterized by commitment, control, and challenge. The items from the six scales together have shown an internal consistency of .80 and a test-retest correlation of .61 over a 5-year interval (Kobasa, 1982).

The revised **Hardiness Scale** consists of 36 items; 12 items measuring commitment, 16 items measuring control, and 8 items measuring challenge. The reported internal consistency reliability (coefficient alpha) for this revised scale is .86. This revised composite scale measuring the hardiness construct duplicates the major findings of the previous scale (Kobasa & Maddi, 1982). In this investigation, reliability estimates of the **Hardiness Scale** were obtained to further evaluate internal consistency of the instrument. To simplify interpretation, scoring of negatively loaded items was reversed so that a high score indicates hardiness. A summed score was used as a composite score for each respondent.

Ambiguity Tolerance

The **Budner Scale of Tolerance-Intolerance of Ambiguity** (Budner, 1962) was used to measure ambiguity tolerance. This instrument is the most well known and widely used scale purporting to measure intolerance of ambiguity

(Sidanius, 1978). The items assess responses to situations characterized by **novelty, complexity,** and **insolubility.** On positively worded items, strong agreement was scored 7, moderate agreement 6; slight agreement, 5; slight disagreement, 3; moderate disagreement, 2; and strong disagreement, 1. Scoring of negatively worded items was in the reverse direction. All omissions were scored 4. Budner (1962) reported that this scale has shown fairly good internal consistency. Internal consistency reliabilities (coefficient alpha) reported ranged from .39 to .62 with a mean of .49 (Budner, 1962). Gifford et al. (1979) reported a reliability estimate of .65 when they used Budner's instrument in their investigation of the moderating effects of ambiguity tolerance on the relationship between message characteristics and reports of uncertainty. According to Nunnally (1978), an alpha coefficient of at least .70 is adequate for instruments in early stages of development, and .80 is considered adequate for more developed instruments; therefore, this instrument, by Nunnally's criteria, has questionable internal consistency. Although split-half reliability of the scale is moderately low, due to the heterogeneous nature of the items, the test-retest reliability has been found to be adequate with a correlation of .85 (Budner, 1962). Sidanius (1978) assessed the reliability of this scale and found a test-retest reliability of .73 when administered to college students 2.5 months apart, as did Tatzel (1980) who administered the test to college students 6 months apart.

Prior to conducting the present investigation, this instrument was pretested to reevaluate reliability. A convenience sample of 38 staff registered nurses was used for data collection. Alpha reliability was

computed to be .629; however, alpha estimates of internal consistency assume unidimensional scales and parallelism. Since this estimate of reliability is low by Nunnally's criteria, the instrument was evaluated for heterogeneity using the computational formula for the omega estimate of reliability (Heise & Bohrnstedt, 1970):

$$\Omega = 1 - ([a - \Sigma h_j^i] / [a + 2b])$$

where: a = the number of items in the composite score
h = the communality of the item
b = the sum of the interitem correlations

When the items of an instrument are parallel or tau-equivalent, alpha and omega reliabilities will be equal; however, if the items are not parallel, omega will be greater than alpha (Greene & Carmines, 1980). The omega estimate of reliability for the items of this instrument was .736, confirming that alpha was not an appropriate estimate of internal consistency.

Content validity was insured by determining that each item represented a perceived threat and referred to one of the three types of ambiguous situations (Budner, 1962). Criterion validity was evaluated by determining the relationship of this instrument to three other measures of tolerance-intolerance (Eysenck, 1954; O'Connor, 1952; Saunders, 1955). Correlations of Budner's (1962) scale with these other measures ranged from .36 to .54 and were significant at the .05 level for a two-tailed test. Budner (1962) believes that the measures intercorrelate at a high enough level to suggest that they are tapping a common dimension.

To simplify interpretation, scoring of negative items was reversed so that a high score on all items reflected tolerance of ambiguity. A summed score was used as a composite score for each respondent.

Technical Support Services

The availability and responsiveness of support services was measured using a 27-item revision of the 35-item questionnaire that was developed by Mark (1992) for use in a study to differentiate practice models. The items selected for inclusion in the questionnaire assess the availability and responsiveness of technological, clerical, and patient care support services as evaluated by staff registered nurses working on a nursing unit. These classifications of technical support services are consistent with those proposed by Shukla (1987) in a conceptual model specifying factors affecting nurse performance. Each item is rated in two ways. **Availability** is measured by indicating "yes" or "no" in response to the question **"Is the service consistently available?"** (0 = not consistently available; 1 = consistently available). **Responsiveness** is measured using a 3-point Likert scale (1 = poor responsiveness; 2 = fair responsiveness; 3 = good responsiveness). High scores on this scale indicate good responsiveness to need for technical support services, and low scores indicate poor responsiveness.

Internal consistency of this scale was evaluated by Mark (1992) using Kuder Richardson-20 (KR-20) formula and Cronbach's alpha. The KR-20 was reported to be .756 for the **availability** of the service and for **responsiveness**, the alpha coefficient was .884 (Mark, 1992). In the present investigation, reliability estimates were computed to provide estimates of the internal consistency of the revised instrument.

Construct validity was not evaluated since the instrument was developed using structures and resources that should be available on nursing units to support practice (Munson & Clinton, 1979).

The **quality** of the technical support services was calculated by multiplying the **availability** of each support service by the **responsiveness** of that service. A summed scale score was computed to form a composite score for each respondent.

Nurse Performance

Performance of staff registered nurses was measured using items from four subscales of the **Six-Dimension Scale of Nursing Performance** (Schwirian, 1978). This instrument is consistent with a nursing process model of good nursing practice (Schwirian, 1978). Each item was rated on a scale of 1 (not performed very well) to 4 (performed very well); thus, high scores reflect a high level of performance and low scores reflect poor performance. Alpha coefficients of .92 for the Critical Care/Skills subscale, .93 for the Teaching/Collaboration subscale, .94 for the Planning/Evaluation subscale, and .96 for the Interpersonal Relationships/Communication subscale have been reported (Schwirian, 1978). Reliability coefficients obtained on supervisor appraisals of performance have been high, as well (Schwirian, 1978).

Content validity for the **Six-Dimension Scale of Nursing Performance** was established through consensus among developers of the instrument, consultants, and respondents in a pilot project. The opinion of members of this group was that the behaviors were descriptive of behaviors thought to reflect good patient care (Schwirian, 1978).

A second validity issue was concerned with whether the items belonged in the categories agreed on by the developers and content experts. Factor analysis resulted in the formation of six subscales that contained a total of 52 items (Schwirian, 1978). Analysis of data obtained from supervisors showed that the scales differentiated between graduates identified by nursing school faculty as having promise for successful performance and those who had not been so designated (Gortner & Schwirian, 1977). This differentiation gives strength to the external validity of the **Six-Dimension Scale of Nursing Performance**

In the present investigation construct validity was analyzed using factor analysis. Reliability estimates were computed to assess internal consistency of the instrument. When the data collected in the present investigation were factor analyzed, the subscales (factors) that were formed were used as the outcome variables. A summed subscale score was computed to form a composite score for each respondent.

Patient Acuity

Patient acuity, one of the indicators of environmental turbulence, was measured using the **Medicus Patient Classification System.** This instrument rates the nursing care intensity of each patient on a 0.7 to 4.6 scale. High scores indicate high acuity and low scores indicate low acuity. Overall, the **Medicus Patient Classification System** has well-established validity and reliability (Medicus, 1977, 1985, 1991). This classification system has been used for approximately 12 years and at the present time is used in over 100 hospitals. Reliability of this classification system is reported to range from .89 to .97 (Medicus, 1977, 1985). Interobserver reliability estimates on units included in the

present investigation are reported in Appendix C. Internal consistency reliability was not evaluated.

Perceived Environmental Uncertainty

The instrument used to measure the perception of environmental uncertainty was developed by the investigator using five dimensions proposed by Lorenzi et al. (1981). These dimensions appear to influence perceptions of uncertainty resulting from (a) environmental dynamism, (b) environmental complexity, (c) environmental dominance, (d) need for information, and (e) confidence in decision-making. Using these concepts, a 15-item questionnaire was developed by the investigator. Items were measured using a 6-point Likert scale (1 = strong agreement; 2 = moderate agreement; 3 = slight agreement; 4 = slight disagreement; 5 = moderate disagreement; 6 = strong disagreement). Four items were negatively loaded and were reverse scored. This resulted in low scores on items reflecting the perception of certainty, and high scores reflecting uncertainty. A summed scale score was computed to form a composite score for each respondent.

Prior to conducting the proposed investigation, this instrument was pretested to determine initial reliability. A convenience sample of 38 staff registered nurses constituted the sample for this pretest of the instrument. Internal consistency was evaluated using coefficient alpha and was computed to be .785. According to Nunnally (1978), this is an acceptable reliability estimate for an instrument in the early stages of development.

Analytic Method

Two analytic methods were used to answer the research question: (a) contextual regression analysis, and (b) path analysis.

Contextual Regression Analysis

Contextual regression analysis is a statistical strategy used to determine the presence of a contextual effect; that is, whether variables measured at a different level of analysis contribute to the explained variance in an outcome measure after the effects of individual characteristics have been taken into account. In this type of analysis, "effects" refer to the explained variance and do not imply causality (Boyd & Iversen, 1979). This analytic technique affords a way to combine variables aggregated at different levels of measurement, permitting the investigator to examine the effects of groups on individuals or of individuals on groups (Holzemer, Jennings, Chambers, & Paul, 1989). A contextual effect (such as a program effect, organizational effect, or environmental effect) is said to be present if group level variables account for a significant proportion of the variance in the dependent variable after controlling for effects due to individual characteristics (Holzemer et al., 1989). An individual effect is present if additional variance can be attributed to individual level variables after controlling for group effects (Holzemer et al., 1989). Thus, the contextual analysis answers the question: **Do characteristics of the group have an effect on the individual?**

Path Analysis

A path analytic technique was used to determine the effects of the exogenous, or independent variables on the endogenous, or dependent variable. Path analysis provides the means to examine the sequential relationships among the variables in a model. The path model is intended to combine the quantitative information provided by the path coefficients with the conceptual information on hypothesized causal relationships. Path analysis helps to clarify both theoretical and empirical relationships (Kerlinger, 1973) by providing a quantitative interpretation and test of the model.

Data Analysis

Statistical analysis took place in three phases. The first phase of data analysis focused on determining whether linear model assumptions were met. Relationships among independent and dependent variables were plotted and the distributions inspected for linearity. Next, the mean, median, standard deviation, and range for each variable were computed. Data were examined for skewed distributions, gaps in data distribution, multiple peaks, and outliers. Then, summed scale scores were computed to measure personality hardiness, ambiguity tolerance, quality of technical support services, perceived environmental uncertainty, and the subscales formed from items of the **Six-Dimension Scale of Nursing Performance.** To determine the strength and direction of relationships among the variables, correlational analysis was done. The contextual analysis was done using the REGRESSION subprogram of the **Statistical Package for Social Sciences (SPSSX).**

The path models were estimated using SPSSX REGRESSION subprogram to compute path coefficients (standardized regression coefficients). The total association was decomposed into direct and indirect effects. Direct effects are represented by the path coefficient of the direct path to an outcome variable from an independent or predictor variable. Indirect effects, calculated by using the product of the indirect paths to the outcome variable through a mediator variable, were computed by summing the products of the indirect paths. Significant causal relationships were identified and the model was trimmed, by eliminating nonsignificant paths, for further empirical testing. The results are presented and discussed in Chapter 4.

Chapter 4

FINDINGS

The purpose of this investigation was to determine the effects of environmental turbulence on nurse performance. In addition, the mediating effects of personality hardiness, ambiguity tolerance, quality of technical support systems, and perceived environmental uncertainty on the nurse performance measures were examined. This chapter presents the findings of the study. First, characteristics of the sample and the setting are described. Then, psychometric properties of measurement instrument are presented. Finally, descriptive statistics of the study variables, the contextual analysis, and the results of path analysis are discussed.

Characteristics of the Sample and Setting

The Sample

A total of 135 randomly selected staff registered nurses was invited to participate in the investigation. Prior to data collection, eight (5.9%) of these nurses left the work environment; 127 questionnaires were then distributed to staff registered nurses working on 19 inpatient nursing units. A total of 97 (74.8%) questionnaires was returned by participants. Of the returned questionnaires, two had missing data and were excluded from the analysis, resulting in a final sample of 95 registered nurses. The distribution of respondents by inpatient nursing unit is presented in Table 2.

Table 2

Frequency Distribution of Respondents by Unit (N=95)

Unit	Number Distributed	Number Returned	Response Rate (%)
1	5	5	100
2	4	2	50
3	6	5	83
4	13	9	69
5	7	5	71
6	5	4	80
7	9	7	78
8	7	7	100
9	10	8	80
10	4	3	75
11	9	7	78
12	6	4	66
13	3	3	100
14	8	5	63
15	8	6	75
16	5	4	80
17	5	3	60
18	7	6	86
19	6	2	33
Total	127	95	74.8

The sample consisted of 87 female (91.6%) and 8 male (8.4%) staff registered nurses. This is a slightly higher percentage of males than the 3.6% reported in national survey data (Moses, 1990).

A review of the age distribution of the respondents revealed that 45% were under 30 and 13.7% were over 45 years of age. Thus, this sample has more nurses in the under 30 age group than reported in national survey data (15.6%), and therefore, does not reflect the decline in the under 30 population described by Moses (1990). There are also fewer nurses over 45 than are reported nationally (36.4%) (Moses, 1990). This latter finding may have resulted from the fact that the sample was selected from a population of staff nurses, not from all nurses employed in the setting.

Approximately 62% of the respondents were classified as Clinician II on the Clinical Ladder. The Clinician II is the third level on the Clinical Ladder. Staff nurses functioning at this level independently plan and implement individualized care and have basic leadership responsibilities.

Personal attributes included in the research were educational experiences and the variety of clinical roles and clinical areas in which respondents had worked. Table 3 presents frequency distributions for the educational experiences and Tables 4 and 5 present those for the clinical areas and roles reported by the respondents. Fifty-one percent of respondents had a baccalaureate degree in nursing. The results presented in Table 3 reflect a shift, similar to the national trend, from basic nursing education in diploma programs to associate degree and baccalaureate education. The sample in the present investigation contains: (a) fewer diploma graduates (8.4%) than the national population (40%),

Table 3

Frequency Distributions of Nursing and Non-Nursing Educational Experiences (=95)

Variable	Value Label	Frequency	Percent
First degree in nursing	Practical Nursing	17	17.9
	Diploma	12	12.6
	Associate Degree	25	26.3
	Baccalaureate Degree	41	43.2
Highest degree in nursing	Diploma	8	8.4
	Associate Degree	35	36.8
	Baccalaureate Degree	49	51.6
	Master's Degree	3	3.2
Enrolled in a program leading to a higher degree in nursing	Baccalaureate Degree	8	8.4
	Master's Degree	8	8.4
Highest non-nursing degree	Associate Degree	4	4.2
	Baccalaureate Degree	14	14.7
	Master's Degree	3	3.2
Enrolled in a program leading to a higher degree in another field	Baccalaureate Degree	2	2.1

Table 4

Frequency Distribution of Types of Clinical Experiences (N=95)

Type of Clinical Experience	Number Reporting Experience in the Clinical Area	Percent
General Surgical Nursing	69	72.6
General Medical Nursing	61	64.2
General Pediatric Nursing	26	27.4
Adult Critical Care/ Special Care Nursing	25	26.3
Psychiatric Nursing	16	16.8
Obstetric Nursing	15	15.8
Community Health/Home Health Nursing	14	14.7
Pediatric Critical Care/ Special Care Nursing	14	14.7
Rehabilitation Nursing	7	7.4
Emergency Nursing	4	4.2

Table 5

Frequency Distribution of Types of Clinical Roles (N=95)

Type of Clinical Role	Number Reporting Experience in the Role	Percent
Head Nurse/Manager	29	30.5
Nurse Educator	26	27.4
Case Manager	10	10.5
Office Nurse	8	8.4
Special Procedures	6	6.3
Research Nurse	5	5.3
Program Coordinator	4	4.2
Clinical Nurse Specialist	3	3.2
Nurse Practitioner	2	2.1

and (b) a greater percentage of associate degree (36.8%) and baccalaureate-prepared nurses (51.6%) than the national sample (25% and 27%, respectively) (Moses, 1990). Nationally, 6% of nurses have master's degrees (Moses, 1990), as compared to 3.2% in the setting for this investigation. This latter finding, in all likelihood, was observed because only staff nurses were sampled.

Moses found that 9.5% of nurses nationally are enrolled in programs studying for additional academic degrees (Moses, 1990). In the present investigation, 8.4% of respondents were enrolled in baccalaureate programs and an additional 8.4% were enrolled in programs leading to a master's degree. These findings are higher than those reported nationally and may be a result of access to both baccalaureate and master's education in a nearby school of nursing, as well as to tuition waiver programs offered by the institution in which the investigation was conducted.

Forty-three precent of respondents indicated that they were members of a professional organization, and 26.3% of respondents were certified by one of these organizations.

While the clinical areas in which respondents had worked were diverse, general medical and general surgical experience was most frequently cited (61% and 69%, respectively). All respondents reported staff nurse experience; the next most frequently reported roles were those of manager and educator (30.5% and 27.4%, respectively).

The Setting

Unit environmental characteristics for each of the 19 units participating in the research are presented in Appendix D. These variables reflect the turbulence in the internal environment to which

staff nurses were exposed in their day-to-day practice. The mean, standard deviation, minimum, and maximum values by unit for each of the following variables are included: patient acuity, day-to-day change in patient acuity, occupancy, day-to-day change in occupancy, number of admissions to and discharges from a unit in a 24-hour period, and number of transfers on and off a unit in a 24-hour period.

Instrumentation

Reliability and validity are fundamental considerations when evaluating instruments that have been used in research. The steps in the process of evaluating the instruments used in this investigation were abstracted from guidelines for instrument development as described by Mishel (1989). Concept clarification, the first step in the process (Mishel, 1989), was presented in Chapter 2. Operationalization of the concepts, which involves determining and defining how the concept will be measured (Mishel, 1989), was presented in Chapter 3 and was based on empirical indicators described in the conceptual-theoretical-empirical framework guiding the research. This section reports the results of reliability and validity assessment for instruments used in this investigation.

Reliability of each instrument was estimated using coefficient alpha. The **Tolerance-Intolerance of Ambiguity Scale** (Budner, 1962) was further evaluated using an omega estimate of reliability. The reliability estimates that are cited reflect the reliability of the scale or subscale used in model testing.

Construct validity was partially evaluated using factor analysis. Assuming unique variance in each item, principal axis factoring was used

(Nunnally, 1978). Varimax rotation was used to reduce cross-loading of items.

Some items were deleted from the **Perceived Environmental Uncertainty Scale** and the **Six-Dimension Scale of Nursing Performance.** The criteria used in deletion of items from the **Six-Dimension Scale of Nursing Performance** included: (a) factor loading below .30 on any item, and (b) cross-loading on two or more factors (Nunnally, 1978). Items were deleted from the **Perceived Environmental Uncertainty Scale** as a result of low interitem and item-total correlations, as suggested by Nunnally (1978).

Patient Acuity

Patient acuity was measured using the **Medicus Patient Classification System** (Medicus Corporation, 1991). The 36 indicators and the weight of the indicator used to calculate individual patient acuity are presented in Table 6. In this investigation, daily individual patient acuity scores for all the patients on a nursing unit were summed over a 61-day period to form the unit acuity score. Day-to-day change in patient acuity was calculated by determining the absolute day-to-day change for a 60-day period of time. The interrater reliability by unit for the time period during which the data were collected is presented in Appendix C.

Technical Support Services

The quality of technical support services was measured using a modification of an instrument developed by Mark (1992) that incorporated respondents' perceptions of the availability and responsiveness of support

Table 6

Medicus Patient Classification System:

Acuity Indicators and Indicator Weights

Indicators	Weight
Admission or Transfer In	
Discharge or Transfer Out	
Altered Mental Status	3
Communication Barriers	1
Self-Care With No Minimal Assistance	1
ADL With Partial Assistance	2
ADL With Complete Assistance	6
Fluid Balance Assessment	6
Fluid Balance Management	7
Fluid Balance Management - Complex	14
Incontinence Management	6
Preventive Skin Care	2
Wound Management	4
Wound Management - Complex	8
Wound Management - Extensive and Complex	10
Pulmonary Management	7
Pulmonary Management With Support	15
Pulmonary Management With Continuous Support	23
Vital Signs, Q1½-2 Hours	10
Vital Signs, Q1 Hour/More Often	15
Noninvasive Monitoring - Low Risk	8
Noninvasive Monitoring - High Risk	12
Invasive Monitoring - Low Risk	16
Invasive Monitoring - High Risk	22
Learning Needs - Reinforcement	2
Learning Needs - New Content	3
Emotional Needs - Reassurance	7
Emotional Needs - Coping Deficit	8
Medication Management - Intermittent	2
Medication Management - Continuous	3
Specimen Collection	3
Specimen Collection - Complex	8
Isolation	2
Drainage Devices	4
Prep For Test/Procedure	1
One-to-One Care	32

services necessary to promote clinical practice. The Kuder-Richardson 20 reliability for the availability of the technical support services was .839 and the alpha reliability for the responsiveness of these same services was .833. Item means, standard deviation, and item-total correlation for each item of the availability and responsiveness scales are presented in Appendix E. While two items (specimen pick-up, stocked linen cart) had low item-total correlations on both the availability and responsiveness scales, these items were not eliminated since the services they represent are considered essential; thus all items were retained in model testing.

Ambiguity Tolerance

The reliability of the **Tolerance-Intolerance of Ambiguity Scale** (Budner, 1962) was evaluated using both coefficient alpha and an omega reliability. Both estimates of reliability were computed in order to compare results of previous empirical work to results obtained in the present investigation, as well as to evaluate the instrument for problems of heterogeneity. Zeller and Carmines (1980) state that alternate estimates of internal consistency should be used when the items of an instrument are heterogeneous, reflected by low interitem and item-total correlations, since coefficient alpha will be a less optimal estimator as the divergence among interitem correlations becomes greater.

The alpha reliability on the 16-item instrument was .571, which was consistent with results reported by other investigators (Budner, 1963; Gifford et al., 1979). The omega reliability was .718. If the omega

estimate is higher than the alpha estimate of internal consistency, items on the instrument are nonparallel or heterogeneous (Zeller & Carmines, 1980). Thus, coefficient alpha was not an appropriate estimate of internal consistency for this instrument.

Construct validity was evaluated with factor analysis using principal axis factoring with varimax rotation. A three factor solution was requested to confirm the theoretical structure predicted by Budner (1962). The factor pattern obtained is presented in Table 7. This factor pattern was compared to Budner's results; however, the factor pattern observed was not consistent with that described by Budner (1962). See Appendix F. For example, several items did not load on the factors that Budner (1962) reported. As well, factor loadings on several items were low, indicating that these items were not adequate measures of the construct. One item, however, had a factor loading of .955. This item, which measured respondents' preference for novel situations, was the strongest measure of tolerance for ambiguity and seems to have emerged as a criterion measure of ambiguity tolerance in the present analysis. All items were retained for use in model testing.

Personality Hardiness

The reliability of Kobasa's (1979) **Hardiness Scale** (Kobasa, 1982) was evaluated using coefficient alpha. The internal consistency reliability was .700 for the composite instrument, which is somewhat low for an instrument in later stages of development (Nunnally, 1979).

Construct validity was evaluated with factor analysis using principal axis factoring with varimax rotation. A three factor solution was requested to confirm the theoretical structure proposed by Kobasa (1979).

Table 7

Factor Structure and Reliability Summary of the Tolerance-Intolerance of Ambiguity Scale (N=95)

Item	Factor Loadings		
	Novelty	Insolubility	Complexity
What we're used to is preferable to what is unfamiliar.	.955		
People who fit their lives into a schedule probably miss most of the joy of living.	.390		
An expert who doesn't come up with a definite answer probably doesn't know much.	.271		
In the long run, it is possible to get more done by tackling small, simple problems rather than larger complicated ones.	.212		
A person who leads an even, regular life in which few surprises or unexpected events arise, really has a lot to be grateful for.	.195		
I like parties where most of the people are strangers to me.	.162		
There is no such thing as a problem that can't be solved.		.630	
The sooner we all acquire similar values and ideals the better.		.421	
A good job is one that clearly states what is to be done and how it is to be done.		.337	
Supervisors who give vague assignments or instructions give me a chance to show initiative and originality.			.516
People who insist on a yes or no answer don't know how complicated things really are.			.491
Often the most interesting and stimulating people are those who don't mind being different and original.			.435

Table 7 - continued

Item	Factor Loadings		
	Novelty	Insolubility	Complexity
It is more fun to tackle a complicated problem than to solve a simple one.			.433
A good teacher is one who makes you wonder about your way of looking at things.			.418
Many of our most important decisions are based on insufficient information.			.368
I would like to live in a foreign country for awhile.			.278
Alpha: .571 Omega: .718			

The factor pattern obtained is presented in Table 8. This factor pattern was compared to the theoretical dimensions of hardiness described by Kobasa (1979), but was inconsistent with the factor structure she proposed. Several items did not load on the factors that Kobasa (1979) reported; however, the items seemed to reflect commitment, control, and challenge. All items were retained for use in model testing. See Appendix G for presentation of the psychometric properties of the instrument.

Perceived Environmental Uncertainty

The **Perceived Environmental Uncertainty Scale** is an investigator-developed instrument. The reliability of the instrument was evaluated using coefficient alpha. Alpha reliability on the 15-item scale was .774. To determine the strength of the association between items and between each item and the composite instrument, item-total and interitem correlations were examined. See Appendix H. The higher the correlation between the item and the total scale, generally, the better the item. Low correlations reflect low association with the total scale and should be the first to be eliminated (Ferketich, 1991). Four of the item-total correlations did not meet the .30 criteria (Nunnally, 1978; Zeller & Carmines, 1980). Additionally, these same items had low interitem correlations among themselves and with other items on the instrument and were not used in subsequent analyses. Using the remaining 11 items to evaluate internal consistency of the instrument, alpha reliability improved to .827.

Factor analysis of the 11 remaining items using principal axis factoring resulted in the single factor solution presented in Table 9.

Table 8

Factor Structure and Reliability Summary of the Hardiness Scale (N=95)

Item	Factor Loadings		
	Commitment	Challenge	Control
I am really interested in the possibility of expanding my consciousness through drugs.	.567		
In my case, getting what I want has little or nothing to do with luck, **OR** Many times, we might as well decide what to do by flipping a coin.	.512		
Many times I feel that I have little influence over the things that happen to me, **OR** It is impossible for me to believe that chance or luck plays an important role in my life.	.469		
Life is empty and has no meaning in it for me.	.432		
What happens to me is my own doing, **OR** Sometimes I feel that I don't have enough control over the direction my life is taking.	.418		
Becoming a success is a matter of hard work; luck has little or nothing to do with it, **OR** Getting a good job depends mainly on being in the right place at the right time.	.375		

Table 8 - continued

Item	Factor Loadings		
	Commitment	Challenge	Control
Most people don't realize the extent to which their lives are controlled by accidental happenings, **OR** There is really no such thing as luck.	.372		
Who gets to be boss often depends on who was lucky enough to be in the right place first, **OR** Getting people to do the right thing depends on ability; luck has little to do with it.	.324		
If you have to work, you might as well choose a career where you deal with matters of life and death.	.316		
The idea that most teachers are unfair to students is nonsense, **OR** Most students don't realize the extent to which their grades are influenced by accidental happenings.	.307		
The human's ability to think is not really such an advantage.	.267		
Most of life is wasted in meaningless activity.	.254		
Most of the time I can't understand why politicians behave the way they do, **OR** In the long run, the people are responsible for bad government on a national as well as on a local basis.	.204		

Table 8 - continued

Item	Factor Loadings		
	Commitment	Challenge	Control
The attempt to know yourself is a waste of effort.	.136		
I long for a simple life in which bodily needs are the most important things and decisions don't have to be made.	.104		
No matter how hard I try, my efforts will accomplish nothing.		.659	
I find it hard to believe people who actually feel that the work they perform is of value to society.		.621	
I find it difficult to imagine enthusiasm concerning work.		.487	
I wonder why I work at all.		.441	
Before I ask a question, I figure out exactly what I already know and what it is I need to find out.		.376	
It upsets me to go into a situation without knowing what I can expect from it.		.361	
In the long run, people get the respect they deserve in the world, **OR** Unfortunately, an individual's work often passes unrecognized no matter how hard he tries.		.351	
My work is carefully planned and organized before it is begun.		.337	
I tend to start right in on a new task without spending much time thinking about the best way to proceed.		.312	

Table 8 - continued

Item	Factor Loadings		
	Commitment	Challenge	Control
Those who work for a living are manipulated by their bosses.			.649
Politicians control our lives.			.474
Most of my activities are determined by what society demands.			.446
No matter how hard you work, you never really seem to reach your goals.			.440
Pensions large enough to provide for dignified living are the right of all when age or illness prevent one from working.			.401
With enough effort, we can wipe out political corruption, **OR** It is difficult for people to have control over things politicans do in office.			.388
Without the right breaks one cannot be an effective leader, **OR** Capable people who fail to become leaders have not taken advantage of their opportunities.			.364
One who does his/her best should expect to receive complete economic support from society.			.302
There are no conditions that justify endangering the health, food, and shelter of one's self or one's family.			.302

Table 8 - continued

Item	Factor Loadings		
	Commitment	Challenge	Control
The most exciting thing for me is my own fantasies.			.157
I like to be with people who are unpredictable.			.104
I very seldom make detailed plans.			-.183
Alpha: .700			

Table 9

Factor Structure and Reliability Summary of the

Perceived Environmental Uncertainty Scale (N=95)

Item	Factor Loading
Frequent admissions and discharges from the unit make it difficult for me to plan my work.	.676
Frequent transfers on and off the unit make it difficult for me to get my work done.	.666
If I had more information about my patient's current condition, I could do a better job.	.637
If I got timely feedback about unit management decisions I make, I could do a better job.	.619
If my patients didn't have such complex problems, I could do a better job.	.551
Physicians change their orders so frequently that I have difficulty getting my job done.	.549
I have to consult with several health care practitioners before I can make decisions about patient care.	.510
If I got timely feedback about the effect of clinical decisions I make, I could do a better job.	.503
If I had more knowledge/education about the care my patients need, I could do a better job.	.497
Patients' conditions change too unpredictably for me to do a good job.	.438
If I had more information about what my supervisor expects of me, I could do a better job.	.438
Alpha: .827	

Items included in the final solution measured environmental dominance, environmental complexity, need for information, and environmental dynamism and were retained for use in model testing.

Nurse Performance

The **Six-Dimension Scale of Nursing Performance** (Schwirian, 1978) consists of 52 items. The Leadership and Professional Development subscales were not used because they measured attributes of performance not considered in this research. The 37 items from the four remaining subscales were factor analyzed using principal axis factoring with varimax rotation. After a series of factor analyses, a three factor solution was selected as the most interpretable and representative of nurse performance. The factor pattern is presented in Table 10. Twenty-six items were retained for model testing and formed three subscales: (a) Implementation of Nursing Process (11 items), (b) Interpersonal Relationships and Communication Skills (10 items), and (c) Technical Skills and Prioritizing Care for Seriously Ill Patients (5 items). While these three subscales differ from the factors reported by Schwirian (1978), they are conceptually compatible with her definition of nurse performance and were, therefore, used as dependent variables in the proposed causal models. The theoretical models are presented in Figures 4, 5, and 6.

Alpha reliability for the total 26-item scale was .926. Subscale reliabilities were .895 for the Implementation of Nursing Process subscale, .882 for the Interpersonal Relationships and Communication Skills subscale, and .742 for the Technical Skills and Prioritizing Care for Seriously Ill Patients subscale. Appendix I presents the psychometric properties of each subscale.

Table 10

Factor Structure and Reliability Summary of the Six Dimension Scale of Nurse Performance (N=95)

Item	Factor Loadings: Implementation of Nursing Process	Factor Loadings: Interpersonal Relations/ Communication Skills	Factor Loadings: Technical Skills/ Prioritizing Care of Seriously Ill Patients
Coordinate the nursing care plan with the medical plan of care.	.752		
Teach preventive health measures to patients and their families.	.744		
Teach a patient's family about the patient's needs.	.632		
Develop a plan of nursing care for the patient.	.602		
Use teaching aids and resource materials in teaching patients and families.	.599		
Evaluate results of nursing care.	.591		
Adapt teaching methods and materials to the patient's/ family's level of understanding.	.582		
Identify anticipated changes in the patient's condition and include them in the plan of care.	.567		
Develop innovative methods and materials for teaching patients.	.554		
Identify community resources and use them in developing a plan of care for the patient.	.539		
Promote inclusion of the patient's desires/decisions concerning care in the medical and nursing plans of care.	.523		
Alpha: .895			

Table 10 - continued

Item	Factor Loadings: Implementation of Nursing Process	Factor Loadings: Interpersonal Relations/ Communication Skills	Factor Loadings: Technical Skills/ Prioritizing Care of Seriously Ill Patients
Help a patient communicate with others.		.768	
Recognize and meet the emotional needs of a dying patient.		.712	
Seek assistance when necessary.		.663	
Help meet the emotional needs of a patient.		.659	
Give emotional support to the family of critically ill/ dying patients.		.658	
Explain nursing procedures to a patient prior to performing them.		.583	
Use nursing procedures as opportunities to interact with patients.		.529	
Communicate acceptance of each patient and concern for patient welfare.		.519	
Contribute to productive working relationships with other health team members.		.479	
Contribute to an atmosphere of mutual trust, acceptance, and respect among other health team members.		.440	
Alpha: .882			

Table 10 - continued

Item	Factor Loadings: Implementation of Nursing Process	Factor Loadings: Interpersonal Relations/ Communication Skills	Factor Loadings: Technical Skills/ Prioritizing Care of Seriously Ill Patients
Function competently in emergency situations.			.792
Perform appropriate measures in emergency situations.			.784
Perform nursing care required by patients who are seriously ill.			.599
Use equipment safely and competently.			.597
Perform technical procedures competently.			.584
Alpha: .742			

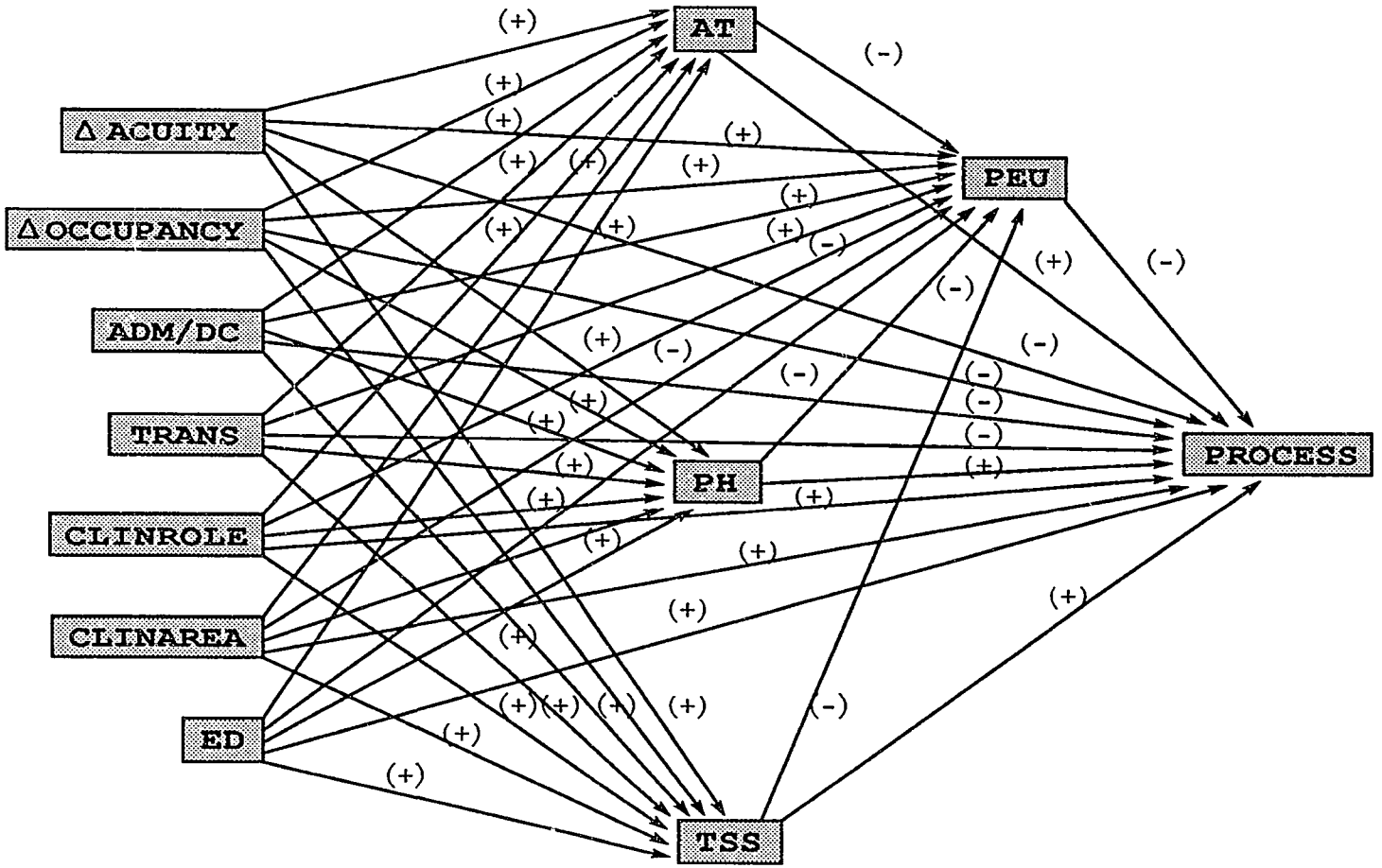

Figure 4. Causal Model of Environmental, Sociodemographic, and Personal Factors Affecting Implementation of Nursing Process

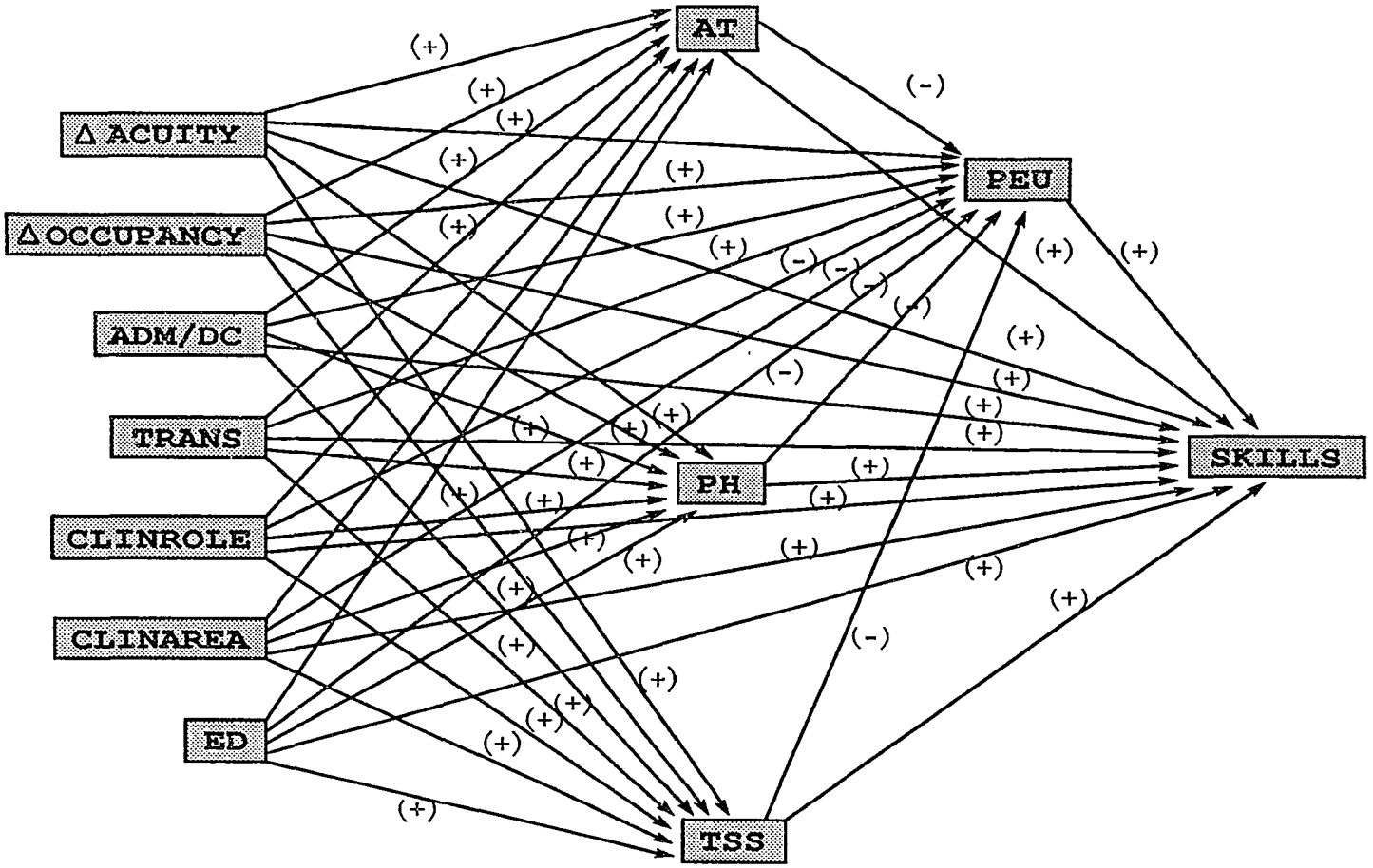

Figure 5. Causal Model of Environmental, Sociodemographic, and Personal Factors Affecting Performance of Technical Skills and Prioritizing Care of Seriously Ill Patients (SKILLS)

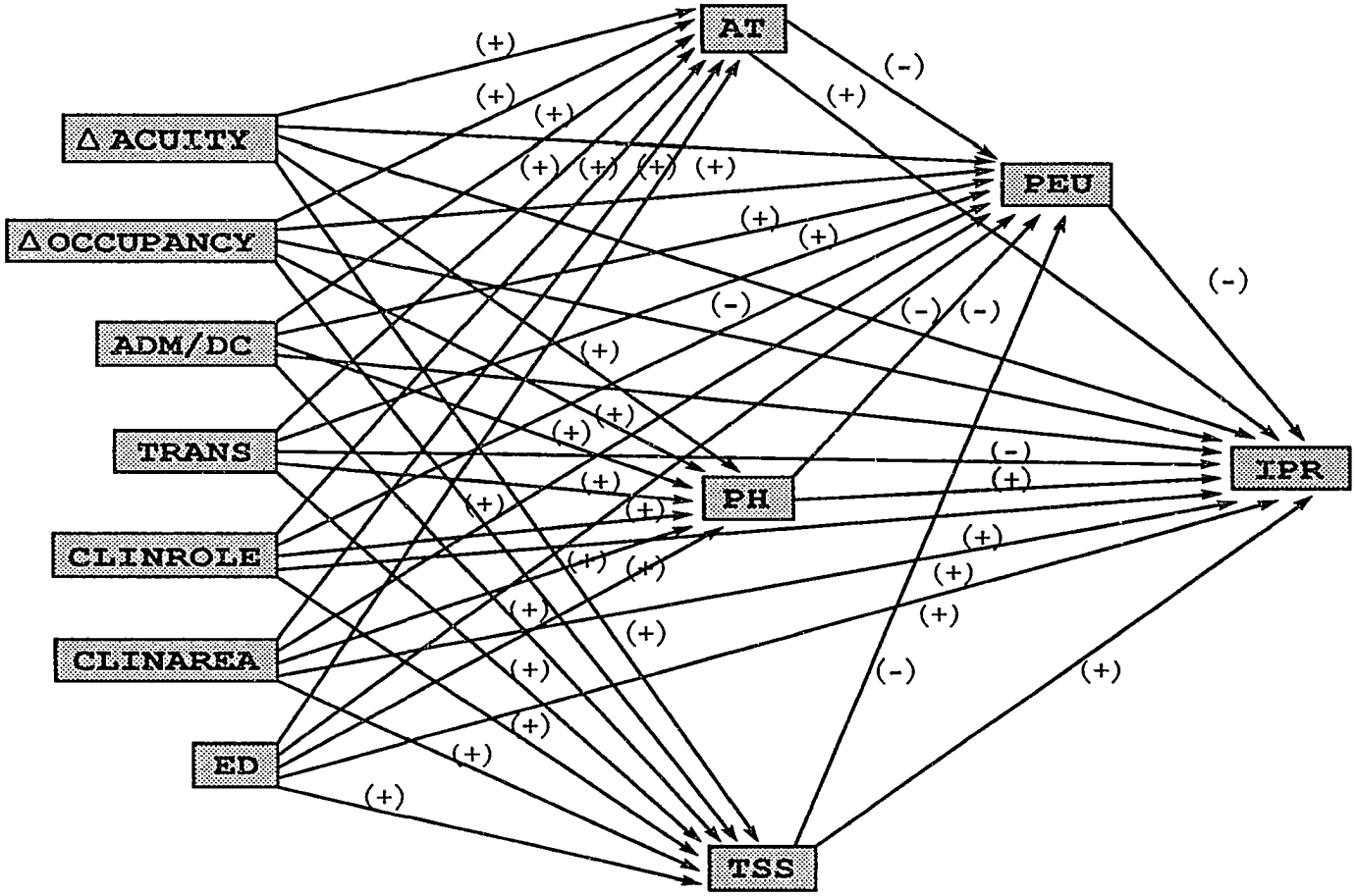

Figure 6. Causal Model of Environmental, Sociodemographic, and Personal Factors Affecting Interpersonal Relationships and Communication Skills (IPR)

Descriptive Statistics

Operational definitions of the study variables are presented in Table 11. Descriptive statistics for each variable in the model are presented in Table 12. The mean, standard deviation, maximum, median, and minimum scores for each variable are included.

Group level variables measuring objective characteristics of the clinical environment reflecting turbulence revealed little ($\bar{X}$ = 95.97; S.D. = 29.17) day-to-day change in acuity (Δ ACUITY). This finding is not surprising since decreased length of stay partly eliminates low acuity days. In addition, there was low ($\bar{X}$ = 2.26; S.D. = .769) average day-to-day change in occupancy (Δ OCCUP). A high number of admissions to and discharges from a unit in a 24-hour period (ADM/DC) was expected because decreased length of stay creates bed availability and allows frequent admissions to inpatient beds; however, results revealed that, while there was some variation (S.D. = 3.23), the average number of admissions to and discharges from a unit was not as high as expected ($\bar{X}$ = 7.38). A high number of transfers on and off a unit in a 24-hour period (TRANS) was also expected because compressed length of stay often requires that numerous tests or procedures be completed in fewer days, requiring that the patient leave the unit numerous times. While there was some variation between units (S.D. = 4.10), the number of transfers on and off units in a 24-hour period was not as high as expected ($\bar{X}$ = 9.24).

On the average, respondents had functioned in two clinical roles (CLINROLE), and had worked in three clinical areas (CLINAREA). The level of education (ED) was almost evenly distributed between those with a

Table 11

Operational Definitions of Study Variables

Variable	Definition
Group	
Δ ACUITY	Mean day-to-day change in total patient acuity on a nursing unit.
Δ OCCUPANCY	Mean day-to-day change in number of patients on a nursing unit (occupancy rate).
ADM/DC	Mean number of admissions to and discharges from a nursing unit in a 24-hour period of time.
TRANS	Mean number of patient transfers on and off of a nursing unit to diagnostic studies and/or procedures in a 24-hour period of time.
Individual	
CLINROLE	Variety of roles a staff nurse has had since graduation from a school of nursing. Computed by summing "yes" responses to items representing clinical roles in which a nurse had (at least) 3 months experience.
CLINAREA	Variety of clinical areas a staff nurse has practiced in since graduation from a school of nursing. Computed by summing "yes" responses on items indicating that the nurse had (at least) 3 months experience in a clinical area.
ED	Highest education in nursing (1 = diploma; 2 = associate degree; 3 = baccalaureate; 4 = masters degree).
AT	Summed score on the 16 items of the Tolerance-Intolerance of Ambiguity Scale.
PH	Summed score on the 36 items of the Hardiness Scale.
TSS	Summed score of the product of the 27 items of the availability and responsiveness scales of the Technical Support Services Questionnaire.
PEU	Summed score on the 11 items of the Perceived Environmental Uncertainty Scale.

Table 11 - continued

Variable	Definition
PROCESS	Summed score on the 11 items of the Six-Dimension Scale of Nurse Performance measuring implementation of nursing process.
SKILLS	Summed score on the 5 items of the Six-Dimension Scale of Nurse Performance measuring performance of technical skills and prioritizing care of seriously ill patients.
IPR	Summed score on the 10 items of the Six-Dimension Scale of Nurse Performance measuring interpersonal relationships and communication skills.

Table 12

Descriptive Statistics for the Variables of the Model (N=95)

	Mean	S.D.	Maximum	Median	Minimum
Dependent Variables					
Individual Level					
PROCESS	31.25	6.68	44.00	31.00	18.00
IPR	33.85	4.95	40.00	35.00	20.00
SKILLS	16.70	2.44	20.00	17.00	8.00
Independent Variables					
Group Level					
Δ ACUITY	95.97	29.17	155.44	96.86	22.82
Δ OCCUPANCY	2.26	.769	3.95	2.14	.65
ADM/DC	7.38	3.23	15.48	7.10	.82
TRANS	9.28	4.10	16.07	10.44	1.13
Individual Level					
CLINROLE	1.98	1.28	8.00	2.00	1.00
CLINAREA	2.68	1.59	8.00	2.00	1.00
ED	2.45	.698	4.00	3.00	1.00
Mediator Variables					
Individual Level					
AT	79.126	12.38	112.00	79.00	52.00
PH	61.46	6.34	76.00	62.00	45.00
TSS	25.14	10.59	50.00	25.00	4.00
PEU	44.26	9.88	66.00	42.00	20.00

baccalaureate degree and those with an associate degree or diploma in nursing. They perceived themselves to be somewhat tolerant of ambiguity (AT), and as having characteristics of the hardy personality (PH); that is, committed to work and self, internally controlled, and challenged. The quality of technical support services (TSS) was perceived as "poor." Respondents perceived uncertainty in the clinical environment (PEU) as reflected by an overall response indicating "slight agreement" with the indicators measuring this variable. Respondents rated themselves as performing "well" in the clinical environment as represented by subscale mean values for implementation of nursing process (PROCESS), interpersonal relationships and communication skills (IPR), and performance of technical skills and ability to prioritize care for seriously ill patients (SKILLS).

Histograms and scatter plots of the variables were examined for skew, gaps in distribution of the data, multiple peaks, and outliers (Heartwig & Dearing, 1979). One variable, measuring the number of clinical roles a staff nurse had functioned in (CLINROLE), was positively skewed toward subjects who had functioned in fewer clinical roles (91.6% of respondents had functioned in three or fewer clinical roles). Outliers represented those respondents who had functioned in five, six, or eight roles (1.1%, 2.1%, and 1.1%, respectively). Inspection of histograms revealed some gaps in data distribution for the following variables: day-to-day change in acuity (Δ ACUITY), day-to-day change in occupancy (Δ OCCUPANCY), and number of admissions to and discharges from a unit in 24 hours (ADM/DC). Overall, there were no gross departures from normality observed. Scatter plots of relationships between study variables showed that they were linearly related to a reasonable degree.

Intercorrelations among the study variables are presented in Table 13. Pearson product-moment correlations were computed on the variables to assess the strength and direction of the linear relationship between two variables. The highest correlations were among the four variables operationalizing environmental turbulence. The three measures of nurse performance were also highly correlated. This latter finding was expected since these measures were tapping the theoretical dimensions of nurse performance and the variables had been formed from the factor structure obtained when the **Six-Dimension Scale of Nursing Performance** was evaluated for construct validity. Interestingly, the two personality variables (PH and AT) were not highly correlated ($r = -.254$, $p = .05$), indicating that these variables measured different personality traits.

Contextual Analysis and Model Testing

Multiple regression was used to examine the contextual effects of the unit environment and individual nurse characteristics on the three measures of nurse performance. To determine which variables in the models best predict nurse performance, path analysis was employed.

Contextual Analysis

The purpose of this investigation was to determine the effects of environmental turbulence on nurse performance. Contextual analysis is a statistical strategy used to investigate the relationships of both individual and group characteristics with an outcome variable. The primary purpose of this strategy is to determine whether group membership contributes to the explained variance in an outcome measure after the

Table 13

Intercorrelations Among Study Variables (N=95)

	Δ ACUITY	Δ OCCUPANCY	ADM/DC	TRANS	CLINROLE	CLINEXP	ED	AT	PH	TSS	PEU	PROCESS	SKILLS	IPR
Δ ACUITY	1.000													
Δ OCCUPANCY	.683**	1.000												
ADM/DC	.553**	.682**	1.000											
TRANS	.689**	.642**	.794**	1.000										
CLINROLE	- .064	- .128	- .072	.005	1.000									
CLINEXP	- .067	.011	.006	.061	.374**	1.000								
ED	.070	.028	.070	.024	.048	- .059	1.000							
AT	.082	.070	.200	.204*	- .084	- .062	- .203	1.000						
PH	.037	- .041	- .121	- .116	.168	- .090	.070	- .254*	1.000					
TSS	.141	.066	.053	.045	- .071	.050	.090	.125	.090	1.000				
PEU	- .162	- .245*	- .436**	- .407**	.003	.068	.082	.092	- .254*	.274**	1.000			
PROCESS	- .187	- .262*	- .268**	- .283**	.096	.028	- .116	.243*	.111	.162	.472**	1.000		
SKILLS	- .074	- .101	- .144	- .100	.097	- .014	- .148	.304**	- .005	.098	.333**	.590**	1.000	
IPR	- .104	- .205*	- .193	- .137	.105	.082	- .240*	.341**	- .008	.145	.241*	.573**	.653**	1.000

*Significant at .05
**Significant at .01

effects of individual characteristics have been taken into account (Iversen, 1991).

Three measures of nurse performance, implementation of nursing process (PROCESS), technical skills and prioritizing care for seriously ill patients (SKILLS), and interpersonal relationships and communication skills (IPR), were used as the dependent variables; 11 independent and mediator variables were used as predictors. Individual level nurse data were represented by seven variables: the variety of clinical roles (CLINROLE), the variety of clinical areas in which the nurse had experience (CLINAREA), highest education (ED), personality hardiness (PH), ambiguity tolerance (AT), perceived quality of technical support services (TSS), and perceived environmental uncertainty (PEU). Group-level data were represented by characteristics of the nursing unit environment: day-to-day change in unit patient acuity (Δ ACUITY), number of transfers on and off a nursing unit in a 24-hour period (TRANS), number of admissions to and discharges from a nursing unit in a 24-hour period (ADM/DC), and day-to-day change in patient occupancy on a nursing unit (Δ OCCUP). To determine whether individual nurse characteristics or nursing unit (contextual) effects were better predictors of nurse performance, group level variables (alone), individual level variables (alone), and group and individual level variables together were regressed onto each of the three dependent variables. Results are presented in Tables 14 and 15. The individual level variables (alone) had a greater effect on each of the three dependent variables than did the group level variables (alone). Group level variables (alone) exerted a significant effect ($R^2 = .095$; $p = 0.058$) only on implementation of nursing process (PROCESS).

Table 14

Contextual Effects of Group and Combined Group and Individual Variables on PROCESS, SKILLS, and IPR (N=95)

	df		PROCESS	SKILLS	IPR
Group (alone)	4	R^2	0.095	0.021	.052
		p-value	0.058	0.743	0.301
Group and Individual	11	R^2	0.313	0.259	0.222
		p-value	0.0006	0.0062	0.025
difference	7	R^2 difference	0.218	0.238	0.170
		F-ratio (7, 83)	3.880	3.820	2.700
		p-value	0.010	0.010	0.050

Table 15

Contextual Effects of Individual and Combined Group and Individual Variables on PROCESS, SKILLS, and IPR (N=95)

	df		PROCESS	SKILLS	IPR
Individual (alone)	7	R^2	.281	.219	.215
		p-value	0.0001	0.002	0.003
Group and Individual	11	R^2	.313	.259	.222
		p-value	0.0006	0.0062	0.025
difference	4	R^2 difference	.032	.040	.007
		F-ratio (4, 83)	1.000	1.111	0.2
		p-value	NS	NS	NS

To evaluate the statistical significance of the contribution of group level variables (alone) and individual variables (alone) as compared to the contribution of group and individual variables (together) to the explained variance in the three dependent variables, the significance of the difference between the R^2 was computed using the formula proposed by Kerlinger and Pedhazur (1973) to determine the F ratio:

$$F = \frac{(R^2_{\text{larger model}} - R^2_{\text{smaller model}})/(k1 - k2)}{(1 - R^2_{\text{larger model}})/(N - k1 - 1)}$$

where: N = total number of cases

k1 = number of independent variables of the larger model

k2 = number of independent variables of the smaller model

In each model, (PROCESS, SKILLS, and IPR), the differences in R^2 were significant at $p = .05$ when the models with group level variables (alone) were compared to the models with group and individual variables (together) (Table 14). The differences in R^2 when models with individual variables (alone) were compared to models with group and individual variables (together) were nonsignificant (Table 15). Thus, individual level variables significantly contribute to explained variance in PROCESS, SKILLS, and IPR when added to the effects of group level variables (Table 14) and add to the accuracy of prediction.

Path Analysis

A series of regression equations were specified for each of the dependent variables in the models (see Figures 4, 5, and 6). These equations were formulated based on the framework of the causal model, and were specified in the direction of the causal flow. Each independent variable was regressed onto each of the three mediator variables. The

independent and mediator variables were then regressed onto perceived environmental uncertainty. Finally, all of these variables were regressed onto each of the three measures of nurse performance. Using this approach, it was possible to determine the increments in the proportion of variance accounted for by each group of variables in the model (Kerlinger & Pedhazur, 1973).

The relationships among the variables of the model are both theoretically and empirically supported in the literature; however, the variables selected to operationalize the concept of environmental turbulence have not previously been investigated in the health care environment, nor have the effects of these variables on nurse performance been studied. Therefore, in addition to the discussion of the significant direct and indirect causal relationships in the full model, due to the exploratory nature of the investigation, those paths that show a trend toward significance are also described.

The full models will be presented first, followed by a discussion of the trimmed models. The major findings of the investigation, limitations of the research, implications of the models for performance theory and nursing administration theory and practice, and recommendations for future research are presented in Chapter 5.

The Full Models

Full models of environmental, sociodemographic, and personal factors influencing the three measures of nurse performance are presented in Table 16. This table contains the standardized regression coefficients (B), which represent the change in the dependent variable for every unit change in the dependent variable (Davis, 1985), and the significance (p-value

Table 16

Causal Model of Environmental, Sociodemographic, and Personal Factors Influencing PROCESS, SKILLS, and IPR Standardized Regression Coefficients, Level of Significance and Explained Variance (N=95)

Independent Variables		Dependent Variables						
		PH	AT	TSS	PEU	PROCESS	SKILLS	IPR
Δ ACUITY	β	.200	.043	.239	.137	.034	-.048	.088
	p value*	.218	.788	.149	.298	.902	.759	.566
Δ OCCUPANCY	β	.041	-.152	-.072	.050	-.121	.042	-.141
	p value*	.800	.349	.665	.696	.410	.789	.358
ADM/DC	β	-.074	.189	.048	-.331	.052	-.094	-.137
	p value*	.690	.314	.798	.026	.762	.606	.442
TRANS	β	-.215	.193	-.123	-.300	-.158	.058	-.051
	p value*	.278	.342	.540	.058	.386	.766	.786
CLINROLE	β	.235	-.058	-.115	-.089	.121	.173	.105
	p value*	.038	.600	.316	.329	.246	.122	.334
CLINAREA	β	-.149	-.067	.126	.166	-.013	-.106	.056
	p value*	.188	.548	.272	.068	.822	.343	.604
ED	β	.045	-.215	.148	.053	.054	-.074	-.180
	p value*	.661	.038	.162	.533	.577	.472	.075

Table 16 - continued

Independent Variables		Dependent Variables						
		PH	AT	TSS	PEU	PROCESS	SKILLS	IPR
PH	β				.371	-.007	-.097	.018
	p value*				.001	.947	.406	.877
AT	β				.264	.226	.248	.341
	p value*				.004	.036	.031	.003
TSS	β				.209	.062	.022	.126
	p value*				.015	.534	.838	.228
PEU	β					.365	.033	.049
	p value*					.004	.016	.705
R^2		.095	.115	.063	.465	.313	.222	.259
p-value**		.253	.142	.061	.0000	.0006	.025	.006

Note: p-values* - represent significance of the 2-tailed T-test.
p-value** - represents significance of the F-ratio.

of the two-tailed T-test) of the parameter estimate. The table also presents the R^2, which represents the variance in each dependent variable explained by the independent variables, and the significance of the F-test. The results in Table 16 are organized to represent the direction of the causal flow.

Personality hardiness. When all of the independent variables were regressed onto personality hardiness, approximately 9.5% of the variance was accounted for by these variables. The variety of clinical roles (CLINROLE) was the only significant positive predictor ($p = 0.038$) of hardiness (PH), however. This finding, which supported the hypothesized relationship, implies that those nurses who have had a variety of clinical roles exhibited a higher level of hardiness than those who had less variety in the clinical roles in which they had functioned. As variables were eliminated from the model, however, the relationship between hardiness (PH) and the variety of clinical roles (CLINROLE) became nonsignificant ($p = 0.104$) and was eliminated.

Ambiguity tolerance. When all of the independent variables were regressed onto ambiguity tolerance, level of education (ED) was the only significant predictor ($R^2 = 0.12$; $p = 0.038$). The relationship was inverse, implying that individuals with more education were less tolerant of ambiguity than were those with less education. The relationship was in the opposite direction from that which was hypothesized.

Quality of technical support services. There were no significant predictors of the quality of technical support services (TSS); however, both level of education (ED) and day-to-day change in patient acuity (Δ ACUITY) showed a trend toward significance. Day-to-day change in

patient acuity had a positive effect ($p = 0.149$) on the perceived quality of technical support (TSS) and suggested that the quality of technical support services available was perceived more favorably on units with less day-to-day variation in patient acuity than on units with more day-to-day variation. Level of education (ED) also had a positive effect ($p = 0.162$) on the perceived quality of technical support services (TSS), suggesting that more highly educated individuals rated the quality of technical support services more favorably than did individuals with less education.

Perceived environmental uncertainty. There were several significant predictors of perceived environmental uncertainty (PEU). These variables together explained 46.5% of the variance. The number of admissions and discharges in a 24-hour period (ADM/DC) ($p = 0.026$) and the number of transfers on and off the unit in a 24-hour period (TRANS) ($p = 0.058$) both decreased the perception of uncertainty in the environment (PEU). These effects were in the opposite direction of those hypothesized.

The variety of clinical areas a staff nurse had worked in (CLINAREA) was also predictive of perceived environmental uncertainty (PEU) ($p = 0.068$). The effect on the perception of uncertainty, however, was positive, implying that individuals with a broad clinical base perceived more uncertainty in their environment than did those with a narrower clinical base. The variety of clinical areas (CLINAREA) in which a staff nurse had worked had a negative effect on personality hardiness (PH). While the effect was nonsignificant ($p = 0.188$), it suggests that individuals who had worked in a wide variety of clinical areas were less

hardy than those individuals with a narrower clinical base. These (CLINAREA, CLINROLE) variables were eliminated when the model was trimmed.

Each of the mediator variables was a significant predictor of perceived environmental uncertainty. Theoretically, personality hardiness (PH), ambiguity tolerance (AT), and quality of technical support services (TSS) should reduce the perception of uncertainty in the environment (PEU); instead, the effects were positive and highly significant ($p = 0.001$; $p = .004$; $p = 0.015$, respectively). This suggests that individuals with high tolerance for ambiguity and hardy personalities perceive more uncertainty in their environment, or can tolerate ambiguity better and so can perceive uncertainty without feeling threatened, whereas the less hardy individual has to deny uncertainty to keep from becoming overwhelmed. At this point, the meaning of the relationship between perceived quality of technical support services and perception of environmental uncertainty is unclear.

Implementation of nursing process. Ambiguity tolerance (AT) and perceived environmental uncertainty (PEU) were significant predictors of the quality of implementation of nursing process (PROCESS) ($p = 0.036$ and 0.004, respectively). Both of these variables were positive predictors in the model that explained 31.3% of the variance in this performance measure. This relationship suggests that individuals with a high tolerance for ambiguity rated their performance higher on implementation of nursing process than did individuals who were less tolerant of ambiguity. Individuals who perceived their environment as more uncertain also evaluated their performance more favorably.

Technical skills and prioritizing care of seriously ill patients. Ambiguity tolerance (AT) and perceived environmental uncertainty (PEU) were also significant predictors of performance of technical skills and ability to prioritize care of seriously ill patients (SKILLS) ($p = 0.031$ and 0.016, respectively). The model incorporating these variables explained approximately 22% of the variance in performance of technical skills and ability to prioritize care (SKILLS). The results suggest that nurses with a high tolerance for ambiguity and who perceived uncertainty in the environment evaluated their performance of technical skills and prioritizing care for seriously ill patients more favorably than did those nurses who did not perceive uncertainty and were intolerant of ambiguity.

The variety of clincal roles (CLINROLE) showed a trend toward significance ($p = 0.122$) as a positive predictor. This relationship suggests that clinical experience had a positive effect on performance of technical skills and prioritizing care of seriously ill patients.

Interpersonal relationships and communication skills. The only significant predictor of interpersonal relationships and communication skills (IPR) in the initial test of the model was ambiguity tolerance (AT) ($p = 0.003$). The effects were positive, as hypothesized. Surprisingly, level of education (ED) had a negative effect on interpersonal relationships and communication skills (IPR). This relationship showed a trend towards significance ($p = 0.075$), suggesting that nurses with more education set higher standards for themselves and may not be meeting their own performance expectations. The variables in the model explained 25.9% of the variance in IPR.

The Trimmed Models

The process of theory trimming (Heise, 1969) employs application of two criteria: **meaningfulness and significance** (Kerlinger & Pedhazur, 1973). The primary guideline for deletion of paths in a causal model is the theory of the researcher (Kerlinger & Pedhazur, 1973). In the absence of guidelines for determining meaningfulness, some researchers (Kerlinger & Pedhazur, 1973; Land, 1969) recommend that path coefficients which are not significant at the .05 level be treated as not meaningful. In the present investigation, path coefficients that were significant at the .05 level or greater were retained in the trimmed model and were considered theoretically meaningful.

To preserve significant causal relationships, a conservative approach to theory trimming was chosen. In the first revision of each of the models, all paths that were not significant at $p = 0.50$ were eliminated and the path coefficients were re-estimated. In the second revision, all paths that were not significant at $p = 0.30$ were eliminated. The final revision eliminated all paths that were not significant at $p = 0.10$.

The trimmed models are presented in Table 17 and are consolidated into a single model that is presented in Figure 7. Direct, indirect, and total effects on each of the three measures of nurse performance by the predictor variables are presented in Table 18. Findings are presented for each model and discussed in Chapter 5.

Implementation of nursing process. Implementation of nursing process (PROCESS), which measured planning, evaluation, and teaching patients and families, was not directly affected by any of the predictor variables; however, indirect effects were present. Personality hardiness (PH) had

Table 17

Trimmed Causal Model of Environmental, Sociodemographic, and Personal Factors Influencing PROCESS, SKILLS, and IPR: Standardized Regression Coefficients, Level of Significance, and Explained Variance (N=95)

Independent Variables		Dependent Variables				
		AT	PEU	PROCESS	SKILLS	IPR
ADM/DC	β	.215	-.454			-.272
	p value*	.034	.0000			.006
PH	β		.352			
	p value*		.0001			
ED	β	-.218				
	p value*	.031				
TSS	β		.236			
	p value*		.005			
AT	β		.243	.201	.276	.395
	p value*		.006	.027	.004	.0001
PEU	β			.453	.307	
	p value*			.0000	.002	
R^2		.087	.414	.262	.186	.187
p-value**		.015	.0000	.0000	.0001	.0001

Note: p-values* represent significance of the 2-tailed T-test.
p-value** represents significance of the F-ratio.

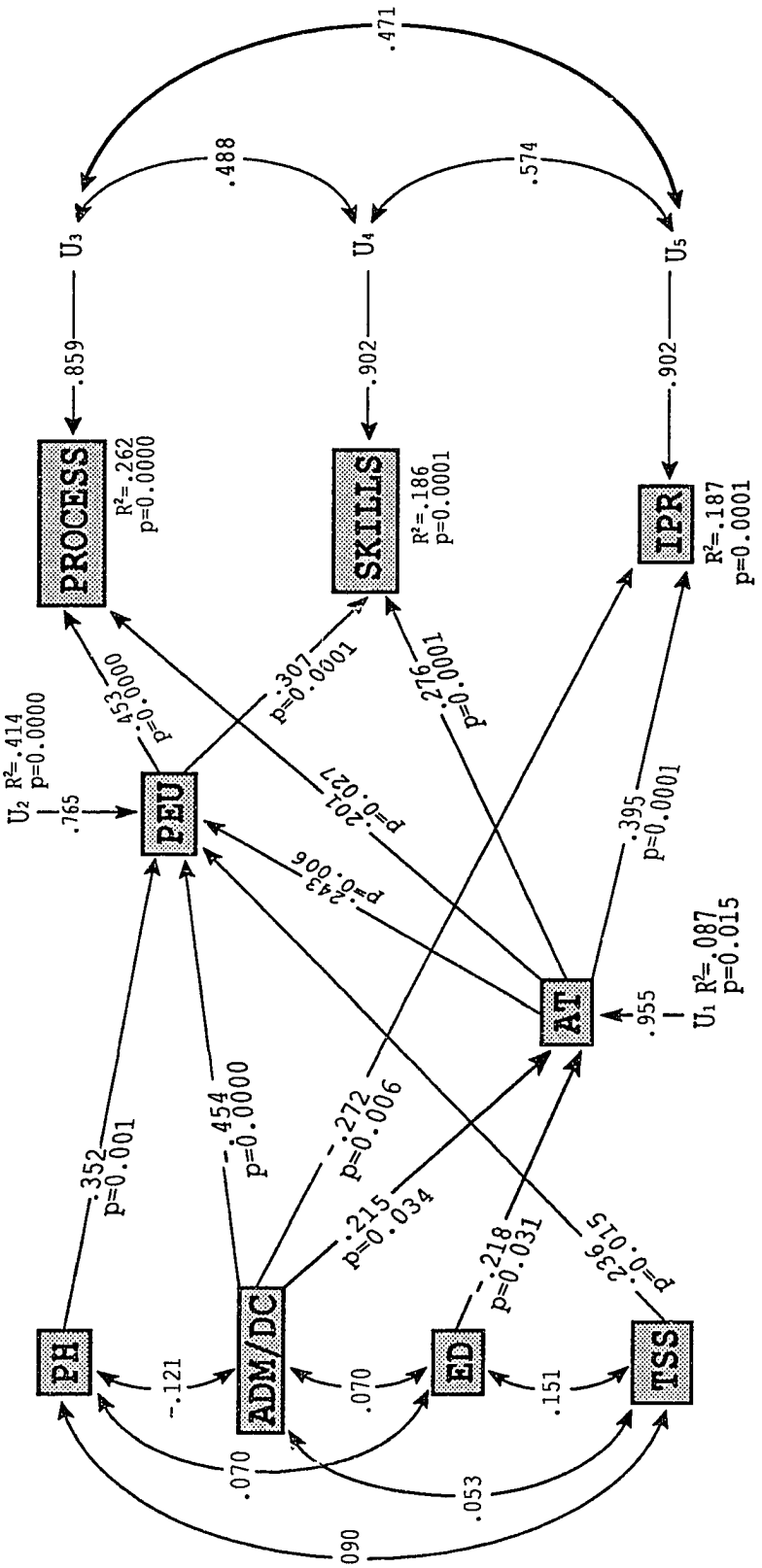

Figure 7. Trimmed Causal Model of Environmental, Sociodemographic, and Personal Factors Affecting Nurse Performance (N=95).

Table 18

Direct, Indirect, and Total Effects of PH, ADM/DC, ED, and TSS on PROCESS, SKILLS and IPR (N=95)

Effects On:	IPR	SKILLS	PROCESS
Effects of PH:			
direct effect	0	0	0
indirect effect	0	.108	.159
total effect	0	.108	.159
Effects of ADM/DC:			
direct effect	-.272	0	0
indirect effect	.085	-.056	-.041
total effect	-.187	-.056	-.041
Effects of ED:			
direct effect	0	0	0
indirect effect	-.086	-.081	-.068
total effect	-.086	-.081	-.068
Effects of TSS			
direct effect	0	0	0
indirect effect	0	.072	.107
total effect	0	.072	.107

a **positive** total effect on implementation of nursing process (PROCESS) through perceived environmental uncertainty (PEU). Since the direct effect of personality hardiness (PH) on implementation of nursing process (PROCESS) was nonsignificant ($p = 0.947$), it appears that the perception of uncertainty (PEU) maximizes the effect of hardiness (PH) on implementation of nursing process (PROCESS); that is, when perceived environmental uncertainty (PEU) is high, personality hardy (PH) nurses improve their performance. The quality of technical support (TSS) also had a **positive** total effect on implementation of nursing process (PROCESS) through perceived environmental uncertainty (PEU). The direct effect of the quality of technical support services (TSS) on implementation of nursing process (PROCESS) was nonsignificant ($p = 0.534$); thus, in an environment that nurses perceive as uncertain, the quality of technical support services (TSS) has a **positive** total effect on implementation of nursing process (PROCESS); that is, when perceived environmental uncertainty (PEU) is high, there is a stronger relationship between quality of technical support (TSS) and implementation of nursing process (PROCESS). Both level of education (ED) and the number of admissions and discharges from a unit in 24 hours (ADM/DC) had **negative** total effects on implementation of nursing process (PROCESS) through ambiguity tolerance (AT) and perceived environmental uncertainty (PEU). The total effects of level of education (ED) were small, but the total effects of the number of admissions and discharges in a 24-hour period (ADM/DC) remained negative in spite of the mediating effects of ambiguity tolerance (AT) and perceived environmental uncertainty (PEU).

Technical skills and prioritizing care of seriously ill patients. Technical skills and ability to prioritize care of seriously ill patients (SKILLS) was not directly affected by any of the predictor variables. Many interesting and significant indirect relationships emerged in the analysis, however. Personality hardiness (PH) had a **positive** indirect effect on performance of technical skills and ability to prioritize care for seriously ill patients (SKILLS) through perceived environmental uncertainty (PEU). It seems that the hardiness characteristic maximized the nurses' ability to perceive uncertainty in the environment and **positively** affected performance of technical skills and ability to prioritize care for the seriously ill patient.

The quality of technical support services (TSS) had a **positive** indirect effect on technical skills and prioritizing care for seriously ill patients (SKILLS) through perceived environmental uncertainty (PEU). The direct effects of the quality of technical support services (TSS) on performance of technical skills and prioritizing care (SKILLS) in the full model were nonsignificant ($p = 0.838$); thus, it seems that the nurses' ability to perform technical skills and prioritize care for seriously ill patients is improved when quality support services are available to nurses who perceive high levels of environmental uncertainty. Level of education (ED) had an overall small, **negative** effect on technical skills performance and ability to prioritize care (SKILLS) through ambiguity tolerance (AT) and perceived environmental uncertainty (PEU). In the full model, the direct effect was **negative** and nonsignificant ($p = 0.472$). This suggests that level of education does not affect performance of skills and ability to prioritize care except through other variables that improve

the significance of the impact it exerts. The number of admissions and discharges in a 24-hour period (ADM/DC) also had indirect effects on performance of technical skills and prioritizing care for seriously ill patients (SKILLS) through ambiguity tolerance (AT) and perceived environmental uncertainty (PEU). The total effects on technical skills performance and prioritizing care of seriously ill patients (SKILLS) are **negative** but small.

Interpersonal relationships and communication skills. The number of admissions and discharges in a 24-hour period (ADM/DC) had a significant ($p = 0.006$) **negative** effect on interpersonal relationships and communication skills (IPR). This effect, however, was mediated by the effect of ambiguity tolerance (AT) on interpersonal relationships and communication (IPR) so that the effect of the number of admissions and discharges (ADM/DC) on interpersonal relationships and communication skills (IPR) diminished somewhat if individuals were tolerant of ambiguity (AT) in the environment. The overall effect, however, was **negative.** That is, nurses who work on inpatient units where there are frequent admissions and discharges in a 24-hour period perceive their interpersonal relationships with patients, families, and colleagues and communication skills to be poorer than do nurses on units with fewer admissions and discharges. Level of education (ED) had an indirect **negative** effect on interpersonal relationships and communication skills (IPR) through ambiguity tolerance (AT). The relationship between education and interpersonal relationships and communication skills (IPR) in the full model, though nonsignificant ($p = 0.075$), was **negative** as well. While ambiguity tolerance mediated the negative effects of other predictor

variables on the dependent variables, the influence of the number of admissions and discharges on interpersonal relationships and communication skills remained **negative.**

Because the dependent variables used in the present investigation measured three dimensions of nurse performance, evaluation of correlations among error terms was necessary. The correlations among the error terms (RESID), presented in Table 19, were moderately strong and significant, indicating that the error terms in the equations predicting each of the three measures of nurse performance are related. This may have occurred because the model was misspecified by exclusion of variables that affect each of the three outcome variables (Long, 1989). As well, because the dependent variables were formed using items from the **Six-Dimension Scale of Nursing Performance**, and these subscales were moderately and significantly correlated, the error terms may be correlated because the subscales were correlated.

Summary

The results of the investigation were presented in this chapter. The contextual analysis showed that unit environmental variables exerted a small, significant effect on a staff nurse's ability to implement nursing process (PROCESS); however, the personal factors and sociodemographic variables explained more of the variance in each of the nurse performance measures than did the environmental variables. The results of the path analysis revealed that only one of the environmental variables had a direct effect on a nurse performance measure. The number of admissions to and discharges from a unit (ADM/DC) exerted a moderately strong, significant

Table 19

Correlations Among Error Terms (RESID) for

PROCESS, SKILLS, IPR (N=95)

	PROCESS RESID	SKILLS RESID	IPR RESID
PROCESS RESID	1.000		
SKILLS RESID	.488**	1.000	
IPR RESID	.471**	.574**	1.000

**Significant at p = .01

direct negative effect on interpersonal relationships and communication skills (IPR) that was not reduced by the effects of the mediator variables. As well, the number of admissions and discharges in a 24-hour period (ADM/DC) exerted small but significant negative indirect effects on both implementation of nursing process (PROCESS) and performance of technical skills and prioritizing care for seriously ill patients (SKILLS). These effects were mediated by ambiguity tolerance (AT) and perceived environmental uncertainty (PEU) to the extent that the overall effects on implementation of nursing process (PROCESS) and performance of technical skills and ability to prioritize care for seriously ill patients (SKILLS) were negligible. Each of the models was significantly predictive of performance, though the explained variance was small. These findings and their implications will be discussed in Chapter 5.

Chapter 5

DISCUSSION, SUMMARY, AND CONCLUSIONS

The purpose of this investigation was to determine the effects of environmental turbulence on nurse performance. A review of the theoretical literature suggested the importance of environmental variables in job performance models; however, their importance was often dismissed. While some theorists suggest that performance is ultimately an individual phenomenon (Cummings & Schwab, 1973), others acknowledge that situational constraints affect work outcomes but did not or were unable to operationalize these variables to determine the effects on performance (Dachler & Mobley, 1973; Mitchell, 1983; Peters & O'Connor, 1980; Porter & Lawler, 1968).

In the health care environment, researchers in health services and nursing have proposed and tested various theories of performance. Conceptual models of nursing administration acknowledge the potential effects of the environment on performance (Johnson et al., 1989; Neidlinger & Miller, 1990), but the relationships among the variables in these models have not been tested, nor has the concept of environment been operationalized to reflect turbulence imposed by environmental change. The present research was conducted to examine the effects of specific environmental characteristics on nurse performance. In addition, personal characteristics of the nurse, perceptions of the quality of technical support services, and perceptions of environmental uncertainty were examined for their predictive and mediating effects on nurse performance.

This chapter presents a discussion of the major findings, limitations of the research, the implications for nursing administration theory and practice, and recommendations for further research.

Discussion of Findings

The results of this investigation were surprising. While some of the proposed relationships were supported, others were not. This section reviews the findings presented in the trimmed models (refer to Figure 7, page 127, and incorporates a discussion of prior empirical work.

Implementation of Nursing Process

Two personality traits, personality hardiness and ambiguity tolerance, were examined for their stress mediating effects. While personality hardiness did not have a direct impact on nurses' ability to implement nursing process, it emerged as a positive predictor of uncertainty instead of a mediator of the effects of a stressful environment on ability to implement nursing process. While Kobasa (1979) and colleagues (Kobasa et al., 1981; Kobasa et al., 1982) proposed the stress mediating effects of personality hardiness, the results of this research did not support this proposition. Instead, the hardiness characteristic seems to allow some nurses to perceive uncertainty and be challenged by the demands of the stressful environment. Perhaps nurses who are committed to and challenged by their work and who perceive themselves as having influence over their environment, are not threatened by the uncertainty in the environment, but see it instead as a positive force.

The number of admissions to and discharges from a unit in a 24-hour period of time had no direct impact on ability to implement nursing

process. The impact of admissions and discharges on this performance measure was negative, but these negative effects were mediated by ambiguity tolerance and perceived environmental uncertainty. Nurses working on units with a high number of admissions and discharges perceived less uncertainty and were more tolerant of ambiguity than nurses working on units with fewer admissions and discharges. Tolerance of situations characterized by novelty, complexity, and insolubility allows nurses to perceive the uncertainty in the environment, possibly even prefer it. These nurses do not perceive these situations as threats but instead as challenges that maximize their performance. Nurses who work in medical center environments, such as the setting for this investigation, may prefer working with patients who have complex problems; thus, it is not surprising that these nurses were, on the whole, tolerant of ambiguity and, as a result, were able to perceive the uncertainty in the environment without being threatened. Perceived environmental uncertainty had a positive impact on implementation of nursing process, suggesting that the level of perceived uncertainty in the clinical environment is a positive force.

Level of education had a small negative effect on ability to implement the nursing process. Those staff with baccalaureate and master's degrees were less tolerant of ambiguity; that is, they were threatened by ambiguous situations. Ambiguity intolerance, which can be thought of as an unwillingness to accept alternate outcomes (English & English, 1958), produced greater perceived environmental uncertainty in staff nurses with more education. Since uncertainty is such a positive force, implementation of nursing process was enhanced, resulting in minimal

negative effects of educational level. This finding would be disconcerting were the effects greater since, over time, individual who are unable to practice good bedside nursing may leave the environment; however, in this instance it seems as though staff nurses have adjusted to the levels of uncertainty and challenge.

The perceived quality of technical support services indirectly improved ability to implement the nursing process. Shukla (1987) proposed that support services can affect the efficiency and effectiveness of nurse performance by freeing the nurse to provide more direct care to the patient. The results of this investigation support the proposition that quality technical support services can improve performance of direct care activities such as care planning and evaluation, and patient and family teaching. While the quality of technical support services was proposed as a mediator of the stress caused by turbulent environments, the results did not support this relationship. Instead, nurses who perceived a higher quality of technical support systems also perceived more uncertainty in the work environment and evaluated their performance more favorably. As Shukla's (1987) theory suggests, quality technical support systems enhance implementation of nursing process by freeing the nurse to perform direct care activities.

Technical Skills and Prioritizing Care for Seriously Ill Patients

Performance of technical skills and ability to prioritize care for seriously ill patients was not affected directly by any of the independent variables. As in the previous model, hardiness emerged as a positive

predictor through perceived environmental uncertainty, not as a mediator of the effects of a stressful environment on performance.

The total effects of admissions and discharges on this measure of nurse performance were negative, but were mediated by other variables. Ambiguity tolerance reduced the negative effects on performance of technical skills and ability to prioritize care for seriously ill patients, and the combined effects of ambiguity tolerance and perceived environmental uncertainty on this measure of performance were positive and additive, but did not totally offset the negative impact. Perceived environmental uncertainty had a positive impact on technical skills performance and ability to prioritize care. While the level of perceived uncertainty may be a positive force in the clinical setting, the possibility that tolerance for ambiguity influences choice of work environment is also worth considering. Possibly because the environment is uncertain, staff nurses choose work environments in which structures such as policies, procedures, standards of care, and routines are implemented that assist the nurse in performance of technical skills and prioritizing care for seriously ill patients. These structures, at least theoretically, enhance performance by formalizing and routinizing the activities associated with admissions to and discharges from the units. Deckard et al. (1988) suggested that the means through which nurse managers can influence performance is through manipulation of worksite stressors. Thus, routinizing and formalizing some aspects of the work should reduce the impact of stressors in the work environment on performance of activities associated with admitting and discharging patients. The results of the present investigation seem to support this conclusion.

Higher levels of education negatively affected performance of technical skills and ability to prioritize care of critically ill patients. These effects were indirect, through ambiguity tolerance and perceived environmental uncertainty. While this finding was not anticipated, it may reflect that nurses with baccalaureate and master's degrees are not technically oriented or have not refined their technical skills and consequently evaluated their performance less favorably than staff nurses with diploma and associate degree educational preparation.

The results of this investigation support the proposition that technical support services can improve performance of technical skills and ability to prioritize care of seriously ill patients. The perceived quality of technical support services increased the perception of uncertainty in the environment, resulting in improved performance of technical skills and ability to prioritize care. While one might think that the effects of quality technical support services on performance of technical skills should be greater than on implementation of nursing process, this was not the case. The quality of technical support systems had a greater effect on the nurses' ability to implement nursing process than on performance of technical skills and ability to prioritize care. It is possible that technical support systems affect ability to implement nursing process to a greater extent because these activities are less routinized than technical skills performance, freeing nurses to use their knowledge and abilities to plan and evaluate care and teach patients and families, whereas technical skills activities are more formalized through policies, procedures, and standards of care. Formalization and

routinization require use of less creative energy and so are less affected by technical support systems.

Interpersonal Relationships and Communication Skills

The ability to interact and communicate with patients, families, and other members of the health care team is an essential ingredient in nursing practice. The most striking finding in this model was the negative impact of the number of admissions and discharges in a 24-hour period on interpersonal relationships and communication skills. This effect was diminished somewhat by the effects of ambiguity tolerance, but the total effects remained negative. Thus, on units with high numbers of admissions and discharges, a potential stressor in the clinical environment, staff nurses perceived that they had poorer communication skills and interpersonal relationships with patients, families, and colleagues than did staff working on units characterized by less turbulence in the internal environment. This finding supports Cleland's (1965) work reporting more deterioration in social interaction test scores as the level of stressors increased, but did not support her conclusion that the relationship between stress and performance is curvilinear. Instead, the results of this investigation supported Parasuraman and Alutto's (1981) findings that worksite stressors were negatively related to performance.

The fact that perceived environmental uncertainty had no effect on interpersonal relationships and communication skills is not surprising since these behaviors cannot be routinized or formalized, and raises the question of what other factors might be effective mediators of the effects of environmental stressors on this aspect of nurse performance.

Another finding that was surprising was the negative impact of level of education on interpersonal relationships and communication skills. Staff nurses with higher levels of education were less tolerant of ambiguity than were those with less education. As tolerance for ambiguity increased, self-evaluation of interpersonal relationships and communication skills also improved, but the negative impact of higher education was not eliminated. This finding is disconcerting since, over time, staff nurses with baccalaureate and master's degrees who are unable to maintain good interpersonal relationships with patients, families, and colleagues, may leave the hospital work environment. As nursing progresses toward establishing the baccalaureate degree as the entry level degree, it will be essential that the clinical environment support professional practice. Reduction of worksite stressors is essential for staff to effectively and sensitively interact with patients and their families, peers, and colleagues in other disciplines. Results of this investigation are reason for concern that nurses with higher levels of education may be frustrated and dissatisfied with their interpersonal relationships and communication skills and may ultimately leave the hospital environment.

Limitations

There are several limitations of this investigation. First, the data were collected from medical-surgical and pediatric nurses in one acute care hospital. In addition, characteristics of the sample in this investigation differed from characteristics of nurses reported in national survey data (Moses, 1990). Therefore, generalizability of the findings is limited. While the sample size was adequate to measure the parameters, a more heterogeneous sample from multiple acute care settings would improve

generalizability of the findings. Second, because performance has been defined as behavior over time (Mitchell, 1983), a longitudinal analysis examining the impact of internal environmental turbulence on performance would have better characterized the relationships that exist between and among these variables. It may be that performance fluctuates with changes in the internal environment and that variables affecting performance differ as conditions in the environment change. The cross-sectional design of this investigation did not allow examination of these possibilities.

Third, methods for measuring two of the variables that operationalize the construct of environmental turbulence may have resulted in measurement error. Unit admission and discharge data were retrieved from the admission and discharge logs kept on the unit. The number of transfers on and off the units was collected by visiting each area in the hospital to and from which patients were transported for procedures and diagnostic studies and retrieving scheduling and billing records. These procedures, in all probability, resulted in inaccurate estimates of the number of admissions to and discharges from a unit and the number of transfers on and off a unit in 24 hours. Ability to more accurately measure this variable might have yielded different results in the contextual analysis and causal modeling.

Finally, Budner's (1962) **Tolerance-Intolerance of Ambiguity Scale** and Kobasa's (1979) **Hardiness Scale** had low reliability estimates. While the results of reliability estimates for the **Tolerance-Intolerance of Ambiguity Scale** are consistent with findings reported by other investigators (Budner, 1962; Gifford et al., 1979), results for the

Hardiness Scale are inconsistent with results reported by Kobasa (1979). Other investigators have reported psychometric ambiguity and concern over the theoretical adeqaucy of the instrument (Pollock, 1989) that limit its use. Thus, the predictive effects of these variables must be interpreted with caution because they may not be valid and reliable estimates of the constructs they purport to measure.

Implications for Theory

The theoretical literature suggests that both individual characteristics and situational constraints affect work outcomes. The result of this investigation support Cummings and Schwab's (1973) contention that performance is ultimately an individual phenomenon. Two individual characteristics, level of education and personality hardiness, were predictive of performance, and tolerance for ambiguity and perceived environmental uncertainty, effectively mediated the impact of environmental characteristics on aspects of performance. This investigation also lends support to beliefs that conditions in the work environment, such as environmental turbulence, affect work outcomes (Dachler & Mobley, 1973; Mitchell, 1983; Peters & O'Connor, 1980; Porter & Lawler, 1968) since performance was affected to some extent by conditions in the environment (such as number of admissions and discharges in a 24-hour period) to which professionals were exposed. While the results of this investigation justify incorporating attributes of the environment in performance models, further testing of the model specified in this investigation, as well as other models that incorporate both attributes of the individual and the environment, is necessary to provide empirical support for theories

that advance the proposition that conditions in the work environment affect performance.

Implications for Nursing Theory

The metaparadigm of nursing conceptualizes the environment as the milieu in which patients live and are cared for, as it affects health and recovery from illness. Chopoorian (1986) argued that the term "environment" should be reconceptualized to encompass environments of organizations in which nurses work. Thus, as proposed by Jackson et al. (1986), "environment" should be considered all the conditions, circumstances, and influences affecting the individual nurse or group of nurses. In the present investigation, environmental turbulence was considered an attribute of the environment that affects nurses in the performance of their jobs. Results of both the contextual analysis and the path analysis support this contention. Thus, this research reaffirms Chopoorian's argument that the metaparadigm concept "environment" should be broadened to encompass the multiple environments in which nurses work. While the scope of the present investigation was limited to the hospital environment, it contributes new knowledge to nursing theory as well as to nursing administration theory.

Conceptual models of nursing administration acknowledge the potential effect of the environments in which nurses work on job performance (Johnson et al., 1989; Neidlinger & Miller, 1990). Neidlinger and Miller (1990) propose that "the general environment includes elements outside the organization that may indirectly, or at times directly, affect the internal environment and the delivery of nursing care" (p. 45). The present research was conducted to determine the impact of the turbulence in the

internal health care environment, produced by external environmental change, on job performance. The results support Neidlinger and Miller's (1990) proposition and lend further support to the importance of incorporating attributes of the environment in performance models.

The model developed by Johnson et al. (1989) depicts a reciprocal relationship between systems and outcomes. Reciprocal relationships among system and outcome concepts were not tested in this investigation; however, results of the research support the existence of predictive relationships among these concepts. Testing the reciprocal relationships among the variables of the model proposed in the present investigation would provide an empirical test of the conceptual model proposed by Johnson et al. (1989), as well as a test of the generic model developed by Eliott and Eisdorfer (1982), which depicts interaction between the individual and the environment along the stress continuum.

Implications for Nursing Administration Practice

The results of this investigation have shown that turbulence in the internal environment affects the job performance of nurses. Since nursing administrators must create and maintain environments that support practice, measures must be taken to: (a) monitor conditions in the internal environment that negatively affect performance, and (b) reduce the effects of these conditions on clinical practice. To monitor conditions that affect job performance, information systems must be in place to facilitate collection of data on attributes of the unit environment. Accurate data entry and the ability to retrieve these data will facilitate surveillance of these parameters for use in administrative decision-making. While

patient acuity and occupancy rate and their day-to-day fluctuations have long been criteria used by nursing administrators to make decisions about the staffing patterns, additional criteria, such as the number of admissions to and discharges from a unit in a 24-hour period and other attributes of the clinical environment may now need to be taken into consideration when these decisions are made.

The quality of technical support services was hypothesized to be a mediator variable, buffering the effects of the stressful, turbulent environment on performance. While results of this study did not support this hypothesis, the quality of technical support services emerged as a predictor variable for both implementation of nursing process and performance of technical skills and prioritizing care for seriously ill patients. The perceived quality of technical support services had a positive effect on both of these aspects of performance. Overall, the perceived quality of technical support services in the environment was rated "poor"; thus, in order to better support clinical practice, the quality of technical support services should be improved. An assessment of what needs to be done, who is currently doing it, and who should be doing it is necessary to develop support systems that allow nurses to practice nursing instead of performing non-nursing functions that have been acquired because other disciplines and/or departments were unable to meet the service need. While this strategy may result in addition of personnel in departments that provide support services, it has the potential to improve the practice of professional nursing, improve the quality of care delivered to patients and families, improve patient

satisfaction with care, reduce length of hospital stay, and decrease the turnover rate of nurses in the environment.

Nurses interact with patients and their families and all other members of the health care team, including staff in other departments that provide patient care. While patients and their families may not be able to evaluate how well nurses plan and evaluate nursing care, perform technical skills, and prioritize care for seriously ill patients, they can and often do evaluate the way staff relate to them and meet their emotional needs. Thus, if patients and their families perceive poor interpersonal relationships with staff caring for them, their evaluation of the "care" they receive may be poor. As well, relationships with professional peers, physicians, and other members of the team that deliver and support patient care may be poor. Since the effects of the number of admissions and discharges in a 24-hour period were direct, and not significantly reduced by the effects of mediator variables, the turbulence in the environment must be directly manipulated to affect these aspects of performance.

Recommendations for Future Research

Conceptual models of nursing administration (Johnson et al., 1989; Neidlinger & Miller, 1990), as well as other performance models (Blumberg & Pringle, 1982; Cummings & Schwab, 1973; Dachler & Mobley, 1973; Mitchell, 1983; Peters & O'Connor, 1980; Porter & Lawler, 1968; Schwirian, 1981) acknowledge the potential effect of environment on performance. While the present investigation lends empirical support to this relationship, further efforts to more clearly explicate the attributes of the environment that affect performance are necessary. Both qualitative and quantitative

methodologies will facilitate identification of environmental attributes that staff nurses believe impact clinical practice.

Replication with a larger sample from multiple settings is essential in order to increase generalizability of the study findings and build nursing administration theory. In addition to the variables included in the present investigation, other variables that should be considered in future research are: characteristics of administrators/managers, job design, competence, staffing, and professionalism. In addition, determining the effects of nurse performance on quality of care and patient outcomes is critical in the current health care environment.

Instruments used in this investigation require additional psychometric evaluation. The **Six-Dimension Scale of Nursing Performance** should be reassessed for construct validity. The factor pattern obtained in this investigation differed from the factor pattern obtained by Schwirian (1978) but seems to reflect the practice of professional nursing more accurately than the scales initially proposed (Schwirian, 1978) because it does not fragment the professional components of planning, evaluation, and patient and family education. These items all loaded on one factor representing attributes unique to the performance of professional nurses. The other factors represented aspects of performance expected of all staff who take care of patients in the clinical environment, incorporating interpersonal relationships, communication skills, performance of technical skills and prioritizing care for seriously ill patients. The factor reflecting technical skills performance had a relatively low reliability estimate. considering that practice and technology have changed since Schwirian

(1978) developed the instrument, additional items should be added to this subscale in order to more accurately measure this aspect of performance.

The **Perceived Environmental Uncertainty Scale** had initial reliability estimates that were good for an instrument in the initial stages of development. Items measuring confidence in decision-making, however, were eliminated in the initial test of the instrument because these items did not correlate with either the total scale or other items. Consequently, decision-making uncertainty was not measured. Revision of these items and further testing of the instrument is necessary to determine whether this important dimension can be measured adequately.

In addition to continuing work on the development of the **Perceived Environmental Uncertainty Scale**, the following question must be asked regarding uncertainty: "Is there a level of uncertainty that is a positive force?" Results from the present investigation suggest that this might be the case; however, further empirical work is required before this question can be answered.

Summary

The purpose of this investigation was to determine the effects of environmental turbulence on the job performance of nurses. Job performance is a complex phenomenon that is affected by many factors. The results of the study offer new knowledge about the effects of selected attributes of the environment on three measures of nurse performance. The results of the contextual analysis revealed that characteristics of the environment significantly affected implementation of nursing process, and the results of causal modeling confirmed that one environmental variable, the number

of admissions to and discharges from a nursing unit in a 24-hour period, negatively affected each of the three measures of nurse performance. However, the explained variance for each model was low. This investigation confirmed that objectively measured environmental characteristics should be included in performance models. Thus, the findings of this investigation have theoretical as well as practical implications, and give direction to future research efforts.

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APPENDIX A

CONSENT FORM

CONSENT FORM

You are being asked to participate in a research project undertaken by Jeanne Salyer, R.N., M.S.N., as part of the requirements for completing a doctoral degree in nursing from the School of Nursing, Virginia Commonwealth University, Medical College of Virginia. The purpose of this study is to try to better understand the effects of the work environment on nurse performance. This study examines, for example, the impact of day-to-day change in patient acuity, day-to-day change in unit census; number of admissions, transfers, and discharges in a 24-hour period; availability and responsiveness of technical support services, and personal characteristics of the staff nurse. The outcome of interest is the quality of staff nurse performance.

There are no direct benefits to you or your institution, nor are there any risks. However, it is hoped that the study will yield information for use by nursing administrators in decision-making about the resources needed to support nursing practice.

The study will involve direct data collection from staff nurses working on units selected to be involved in the project, as well as patient acuity and occupancy rate data available from hospital records. It is estimated that completion of this questionnaire will take approximately 45 minutes of your time.

All data collected will be confidential, and will be available only to me. No individual unit will be identified, nor will any individual person on any unit be identified. All results will be reported as aggregate data. Code numbers will be used on individual questionnaire for purposes of data management.

Your participation is entirely voluntary, and your decision to participate or not to participate will not be communicated to your employer, nor will it affect your employment in any way. Your consent to participate will be assumed if you complete and return the enclosed questionnaire.

Thank you very much for your time and participation.

Sincerely,

Jeanne Salyer, R.N., M.S.N.
Doctoral Candidate
School of Nursing
Virginia Commonwealth University
Medical College of Virginia

APPENDIX B

QUESTIONNAIRE DISTRIBUTED TO STAFF NURSES

APPENDIX C

INTER-OBSERVER RELIABILITY ESTIMATES OF MEDICUS PATIENT CLASSIFICATION OF ACUITY BY INPATIENT NURSING UNIT

Inter-observer Reliability Estimates of Medicus Patient Classification of Acuity by Inpatient Nursing Unit

	Inter-observer Reliabilities				
Evaluation Period:	7/28-8/10	8/11-8/24	8/25-9/7	9/8-9/21	9/22-10/5
UNIT					
01	.88	.88	1.00	----	1.00
02	.50	.80	1.00	.60	.40
03	.75	1.00	1.00	1.00	.75
04	1.00	1.00	1.00	1.00	1.00
05	1.00	1.00	1.00	.80	1.00
06	.87	1.00	----	----	1.00
07	1.00	1.00	.60	1.00	.70
08	----	1.00	1.00	.67	----
09	1.00	1.00	----	----	----
10	1.00	1.00	1.00	1.00	1.00
11	----	----	1.00	1.00	.67
12	1.00	.88	.88	.67	1.00
13	1.00	.88	1.00	1.00	1.00
14	1.00	1.00	----	.88	.88
15	1.00	1.00	1.00	----	1.00
16	.90	.60	.72	.80	.90
17	.40	.80	.90	.80	.60
18	.88	1.00	.92	1.00	.82
19	.88	----	.75	.58	.92

APPENDIX D

UNIT ENVIRONMENTAL CHARACTERISTICS

Unit Environmental Characteristics: ACUITY, Δ ACUITY, OCCUPANCY, Δ OCCUPANCY, ADM/DC, and TRANS (N=19)

Variable	Mean	S.D.	Minimum	Maximum
Unit 1				
ACUITY	560.90	132.74	281.00	827.00
Δ ACUITY	100.71	66.72	0	276.00
OCCUPANCY	18.95	3.60	12.00	25.00
Δ OCCUPANCY	2.14	1.79	0	8.00
ADM/DC	6 70	3.53	0	16.00
TRANS	10.57	7.48	0	31.00
Unit 2				
ACUITY	649.56	172.20	303.00	961.00
Δ ACUITY	106.27	92.31	0	369.00
OCCUPANCY	22.89	8.95	9.00	80.00
Δ OCCUPANCY	2.67	2.64	0	11.00
ADM/DC	11.02	4.48	2.00	22.00
TRANS	12.73	5.87	1.00	24.00
Unit 3				
ACUITY	633.73	93.47	444.00	858.00
Δ ACUITY	81.80	65.32	2.00	272.00
OCCUPANCY	20.85	2.43	16.00	24.00
Δ OCCUPANCY	1.84	1.40	0	6.00
ADM/DC	5.82	2.90	1.00	14.00
TRANS	6.43	5.14	0	20.00
Unit 4				
ACUITY	623.41	121.26	408.00	919.00
Δ ACUITY	94.96	68.92	0	283.00
OCCUPANCY	20.12	3.60	14.00	27.00
Δ OCCUPANCY	2.07	1.89	0	7.00
ADM/DC	7.11	3.94	0	17.00
TRANS	10.44	6.94	0	32.00
Unit 5				
ACUITY	708.83	119.13	361.00	1147.00
Δ ACUITY	123.34	105.40	0	452.00
OCCUPANCY	25.39	2.41	19.00	28.00
Δ OCCUPANCY	2.16	2.25	0	8.00
ADM/DC	15.47	4.83	4.00	26.00
TRANS	16.06	10.15	0	37.00

Unit Environmental Characteristics: ACUITY, Δ ACUITY, OCCUPANCY, Δ OCCUPANCY, ADM/DC, and TRANS (N=19)

Variable	Mean	S.D.	Minimum	Maximum
Unit 6				
ACUITY	471.71	156.00	133.00	782.00
Δ ACUITY	106.47	102.71	2.00	393.00
OCCUPANCY	21.77	5.08	11.00	28.00
Δ OCCUPANCY	3.38	3.08	0	12.00
ADM/DC	12.02	4.49	1.00	21.00
TRANS	15.92	9.41	0	32.00
Unit 7				
ACUITY	499.80	130.57	227.00	761.00
Δ ACUITY	116.45	71.83	0	276.00
OCCUPANCY	21.86	4.13	13.00	30.00
Δ OCCUPANCY	3.95	2.82	0	12.00
ADM/DC	11.07	5.18	0	25.00
TRANS	10.46	5.68	0	23.00
Unit 8				
ACUITY	56.68	35.37	3.00	167.00
Δ ACUITY	22.82	24.08	0	91.00
OCCUPANCY	2.52	1.12	1.00	5.00
Δ OCCUPANCY	0.65	0.70	0	2.00
ADM/DC	0.82	0.78	0	3.00
TRANS	1.13	1.89	0	9.00
Unit 9				
ACUITY	700.71	121.29	316.00	923.00
Δ ACUITY	119.64	114.83	0	539.00
OCCUPANCY	24.73	2.74	14.00	28.00
Δ OCCUPANCY	2.70	2.68	0	11.00
ADM/DC	7.03	3.50	2.00	22.00
TRANS	12.85	6.71	1.00	27.00
Unit 10				
ACUITY	159.05	51.50	70.00	295.00
Δ ACUITY	45.84	43.57	0	205.00
OCCUPANCY	9.03	2.89	3.00	15.00
Δ OCCUPANCY	1.95	1.84	0	8.00
ADM/DC	5.32	2.49	1.00	11.00
TRANS	3.60	2.36	0	12.00

Unit Environmental Characteristics: ACUITY, Δ ACUITY, OCCUPANCY, Δ OCCUPANCY, ADM/DC, and TRANS (N=19)

Variable	Mean	S.D.	Minimum	Maximum
Unit 11				
ACUITY	383.47	103.67	127.00	569.00
Δ ACUITY	80.64	61.59	0	248.00
OCCUPANCY	13.44	3.30	6.00	19.00
Δ OCCUPANCY	2.02	1.54	0	6.00
ADM/DC	7.77	3.44	1.00	20.00
TRANS	6.33	4.74	0	20.00
Unit 12				
ACUITY	325.46	119.15	77.00	620.00
Δ ACUITY	84.89	81.38	0	384.00
OCCUPANCY	11.47	2.99	5.00	18.00
Δ OCCUPANCY	1.91	1.92	0	6.00
ADM/DC	6.59	3.20	0	18.00
TRANS	4.44	3.09	0	12.00
Unit 13				
ACUITY	321.68	118.98	92.00	618.00
Δ ACUITY	77.12	69.56	0	278.00
OCCUPANCY	10.12	3.30	3.00	16.00
Δ OCCUPANCY	1.77	1.50	0	7.00
ADM/DC	5.52	1.65	2.00	8.00
TRANS	3.39	2.65	0	10.00
Unit 14				
ACUITY	655.36	156.32	117.00	956.00
Δ ACUITY	128.53	109.19	0	584.00
OCCUPANCY	16.21	2.05	5.00	20.00
Δ OCCUPANCY	1.54	1.91	0	10.00
ADM/DC	4.02	2.10	0	10.00
TRANS	6.23	6.15	0	44.00
Unit 15				
ACUITY	476.53	138.76	157.00	878.00
Δ ACUITY	113.05	107.32	5.00	436.00
OCCUPANCY	17.24	3.33	7.00	22.00
Δ OCCUPANCY	2.33	2.14	0	11.00
ADM/DC	5.43	2.56	1.00	12.00
TRANS	9.95	6.47	0	43.00

Unit Environmental Characteristics: ACUITY, Δ ACUITY, OCCUPANCY, Δ OCCUPANCY, ADM/DC, and TRANS (N=19)

Variable	Mean	S.D.	Minimum	Maximum
Unit 16				
ACUITY	592.07	114.76	403.00	833.00
Δ ACUITY	79.27	74.83	0	261.00
OCCUPANCY	27.68	4.53	22.00	58.00
Δ OCCUPANCY	1.82	1.48	0	6.00
ADM/DC	7.70	3.66	1.00	20.00
TRANS	13.06	7.09	0	31.00
Unit 17				
ACUITY	424.75	184.49	0	746.00
Δ ACUITY	155.44	134.80	5.00	604.00
OCCUPANCY	21.10	5.23	10.00	29.00
Δ OCCUPANCY	3.25	2.73	0	12.00
ADM/DC	7.10	2.80	1.00	13.00
TRANS	10.23	5.09	0	22.00
Unit 18				
ACUITY	696.51	102.61	443.00	1037.00
Δ ACUITY	96.86	84.25	0	413.00
OCCUPANCY	31.19	2.39	23.00	34.00
Δ OCCUPANCY	2.63	2.64	0	12.00
ADM/DC	9.20	4.10	1.00	21.00
TRANS	11.85	7.38	0	31.00
Unit 19				
ACUITY	482.46	102.30	288.00	777.00
Δ ACUITY	101.96	88.95	0	429.00
OCCUPANCY	27.58	3.72	18.00	33.00
Δ OCCUPANCY	2.56	1.97	0	9.00
ADM/DC	7.28	2.85	1.00	13.00
TRANS	8.24	5.11	0	19.00

APPENDIX E

ITEM MEAN, STANDARD DEVIATION, ITEM-TOTAL CORRELATION AND RELIABILITY ESTIMATE OF TECHNICAL SUPPORT SERVICES AVAILABILITY AND RESPONSIVENESS SCALES

Item Mean, Standard Deviation, Item-total Correlation and Reliability Estimate of Technical Support Services Availability and Responsiveness Scales (N=95)

Item	Availability			Responsiveness		
	Mean	S.D.	Item-total Correlation	Mean	S.D.	Item-total Correlation
Venipuncturist/blood specimen collection	.663	.475	.263	1.221	.568	.281
Specimen pick-up	.916	.279	.035	1.621	.622	.173
Patient transportation	.642	.482	.291	1.273	.660	.244
Supply cart stocked	.621	.488	.294	1.200	.662	.276
Ordering/stocking nonsupply cart supplies	.537	.501	.327	1.116	.666	.384
Stocked linen cart	.390	.490	.063	.463	.665	.188
Answering call lights	.505	.503	.466	1.368	.637	.320
Cleaning/mopping floors	.474	.502	.256	.979	.744	.447
Emptying trash	.421	.496	.344	.916	.724	.437
Cleaning rooms after patient discharge	.590	.495	.437	1.242	.680	.532
Scheduling patient follow-up appointments	.758	.431	.371	1.526	.562	.463
Telephone answering	.547	.500	.586	1.390	.589	.520
Transcribing written orders	.684	.467	.524	1.432	.595	.456
Forwarding HIS orders to nurse	.768	.424	.617	1.632	.527	.397
Filing HIS information on chart	.747	.437	.557	1.663	.518	.556
Making charts for new admissions	.716	.453	.800	1.726	.535	.353
Greeting/directing visitors/new patients	.684	.467	.529	1.526	.633	.433

Item Mean, Standard Deviation, Item-total Correlation and Reliability Estimate of Technical Support Services Availability and Responsiveness Scales (N=95)

Item	Availability			Responsiveness		
	Mean	S.D.	Item-total Correlation	Mean	S.D.	Item-total Correlation
Unit dose medications	.558	.499	.362	.863	.678	.327
IV fluid preparation and delivery	.474	.502	.212	1.084	.630	.324
Starting IVs by IV team	.432	.498	.428	.979	.636	.331
Assisting patients with menu selection	.411	.495	.333	.990	.707	.356
Delivering snacks to patients	.716	.453	.354	1.347	.696	.417
Meal tray delivery/pick-up	.611	.490	.531	1.284	.679	.453
Feeding patients/assistance with tray set-up	.463	.501	.229	1.137	.738	.194
Diet teaching	.821	.385	.346	1.579	.629	.292
Respiratory therapy/equipment set-up and change	.253	.437	.225	.674	.736	.304
Discharge planning	.663	.475	.361	1.305	.620	.373
	KR-20: 839			Alpha: .837		

APPENDIX F

PSYCHOMETRIC PROPERTIES OF THE TOLERANCE-INTOLERANCE OF AMBIGUITY SCALE

Psychometric Properties of the Tolerance-Intolerance of Ambiguity Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading			Item-total Correlation
				Complexity Factor 1	Novelty Factor 2	Insolubility Factor 3	
What we're used to is preferable to what is unfamiliar.	Novelty	5.337	1.900		.955		.262
People who fit their lives into a schedule probably miss most of the joy of living.	Complexity	4.221	2.218		.390		.197
An expert who doesn't come up with a definite answer probably doesn't know much.	Insolubility	4.126	2.753		.271		.233
In the long run, it is possible to get more done by tackling small simple problems rather than large complicated ones.	Complexity	4.947	2.038		.212		.143
A person who leads an even, regular life in which few surprises or unexpected events arise, really has a lot to be grateful for.	Novelty	3.716	2.413		.195		.195

Psychometric Properties of the Tolerance-Intolerance of Ambiguity Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading			Item-total Correlation
				Complexity Factor 1	Novelty Factor 2	Insolubility Factor 3	
I like parties where most of the people are strangers to me.	Novelty	5.579	1.899		.162		.048
There is no such thing as a problem that can't be solved.	Insolubility	4.957	2.347			.630	.170
The sooner we all acquire similar values and ideals the better.	Complexity	4.737	2.626			.421	.194
A good job is one that clearly states what is to be done and how it is to be done.	Complexity	5.326	1.870		.318	.337	.125
Supervisors who give vague assignments or instructions give me a chance to show initiative and originality.	Complexity	4.653	2.153	.516			.248
People who insist on a yes or no answer don't know how complicated things really are.	Complexity	4.547	2.067	.491			.300

Psychometric Properties of the Tolerance-Intolerance of Ambiguity Scale (N=95)

	Theoretical Dimension	Mean	S.D.	Factor Loading			Item-total Correlation
				Complexity Factor 1	Novelty Factor 2	Insolubility Factor 3	
Often the most interesting and stimulating people are those who don't mind being different and original.	Complexity	6.316	1.044	.435			.300
It is more fun to tackle a complicated problem than to solve a simple one.	Complexity	4.768	1.986	.433			.345
A good teacher is one who makes you wonder about your way of looking at things.	Complexity	5.673	1.685	.418			.156
Many of our most important decisions are based on insufficient information.	Insolubility	4.642	2.338	.368			.314
I would like to live in a foreign country for awhile.	Novelty	5.579	1.831	.278			.169

Alpha: .571
Omega: .718

Psychometric Properties of the Hardiness Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading: Commitment Factor 1	Factor Loading: Challenge Factor 2	Factor Loading: Control Factor 3	Item-total Correlation
I am really interested in the possibility of expanding my consciousness through drugs.	Commitment	2.958	.323	.567			.168
In my case, getting what I want has little or nothing to do with luck, **OR** Many times, we might as well decide what to do by flipping a coin.	Control	.895	.309	.512			.020
Many times I feel that I have little influence over the things that happen to me, **OR** It is impossible for me to believe that chance or luck plays an important role in my life.	Control	.568	.498	.469			.272
Life is empty and has no meaning in it for me.	Commitment	2.968	.176	.432			.197

APPENDIX G

PSYCHOMETRIC PROPERTIES OF THE HARDINESS SCALE

Psychometric Properties of the Hardiness Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading: Commitment Factor 1	Factor Loading: Challenge Factor 2	Factor Loading: Control Factor 3	Item-total Correlation
What happens to me is my own doing, **OR** Sometimes I feel that I don't have enough control over the direction my life is taking.	Control	.737	.443	.418			.432
Becoming a success is a matter of hard work; luck has little or nothing to do with it, **OR** Getting a good job depends mainly on being in the right place at the right time.	Control	.747	.437	.375			.147
Most people don't realize the extent to which their lives are controlled by accidental happenings, **OR** There is really no such as luck.	Control	.337	.475	.372			.223

Psychometric Properties of the Hardiness Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading			Item-total Correlation
				Commitment Factor 1	Challenge Factor 2	Control Factor 3	
Who gets to be boss often depends on who was lucky enough to be in the right place first, **OR** Getting people to do the right thing depends on ability; luck has little to do with it.	Control	.853	.356	.324			.193
If you have to work, you might as well choose a career where you deal with matters of life and death.	Commitment	2.611	.829	.316		.310	.203
The idea that most teachers are unfair to students is nonsense, **OR** Most students don't realize the extent to which their grades are influenced by accidental happenings.	Control	.726	.448	.307			.084
The human's ability to think is not really such an advantage.	Commitment	2.901	.294	.267		.125	.161

Psychometric Properties of the Hardiness Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading			Item-total Correlation
				Commitment Factor 1	Challenge Factor 2	Control Factor 3	
Most of life is wasted in meaningless activity.	Commitment	2.474	.666	.254	.295		.254
Most of the time I can't understand why politicians behave the way they do, **OR** In the long run, the people are responsible for bad government on a national as well as on a local level.	Control	.642	.482	.204			-.011
The attempt to know yourself is a waste of effort.	Commitment	2.978	.144	.136		.125	.070
I long for a simple life in which bodily needs are the most important things and decisions don't have to be made.	Commitment	2.800	.428	.104			-.099
No matter how hard I try, my efforts will accomplish nothing.	Commitment	2.916	.347		.659		.237

Psychometric Properties of the Hardiness Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading			Item-total Correlation
				Commitment Factor 1	Challenge Factor 2	Control Factor 3	
I find it hard to believe people who actually feel that the work they perform is of value to society.	Commitment	2.884	.409		.621		.381
I find it difficult to imagine enthusiasm concerning work.	Commitment	2.758	.477		.487		.427
I wonder why I work at all.	Commitment	2.758	.578		.441		.310
Before I ask a question, I figure out exactly what I already know and what it is I need to find out.	Challenge	1.463	.836		.376		.295
It upsets me to go into a situation without knowing what I can expect from it.	Control	1.674	.736		.361	.330	.398
In the long run people get the respect they deserve in this world, **OR** Unfortunately, an individuals work often passes unrecognized no matter how hard he tries.	Control	.495	.503		.351		.182

Psychometric Properties of the Hardiness Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading			Item-total Correlation
				Commitment Factor 1	Challenge Factor 2	Control Factor 3	
My work is carefully planned and organized before it is begun.	Challenge	1.432	.724		.337		.210
I tend to start right in on a new task without spending much time thinking about the best way to proceed.	Challenge	.663	.694		.312		.004
Those who work for a living are manipulated by their bosses.	Control	2.284	.710			.649	.537
Politicians control our lives.	Control	1.884	.823			.474	.397
Most of my activities are determined by what society demands.	Control	2.147	.729			.446	.319
No matter how hard I try, my efforts will accomplish nothing.	Commitment	2.537	.633			.440	.457
Pensions large enough to provide for dignified living are the right of all when age or illness prevent one from working.	Challenge	.958	.944			.401	.237

Psychometric Properties of the Hardiness Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading: Commitment Factor 1	Factor Loading: Challenge Factor 2	Factor Loading: Control Factor 3	Item-total Correlation
With enough effort, we can wipe out political corruption, **OR** It is difficult for people to have control over things politicans do in office.	Control	.442	.499			.388	.305
Without the right breaks one cannot be an effective leader, **OR** Capable people who fail to become leaders have not taken advantage of their opportunities.	Control	.821	.385			.364	.239
One who does his/her best should expect to receive complete economic support from society.	Challenge	2.505	.756			.302	.176
There are no conditions that justify endangering the health, food, and shelter of one's self or one's family.	Challenge	1.284	1.145			.302	.248

Psychometric Properties of the Hardiness Scale (N=95)

Item	Theoretical Dimension	Mean	S.D.	Factor Loading			Item-total Correlation
				Commitment Factor 1	Challenge Factor 2	Control Factor 3	
The most exciting thing for me is my own fantasies.	Commitment	2.821	.385			.257	.149
I like to be with people who are unpredictable.	Challenge	.811	.657			.104	.002
I very seldom make detailed plans.	Challenge	.726	.721	-.065	-.101	-.183	-.177

Alpha: .70

APPENDIX H

PSYCHOMETRIC PROPERTIES OF THE PERCEIVED ENVIRONMENTAL UNCERTAINTY SCALE

Psychometric Properties of the Perceived Environmental Uncertainty Scale (N=95)

Item	Factor Loading	Mean	S.D.	Item-total Correlation
Frequent admissions and discharges from the unit make it difficult for me to plan my work.	.676	3.43	1.67	.593
Frequent transfers on and off the unit make it difficult for me to get my work done.	.666	3.86	1.63	.582
If I had more information about my patient's current condition, I could do a better job.	.637	3.32	1.66	.590
If I got timely feedback about unit management decisions I make, I could do a better job.	.619	3.31	1.50	.571
If my patients didn't have such complex problems, I could do a better job.	.551	5.21	1.15	.499
Physicians change their orders so frequently that I have difficulty getting my job done.	.549	4.20	1.47	.498
I have to consult with several health care practitioners before I can make decisions about patient care.	.510	4.77	1.17	.466
If I got timely feedback about the effect of clinical decisions I make, I could do a better job.	.503	3.07	1.47	.473
If I had more knowledge/education about the care my patients need, I could do a better job.	.497	3.40	1.75	.449
Patients' conditions change too unpredictably for me to do a good job.	.438	5.27	1.09	.382
If I had more information about what my supervisor expects of me, I could do a better job.	.438	4.42	1.59	.399
Alpha: .827				

APPENDIX I

PSYCHOMETRIC PROPERTIES OF THE ITEMS OF THE SIX-DIMENSION SCALE OF NURSE PERFORMANCE

Psychometric Properties of the Items of the Six-Dimension Scale of Nurse Performance (N=95)

Factor	Item	Factor Loading	Mean	S.D.	Item-total Correlation
Implementation of nursing process	Coordinate the nursing care plan with the medical plan of care.	.752	2.91	.863	.603
	Teach preventive health measures to patients and their families.	.744	2.67	.928	.606
	Teach a patient's family about the patient's needs.	.632	2.93	.854	.616
	Develop a plan of nursing care for the patient.	.602	3.04	.771	.536
	Use teaching aids and resource materials in teaching patients and families.	.599	2.93	.914	.723
	Evaluate results of nursing care.	.591	3.00	.851	.587
	Adapt teaching methods and materials to the patient's/family's level of understanding.	.582	3.18	.799	.641
	Identify anticipated changes in the patient's condition and include them in the plan of care.	.567	2.87	.854	.513
	Develop innovative methods and materials for teaching patients.	.554	2.44	.896	.649
	Identify community resources and use them in developing a plan of care for the patient.	.539	2.32	1.002	.531
	Promote inclusion of the patient's desires/ decisions concerning care in the medical and nursing plans of care.	.523	2.97	.805	.440
	Alpha: .895				

Psychometric Properties of the Items of the Six-Dimension Scale of Nurse Performance (N=95)

Factor	Item	Factor Loading	Mean	S.D.	Item-total Correlation
Interpersonal Relations/ Communication Skills	Help a patient communicate with others.	.768	3.34	.709	.558
	Recognize and meet the emotional needs of a dying patient.	.712	3.09	.851	.648
	Seek assistance when necessary.	.663	3.56	.664	.397
	Help meet the emotional needs of a patient.	.659	3.38	.717	.672
	Give emotional support to the family of critically ill/dying patients.	.658	3.27	.856	.606
	Explain nursing procedures to a patient prior to performing them.	.583	3.51	.599	.586
	Use nursing procedures as opportunities to interact with patients.	.529	3.46	.665	.399
	Communicate acceptance of each patient and concern for patient welfare.	.519	3.55	.665	.493
	Contribute to productive working relationships with other health team members.	.479	3.29	.666	.503
	Contribute to an atmosphere of mutual trust, acceptance, and respect among other health team members.	.440	3.39	.673	.524
	Alpha: .882				

Psychometric Properties of the Items of the Six-Dimension Scale of Nurse Performance (N=95)

Factor	Item	Factor Loading	Mean	S.D.	Item-total Correlation
Technical Skills/ Prioritizing Care of Seriously Ill Patients	Function competently in emergency situations.	.792	3.14	.820	.530
	Perform appropriate measures in emergency situations.	.784	3.15	.771	.461
	Perform nursing care required by patients who are seriously ill.	.599	2.93	.914	.723
	Use equipment safely and competently.	.597	3.67	.515	.450
	Perform technical procedures competently.	.584	3.43	.663	.351
	Alpha: .742				

VITA

Jeanne Salyer was born on August 2, [redacted] in Durham, North Carolina and is an American citizen. She graduated from S. R. Butler High School, Huntsville, Alabama in 1964. She received a diploma in nursing from the University of Alabama Hospitals in 1967, and a Bachelor of Science in Nursing from the University of Alabama School of Nursing in 1972, and subsequently worked as a medical-surgical and critical care nurse at the University of Alabama Hospital in Birmingham, Alabama. She received a Master of Science in Medical-Surgical Nursing from the University of Alabama in Birmingham in 1975. She has practiced clinical nursing, and taught in staff development programs and in schools of nursing for the past 25 years at the University of Alabama in Birmingham, University of Miami/Jackson Memorial Medical Center, and Virginia Commonwealth University/Medical College of Virginia. She is currently a nursing case manager at the Medical College of Virginia Hospitals. Ms. Salyer has published in multiple journals including: Heart and Lung, Home Healthcare Nurse, Virginia Nurse, Journal of the American College of Cardiology, and Journal of Heart and Lung Transplantation. She has presented many invited papers on topics related to the care of patients with a variety of medical and/or surgical problems including: chronic obstructive pulmonary diseases, mechanical ventilation, acquired immunodeficiency syndrome, and wound management. She maintains membership in Sigma Theta Tau, International Honor Society of Nursing; the Academy of Management; and the American Nurses Association.