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THE RELATIONSHIP BETWEEN PHYSICAL WORK ENVIRONMENTAL FACTORS, PERCEIVED STRESS, JOB SATISFACTION AND TURNOVER INTENTION AMONG INPATIENT ACUTE CARE NURSES

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and approved by

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The Relationship Between Physical Work Environmental Factors, Perceived Stress, Job Satisfaction, and Turnover Intention Among Inpatient Acute Care Nurses

By Diane Helen Applebaum

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The healthcare community needs to be concerned about nursing turnover intention and the effect on the projected nursing shortage. The evaluation of nursing turnover intention and the association between turnover intention and various predictors needs to be determined. Job satisfaction and perceived stress have been identified to influence the intention to turnover. In addition, environmental factors (i.e. odor, noise, and light) may influence perceived stress and job satisfaction. This study tested theoretical relationships between the dependent variables of perceived stress, job satisfaction, and turnover intention and each of the independent variables of (a) odor, (b) noise, and (c) light.

The sample was comprised of 116 full-time registered nurses who worked on the medical-surgical units of a 588 bed Level 1 trauma center located in northern New Jersey. Hypothesis testing employed correlational and regression statistical techniques.

Statistically significant relationships were found between perceived stress and job satisfaction ($r = .55, p = .00$), job satisfaction and turnover intention ($r = .74, p = .00$), perceived stress and turnover intention ($r = .34, p = .00$), and perceived level of odor and job satisfaction ($r = -.27, p = .00$). The relationships between perceived stress and job satisfaction, job satisfaction and turnover intention, and perceived stress and turnover intention were anticipated due to the strong theoretical and empirical evidence supporting these relationships.
Although a specific hypothesis was not proposed to combine all independent variables to explain the dependent variable of turnover intention, all independent variables were added to a model using backward regression. The environmental factors did not contribute significantly to the variance in turnover intention except the level of light. Likewise, perceived stress offered little contribution. Finally, level of light and job satisfaction, together, explained 56% of the variance in turnover intention.
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# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>iv</td>
</tr>
<tr>
<td>List of Appendices</td>
<td>vii</td>
</tr>
<tr>
<td>List of Tables</td>
<td>viii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>ix</td>
</tr>
<tr>
<td>Chapter</td>
<td></td>
</tr>
<tr>
<td>I. The Problem</td>
<td></td>
</tr>
<tr>
<td>The Problem</td>
<td>1</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>1</td>
</tr>
<tr>
<td>Research Questions</td>
<td>1</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>2</td>
</tr>
<tr>
<td>Significance</td>
<td>4</td>
</tr>
<tr>
<td>II. Review of the Literature</td>
<td></td>
</tr>
<tr>
<td>The Healthcare Environment</td>
<td>6</td>
</tr>
<tr>
<td>Environmental and Organizational Climate</td>
<td>8</td>
</tr>
<tr>
<td>Nursing in an Inpatient Acute Care Work</td>
<td>9</td>
</tr>
<tr>
<td>Environment</td>
<td></td>
</tr>
<tr>
<td>Aging and Turnover of the U.S. Nursing Workforce</td>
<td>9</td>
</tr>
<tr>
<td>Role of the Physical Environment</td>
<td>10</td>
</tr>
<tr>
<td>Odors</td>
<td>13</td>
</tr>
<tr>
<td>Noise</td>
<td>14</td>
</tr>
<tr>
<td>Light</td>
<td>16</td>
</tr>
<tr>
<td>Color</td>
<td>18</td>
</tr>
<tr>
<td>Impact of Workplace Design</td>
<td>19</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>21</td>
</tr>
<tr>
<td>Research Questions</td>
<td>23</td>
</tr>
<tr>
<td>III Methods</td>
<td></td>
</tr>
<tr>
<td>Research Setting</td>
<td>24</td>
</tr>
<tr>
<td>Sample</td>
<td>24</td>
</tr>
<tr>
<td>Instruments</td>
<td>26</td>
</tr>
<tr>
<td>Perceived Stress Scale – 10 (PSS – 10)</td>
<td>27</td>
</tr>
<tr>
<td>Nursing Intent to Stay Questionnaire</td>
<td>28</td>
</tr>
<tr>
<td>University of Texas M.D. Anderson Cancer Center</td>
<td>29</td>
</tr>
<tr>
<td>Staff Survey – Physical Work Environment Survey</td>
<td></td>
</tr>
<tr>
<td>Procedure for Data Collection</td>
<td>31</td>
</tr>
<tr>
<td>Data Management</td>
<td>32</td>
</tr>
</tbody>
</table>
IV. Analysis of the Data
   Statistical Description of the Variables
   Psychometric Properties of the Instruments
   Hypotheses
      Hypothesis 1
      Hypothesis 2
      Hypothesis 3
      Hypothesis 4
      Hypothesis 5
      Hypothesis 6
      Hypothesis 7
   Research Question 1
   Research Question 2
   Model 1 – Backward Regression
   Additional Findings

V. Discussion of the Findings
   Perceived Level of Odor and Perceived Stress
   Perceived Level of Noise and Perceived Stress
   Perceived Level Light and Perceived Stress
   Perceived Level of Light and Job Satisfaction
   Perceived Stress and Job Satisfaction
   Job Satisfaction and Turnover Intention
   Perceived Stress and Turnover Intention
   Regression Model
   Warm Stimulating Colors and Perceived Stress
   Perceived Level of Odor and Job Satisfaction
   Additional Findings

VI. Summary, Conclusions, Implications, Limitations and Recommendations
   Summary
   Conclusions
   Implications for Environmental and Occupational Health in Nursing
   Limitations
   Recommendations

References
<table>
<thead>
<tr>
<th>Appendix</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Demographic Questionnaire</td>
<td>79</td>
</tr>
<tr>
<td>B</td>
<td>Physical Work Environment Survey (PWES)</td>
<td>80</td>
</tr>
<tr>
<td>C</td>
<td>Perceived Stress Scale – 10 Item</td>
<td>81</td>
</tr>
<tr>
<td>D</td>
<td>Job Satisfaction Questionnaire</td>
<td>82</td>
</tr>
<tr>
<td>E</td>
<td>Turnover Intention Questionnaire</td>
<td>83</td>
</tr>
<tr>
<td>F</td>
<td>Description of Study Participation</td>
<td>84</td>
</tr>
<tr>
<td>G</td>
<td>Staff Reminder Poster</td>
<td>85</td>
</tr>
<tr>
<td>H</td>
<td>Staff Reminder Postcard</td>
<td>86</td>
</tr>
<tr>
<td>I</td>
<td>Curriculum Vita</td>
<td>87</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Table 1</td>
<td>Frequency Distribution of Nursing Units</td>
<td>26</td>
</tr>
<tr>
<td>Table 2</td>
<td>Descriptive Statistics of Study Variables (Odor, Noise, Light, Perceived Stress, Job Satisfaction, Turnover Intention)</td>
<td>35</td>
</tr>
<tr>
<td>Table 3</td>
<td>Alpha Reliability Coefficients for Study Variables (Odor, Noise, Light, Perceived Stress, Job Satisfaction, Turnover Intention)</td>
<td>36</td>
</tr>
<tr>
<td>Table 4</td>
<td>Summary of Results</td>
<td>39</td>
</tr>
<tr>
<td>Table 5</td>
<td>Backward Regression Model Summary</td>
<td>40</td>
</tr>
</tbody>
</table>
List of Figures

Figure 1  Causal Model of Turnover Intention  22
Chapter I

The Problem

The United States is currently experiencing a critical shortage of registered nurses (Buerhaus, Staiger, & Auerbach, 2000). In addition, nurses across the nation are reporting increased stress and dissatisfaction with nursing (Shader, Broome, Broome, West, & Nash, 2001). One in five nurses plan to leave the profession within the next five years (Levtak, 2002). Job related stress is one of the principal reasons that nurses change jobs. The more stress, the lower job satisfaction and the higher turnover intention (Shader et. al., 2001).

Many aspects of job related stress have been investigated. Various studies have identified the sources and frequency of stress experienced by nurses in the performance of their duties. Examples of areas studied include the type of nursing unit, levels of training and responsibility, staffing, team respect, sociodemographic factors, unsafe workplaces and the effects of a rapidly changing healthcare environment. The impact of physical work environmental factors on perceived stress, job satisfaction and turnover intention is currently unknown.

Statement of the Problem

What is the relationship between the independent variables of physical work environmental factors (i.e. odor, noise, and light), and the dependent variables of perceived stress, job satisfaction and turnover intention in registered nurses working in an inpatient acute care hospital?

Research Questions

1. Is there a relationship between warm, stimulating colors and perceived stress?
2. What is the relationship between perceived level of odor and job satisfaction among inpatient acute care nurses?

Definition of Terms

1. The American Nurses Association defines nursing as the protection, promotion, and optimization of health and abilities, prevention of illness and injury, alleviation of suffering through the diagnosis and treatment of human response, and advocacy in the care of individuals, families, communities and populations. (ANA Nursing World, 2007). It is generally acknowledged to be a stressful profession. Nurses deal with emotional situations involving loss, anxiety, joy, anticipation, anger, new life, and death. Very little is routine. The nurse is confronted with a barrage of events that affect the customers and the health care system of which the nurse is a member. This constant change, with its demands, can be stress producing.

2. Stress is the psychological, physiological and behavioral response by an individual when they perceive a lack of equilibrium between the demands placed upon them and their ability to meet those demands, which over a period of time, leads to ill-health (Palmer, 1989). Cannon (1932) is credited with first describing the “flight or fight” reaction to stress. The physiological manifestations of stress may affect the body (e.g. heart rate, aches and pains and dizziness), the mind (e.g. poor concentration and memory, feeling tired, worrying too much) and behavior (e.g. difficulty with sleep; smoking, drinking, eating habits) (Rollnick, 2004). Nurses are exposed to a variety of stressors because of the nature of their jobs. They are subject to environmental, physical, biological, chemical and psychological hazards. For example, injury from lifting and handling equipment, blood/body fluids, infectious diseases, X-rays, noise, electricity,
chemical hazards, workplace violence, many different interpersonal relationships (i.e., physicians, patients, families, co-workers), and often-unrealistic job component stressors (i.e. workload, rotating shifts, double shifts, mandatory overtime) create an unusually stressful environment. These interactions can result in continued stress and in time lead to emotional exhaustion and burnout.

Stress related disorders can encompass a broad array of conditions, including affective disorders (depression, anxiety, PTSD), maladaptive behaviors (aggression, substance abuse), cognitive impairment which can lead to poor work performance or even injury, and various physiological reactions and adverse physiological endpoints (cardiovascular disorders) (NIOSH, 2006). According to a study conducted by Dr. Linda Aiken and colleagues in 2002, job dissatisfaction for hospital nurses was found to be 4 times higher than the average U.S. worker, and 20% of nurses stated that they intended to leave their jobs within the year (Aiken et.al, 2002). A study by Gray-Toft and Anderson confirmed the fact that stress is a significant factor in the high turnover rates that currently exist among hospital staff nurses. Stress was found to be highly related to job satisfaction and to staff turnover. The study indicated that the higher the levels of stress experienced by RNs led to a significant reduction in job satisfaction as well as to higher turnover rates (Gray-Toft, 1981a).

3. Job satisfaction has been shown to be directly affected by job stress. The more job stress, the lower job satisfaction and the higher turnover intention. The less job related stress, the higher job satisfaction and the lower turnover intention (Shader, et. el., 2001). Job satisfaction has been inversely linked to turnover intention and actual turnover (Price & Mueller, 1981). The work environment plays a key role in job satisfaction. The
environment has to be perceived as clean, comfortable, and safe. These items often emerge as particular concerns of allied health professionals (Fitzgerald, 1984).

4. Turnover intention is an internal perception of the probability that a nurse will leave employment (Price & Mueller, 1981). It refers to individual perception rather than behavior and is seen as a contemplative stage linking the attitudinal component of job satisfaction with the behavioral component of turnover (Alexander, 1998).

Retention of nursing staff is a desirable goal for any organization today. It has become a financial burden to train new staff and a staffing burden due to the extent of orientation. Some researchers have voiced concern that the current work environment is precipitating an exodus of experienced staff (Dudek, Rentschler & Fetzer, 2006). Higher staff turnover is associated with higher levels of nursing stress (Lucas, Atwood & Hagaman, 1993). Factors as simple as physical working conditions – heating, lighting, furnishings, space, noise – can create stress (Rowland, 1997).

Significance

This study will provide a first look at whether there is a relationship between physical work environmental factors, perceived stress, job satisfaction, and turnover intention among nurses. Most of the studies to date have concentrated on the environment and its effects on patient outcomes. It will also contribute to our understanding of how healthcare environments influence perceptions and outcomes related to stress, job satisfaction, and turnover intention. In addition, it may also explain that maintaining health and safety of staff members is an important goal of any healthcare organization.

Healthcare is in a state of transition. Hospital administrators must be able to balance the demands for quality of care and financial viability in a competitive healthcare
market. Both the quality and cost of the delivery of healthcare is directly affected by the turnover of nursing staff. Understanding the relationship between perceived stress, job satisfaction and turnover intention will assist hospital administrators to attract and retain nurses. The physical environmental factors, which may be stressors, are areas within the control of hospital administrators.

In summary, the present study attempted to explain perceived stress, job satisfaction and turnover intention using the three independent variables of (a) odor, (b) noise, and (c) light. The testing of these theorized relationships yielded findings that shed light on what physical work environmental factors contribute to perceived stress, job satisfaction and turnover intention among inpatient acute care nurses.
Chapter II

Review of the Literature

The review of the literature presents underlying theoretical support linking the dependent variables of perceived stress, job satisfaction, and turnover intention to the independent variables of (a) odor, (b) noise, and (c) light. Empirical studies demonstrating support for these theorized linkages will be presented. Finally, the theoretical rationale, hypotheses and research questions of this study conclude this chapter.

The Healthcare Environment

The healthcare environment – where care is actually delivered and received – has substantial effects on patient health and safety, care efficiency, effectiveness and staff morale (The Center for Health Design, 2004). As the landmark 2000 Institute of Medicine Report “To Err is Human” revealed, hospitals fall far short of ensuring patient safety. As many as 98,000 Americans die each year due to preventable medical errors while in the hospital. In fact, more people die in a given year from hospital errors than from motor vehicle accidents, breast cancer, or AIDS. In addition, up to 2 million U.S. hospital patients, one in twenty of all those admitted, contract dangerous infections every year during their hospital stay. In 1995, healthcare acquired infections cost $4.5 billion dollars and contributed to more than 88,000 deaths (The Center for Health Design, 2004). Designing around patient safety will change nursing processes and enhance the culture of patient safety for nurses. Using safety design features in the patient rooms and in the overall hospital design will create an environment where nurses will experience greater efficiency and safety in providing patient care (Reiling, 2003). According to one study,
almost 28.9 percent of nursing staff time was spent walking. This came second only to patient care activities, which accounted for 56.9 percent of observed behavior (Burgio, 1990). Workplace design that reflects a closer alignment of work patterns and the physical setting, such as redesign of a pharmacy layout, has been shown to improve work flow and reduce waiting times, as well as increased patient satisfaction with the service (Ulrich, 2004). The type of unit layout influences the amount of walking by nursing staff (e.g. radial, single corridor, double corridor). Time saved walking can be translated into more time spent on patient-care activities and interaction with family members. This is a source of satisfaction for nurses that leads to nursing retention.

The restructuring of healthcare delivery systems and the redesign of nursing roles has created dramatic changes in the work environment for nurses (Tumulty, 1994). Some of the challenges included reduction in the length of hospital stays due to the changing insurance regulations increase in patient acuity and intense cost containment efforts while still trying to provide quality patient care. As hospitals deal with changes in the external environment, changing regulations and shifts in available resources creates uncertainty in its internal environment, thus affecting nurses by leading to negative psychological consequences such as burnout (Garrett & McDaniel, 2001). Professional burnout has been defined as a syndrome manifested by emotional exhaustion, depersonalization, and reduced personal accomplishments; it commonly occurs in teachers, police officers, nurses and physicians. Burnout is positively associated with job dissatisfaction. (Garrett & McDaniel, 2001). Job dissatisfaction ultimately leads to nursing turnover intention.

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO), in their 2002 report, Healthcare at the Crossroads: Strategies for Addressing the Evolving
Nursing Crisis, estimated that by 2020 there will be at least 400,000 fewer nurses available to provide care than will be needed. The JCAHO report and surveys of nurses found that physical and psychological working conditions, along with support and compensation, are key contributors to turnover and burnout. Environmental support for work has become critical, as the typical patient is more seriously ill, patient loads increase, technology changes, and documentation requirements increase.

**Environmental and Organizational Climate**

A major theme in the literature suggests that the social climate and culture of the workplace are the basic reasons why a nurse decides to stay or leave. The climate of work environments can be defined as a set of organizational characteristics that are relatively stable, differentiate organizations, and influence the behaviors of organizational members (Flarey, 1993). The set of characteristics comprise three different dimensions: a relationship dimension, which includes involvement, peer cohesion, and supervisor support; a personal growth dimension, which includes autonomy, task orientation, and work pressure; and a system maintenance and change dimension, which includes clarity, management control, innovation and physical comfort (Garrett & McDaniel, 2001). Climate generally measures perceptions or feelings about the organization or work environment. This study focuses on the physical environment aspect of the nursing workplace in an inpatient acute care setting.
Nursing in an Inpatient Acute Care Work Environment

Acute care nursing is primarily concerned with short term nursing care for individuals who have a known or predicted physiological alteration. Acute care nursing, also known as medical-surgical nursing, is the foundation of all nursing practice (Academy of Medical-Surgical Nursing, 2007). These nurses have the opportunity to interact with and care for patients with a wide variety of clinical conditions such as surgeries, acute conditions (i.e. pneumonia), and others who may be in the final stage of a progressive or chronic disease. Medical-surgical nurses have a vast set of skills, are patient advocates, welcome diversity and make a difference in people’s lives everyday. It is one of the most demanding specialties of all of the nursing specialties.

Aging and Turnover of the U.S. Nursing Workforce

Registered nurses in the United States are, on average, more than 43 years old and will average 50 years old by 2010, and having a major turnover rate averaging 20 percent per year. Only 20 percent of the registered nurses in the workforce are under the age of 30. A study by Peter Buerhaus of Vanderbilt University on aging nurses published in the November 17, 2004 issue of Health Affairs, paints a dire picture of the nursing shortage in the years ahead. According to the study, although overall employment of registered nurses increased by approximately 205,000 since 2001, most of the growth was attributed to nurses over 50 years of age or foreign-born nurses, followed by women in their early thirties and men. The study recommends that schools of nursing increase their capacity to educate new registered nurses, as well as improve the ergonomic environment, especially to accommodate older nurses (Buerhaus, 2004).
Buerhaus predicts that over the next two decades, a further aging of the registered nurse workforce will continue, with the largest cohorts of registered nurses being between 50 and 69 years of age. Within the next 10 years, the average age of registered nurses is forecast to be 45.4 years old, an increase of 3.5 years over the current age, with more than 40 percent of the registered nurse workforce expected to be older than 50 years of age. By the year 2020, the registered nurse workforce is forecast to be roughly the same size as it is today, falling nearly 20 percent below projected RN workforce requirements (Buerhaus, 2004). As more nurses decide to leave the nursing profession, it is appropriate and timely for nurses in leadership positions – nursing education and nursing administration – to establish new ways of addressing and changing these stressors.

**Role of the Physical Environment**

One of the earliest pioneers of the importance of the physical environment in healthcare was Florence Nightingale. Her efforts on behalf of the British soldiers during the Crimean War focused on design engineering to improve lighting (especially sunlight), ventilation, heating and cooling, sewage facilities, and sufficient space for soldier’s belongings. The safety of clean air and water were important to Nightingale’s patients and to her nurses. The effects of her improvements on outcomes were reflected in the mortality figures for 1855, which fell from 42.7 deaths per 1000 to 2 per 1000 within 3 months of Nightingale’s changes (Seifert, 2005).

In the 2004 report entitled, *The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a Lifetime Opportunity*, Craig Zimring and Roger Ulrich argue that there are now 600 well done studies that show hospital design can significantly
influence medical outcomes. They contend that most hospitals today are noisy, cheerless places that patients find cold and frightening. In addition, crowded, noisy, poorly thought out nursing stations and other staff workspaces add to staff stress and increase the risk of medical errors, which cause an estimated 98,000 deaths in the USA alone. “Hospitals are unnecessarily stressful and dangerous places,” Zimring says.

A study undertaken in England in 2004, the CABE study, found that hospital design affects the recruitment, retention and performance of nurses. The study found that well designed healthcare facilities influence the choice of hospital that nurses will decide to work in and that nurses want to be involved in design decisions. Nurses say that hospital design is an important aspect of whether they choose to stay in a job as it affects how valued they feel by the organization. Nurses stated that the main issues that were of importance in design were:

- Provisions of some facilities such as banks, shops and cafes.
- Public spaces that encourage interaction so that nurses feel part of the bigger picture rather than a discrete unit.
- Visible security.
- Designing for flexibility so that as changes in patient care are made, one space can easily be converted into another.
- Sufficient workspace and wide enough doors etc.

Finally, factors affecting performance include:

- Flexible working spaces, layout and distance to be traveled between tasks.
- Exposure to artificial versus natural light and ventilation.
Having dedicated spaces for staff rest and relaxation, including attractive areas outside as well as adequate staff facilities such as lockers, showers etc.

Provision of space for confidential discussions with patients and other staff.

Sufficient and functional storage space.

Quality of fixtures and fittings such as door frames locks and sink fittings that do not facilitate good infection control practices.

More recently, environmental factors such as noise, air quality, light, toxic exposures, temperature, humidity and aesthetics have been scrutinized for their effects on both patients and workers. The combination of environmental factors with the growing consumer demand for safety, security, competence, and physical and psychological comfort has engendered the concept of a “healing environment.” Healthcare designers in 1988 initiated the concept of a healing environment that could facilitate the healing process by identifying factors that improve the access to people and resources, increase employee comfort, expand patient privacy by reducing noise and distractions, and provide flexibility and personalization in the delivery of care. In the past few years, healthcare designers and healthcare facilities have formed partnerships to incorporate healing environmental design aspects into their renovation and new construction projects, and to measure the effects of these initiatives on patient outcomes (Seifert, 2005).

Workflow design addresses the processes of delivering healthcare. This category includes the interactions between workers as well as the worker-workplace interface. Workflow design looks at:

What, how, and where tasks are accomplished;
• The effects of job characteristics (e.g., distraction, monotony, redundancy, transfer of responsibility, complexity) on patient safety; and

• Workplace features such as ergonomics, equipment, workspace, and information technology.

Interruptions and distractions contributing to accidents have been analyzed by the aviation industry (Dornheim, 2000) and the findings have been applied to the healthcare industry (AHRQ, 2001). Healthcare workers and patients may be distracted by pagers, overhead announcements, alarms, cell phones and other sounds. Other forms of communication for nonurgent messages can include message boards, voice mail or electronic mail. (Seifert, 2005). Noise distractions can lead to an increase in patient care errors that result in an increase in nursing dissatisfaction.

Odors

Odors are negative components of air quality. Indoor air quality has deteriorated since the 1970’s due to the oil shortage and construction of energy efficient buildings. Windows no longer open and the heating and air conditioning reuses the same air. Gone are the days when the nurse can open a window to increase ventilation. Health problems associated with indoor air quality of hospitals include airborne infection outbreaks, latex allergies, and exposure to chemical agents, anesthetic gases and pharmacological agents that can be released and distributed throughout the hospital (Brownson, 2000). Maintaining good air quality involves careful design, location and control of environmental elements.

Air quality has been linked to health and stress in the workplace. The quality of air at work is a concern for employees and is often rated as one of the most important
factors in the work environment. Feeling as though the air in the workplace is of poor quality can result in dissatisfaction with one’s job as well as the building (Mroczek, 2005).

Smells can be direct (aromas) or negative (odors). Smells have a strong link to the limbic system, the brain’s emotional center, and are therefore more memorable than either sights or sounds (Jones, 1996). Aromatherapy is widely accepted in Europe and Asia as part of the healing process. The scent of vanilla has shown to be particularly beneficial. The essential oils of certain fruits and flowers are shown to have similar effects (Jones, 1996). Medicinal smells, which can be perceived as odors, stimulate anxiety, fear and stress; while pleasant aromas can reduce blood pressure, slow respirations and lower pain perception levels (Jones, 1996). The presence of odors in the clinical environment may lead to increased nursing stress, which leads to job dissatisfaction and ultimately turnover intention.

The perception of odor is dominated by the pleasant or unpleasant dimension. Odor can affect mood due to the overlap of the olfactory and emotional systems in the brain. Based on the survey instrument available, we chose to look at the level of odor. Unlike noise, levels of odor are not as clearly defined. S. Schiffman (2000) attempted to clarify the level of odor exposure and related potential health effects. Levels ranged from odor perception to acute toxicity. Pleasant smells are shown to enhance mood and decrease stress.

Noise

Noise, whether positive or negative, is defined as environmentally generated sound with no specific human purpose (Ulrich, 2004). World Health Organization
(WHO) guideline values for continuous background noise in hospital patient rooms are 35dB, with nighttime peaks in wards not to exceed 40dB (Berglund, Lindvall, & Schwela, 1999). Many studies have shown that hospital background noise levels far exceed these guidelines. Background noise levels typically are 45-68dB, with peaks frequently exceeding 85-90dB (Blomkvist, 2005). The research reviewed suggests that hospitals are excessively noisy for two general reasons. First, noise sources are numerous and many are loud. Second, environmental surfaces—floors, walls, ceilings—usually are hard and sound reflecting, not sound absorbing, creating poor acoustic conditions (Ulrich, 2004).

Many research studies have examined the effects of noise on patients, but few studies are available for healthcare staff. There is evidence that staff perceive higher sound levels as stressful (AIA Architect, 2005). Noise induced stress in nurses’ correlates with reported emotional exhaustion and/or burnout (AIA Architect, 2005). The increased feelings of noise related stress and burnout lead to an increase in turnover intention. A recent study by Blomkvist et al. examined the effects of higher versus lower noise levels on a group of coronary intensive care nurses over a period of months. Lower noise levels were linked with a number of positive effects on staff, including reduced perceived work demands, increased workplace social support, improved quality of care for patients, and better speech intelligibility. The Agency for Healthcare Research and Quality (AHRQ) review of research on the relationships between working conditions and patient safety showed insufficient evidence of a definite negative impact of ambient noise on patient outcomes. There is a movement to control environmental noise levels. Reduced noise levels have been incorporated into construction design with the use of sound-proof
building materials. Where noise can become a distraction (potentially affecting the accuracy of caregiver's work), noise reduction strategies should be implemented. Environmental interventions that have proven especially effective for reducing noise and improving acoustics in hospital settings include: installing high-performance sound absorbing ceiling tiles, eliminating or reducing noise sources (i.e. adopting a noiseless paging system), and providing single bed rather than multi-bed patient rooms.

**Light**

Light can be categorized as natural or artificial. Sunlight, or natural light, is electromagnetic radiation in the wavelength range that can be absorbed by the photoreceptors of the eye (Joseph, 2006). In contrast, light from most artificial electric-light sources such as cool white fluorescent light and incandescent lights, are composed of wavelengths of light that are concentrated in limited areas of the visible light spectrum (Edwards & Torcellini, 2002). Studies have shown that people prefer daylight to artificial light for work and like to be close to windows (Heerwagen & Heerwagen, 1986). Heerwagwn and Heerwagen (1986) found that office occupants preferred daylight over artificial light for seven different purposes: psychological comfort, office appearance and pleasantness, general health, visual health, color appearance of people and furnishings, work performance, and jobs requiring fine observation. Greater sunlight has also been linked to higher job satisfaction (Leather, Pygras, Beale, & Lawrence, 1998).

There are few empirical studies that have examined the impact of light – artificial or natural - on mood or task performance in healthcare settings. A study of 141 nurses in Turkey found that nurses exposed to daylight for at least 3 hours a day experienced less stress and were more satisfied at work (Alimoglu & Donmez, 2005). Constant exposure
to artificial light, in particular fluorescent tube light, is commonly mentioned by nurses as one of the most draining aspects of working on a nursing unit (AHRQ, 2003). Looking out at natural light can improve health outcomes, including agitation, sleep and circadian rest – activity rhythms (AHRQ, 2003).

Research from the field of environmental psychology has also shown that amount and type of light can have implications for employee’s feelings, performance, and job satisfaction (Mroczek, 2005). Increased light appears to increase arousal level, and light levels may influence the amount of time the employees spend in the workplace. When workspaces are darker, employees are more likely to leave when they have the choice, such as eating lunch out of the office versus eating at their desks (Mroczek, 2005).

Employees’ feelings about light from the outdoors are very clear. Although sunlight does have the potential to produce glare, most workers prefer to be located near a window. Greater sunlight penetration has also been associated with greater job satisfaction (Mroczek, 2005). Windows offer views to the outside also help to buffer the effects of job stress. Windows offer the opportunity to stay in touch with the outside world (i.e. weather, time of day). No evidence suggests that windows enhance or improve performance, but they reduce boredom and increase overall job satisfaction.

It is recognized that natural light is better, but based on the survey instrument available, we chose to look at the level of light. Unlike noise, levels of light are not as clearly articulated. A. Joseph from The Center for Health Design, identifies that previous researchers have demonstrated that the most obvious effect of light on humans is in enabling vision and performance of visual tasks. Performance on visual tasks gets better
as light levels increase (Boyce, Hunter, & Howlett, 2003). Individuals may feel stressed if they are unable to perform tasks due to inadequate levels of lighting.

**Color**

In addition to lighting, the use of color has been reviewed. Color is an essential element of visual stimulation with well-documented psychological and physiological effects. Warm colors, especially when accompanied by high illumination levels, have found to encourage activity, while cool colors promote more passive behavior (AHRQ, 2003). Colors range from soothing to stimulating. Reds, yellows, and oranges have longer wavelengths and are considered warm, stimulating, colors. Blues, greens, and purples have shorter wavelengths and are considered cool, soft, soothing colors. Since greens and blues are calming, these would most likely be the most positive colors to use in the adult workplace as green is also found to stimulate growth and balance emotions and is found to be highly preferred by adults (Church, 2002). These characteristics can be applied to specific clinical areas. For example, a postoperative unit can promote a feeling of calmness with soft colors and soft music. A more stimulating environment created with vibrant but warm colors and music may be appropriate for a geriatric unit (AHRQ, 2003). In 1996, Kwallek and colleagues studied the effects of color on clerical tasks performed in an office. They found that there were significantly more proofreading errors in white offices compared with blue or red offices (Kwallek, 1996).

The effect of aesthetics is difficult to quantify. What is considered beautiful or psychologically pleasing is a subjective judgment. Focus group interviews and marketing surveys of patients, administrators, physicians, nurses, and other caregivers have demonstrated some common themes that relate to patient satisfaction. One of these
themes is that the healthcare institution’s physical facilities (décor, displays, cheerfulness of the facility) are an important element in patient’s perception in the quality of care. This perception is significant because, in the past, patient satisfaction has been attributed mainly to the clinical aspects of care. Well-groomed and well-dressed staff can reflect respect for patients and visitors as well as consideration for each other. Wearing color-coded uniforms that denote the clinician’s professional role or work unit can help to clearly identify caregivers and designate their work role (Seifert, 2005).

Impact of Workplace Design

A network of healthcare providers has partnered with the Center for Health Design (CHD) to provide measurable results of the impact of design on patient health and recovery, financial operations, and staff satisfaction and turnover. The mission of this project, known as the Pebble Project, a six-year-old research initiative of the CHD, is “to create a ripple effect in the healthcare community by providing researched and documented examples of healthcare facilities whose design has made a difference in the quality of care and financial performance.” Preliminary results are showing that evidence based design can reduce the number of patient falls, healthcare acquired infections, transfers and staff turnover. The data also show increases in patient and employee satisfaction and philanthropic giving. They are also speculating that design efficiencies will result in reduced staff fatigue (Livingston, 2004).

Research suggests that parallel to evidence-based medicine, we can move to evidence-based design (EBD). EBD refers to a process for creating healthcare buildings, informed by the best available evidence, with the goal of improving outcomes and of continuing to monitor the success of designs for subsequent decision making (Ulrich,
2004). It is not about hospitals that are nicer or fancier than traditional hospitals. The focus of evidence based design is to create hospitals that actually help patients recover and be safer, and help staff do their jobs better. EBD is a process for creating health care buildings informed by the best available evidence concerning how the physical environment can interfere with or support activities by patients, families, and staff. Many of the improvements suggested by EBD are only slightly more expensive than traditional solutions, if they are more expensive at all (Ulrich, 2004).

Measurable results are evident at the Barbara Ann Karmanos Cancer Institute in Detroit, an alumnus of the Pebble Project. Nurse attrition fell from 23 percent to 2.3 percent; patient falls were reduced 6 percent because angled doorways, lighting and room layout provided patients better sight lines; and patient satisfaction rose 18 percent. Most significant perhaps is the 30 percent reduction in medical errors resulting from location of and increased space in the medication room, better organization of medical supplies and visual cues, and acoustical panels that minimize ambient noise (Livingston, 2004).

As part of the Pebble Project, Parrish Medical Center in Titusville, Florida opened a new hospital in 2002. A survey of 734 staff members in 2004 found that the majority feel that the design features access to natural light, improved airflow, separation of public/patient transport areas, and “homelike” patient room design—positively affect the quality of their work life and help them provide care more effectively.

- Staff turnover is at 13% a year since the new building opened. It was in the low 20s in the old facility (Center for Health Design, 2005).
Another partner in the Pebble Project is Methodist Hospital/Clarian Health Partners in Indianapolis, Indiana. Since opening its new Comprehensive Cardiac Critical Care unit in 1999, the following data has been collected:

- Patient falls are down 75% due to the unit’s decentralized design, which allows for better observation.
- Patient room layout, equipment integration, and other design features have helped push patient transfers down 90%.
- Overall patient dissatisfaction has dropped from 6% in 1998 to 3% in 2001.
- Decrease in patient transfers and nurses’ more consistent knowledge of each patient’s condition has contributed to an improved medication error index.
- Unit design has helped reduce the caregiver workload index, resulting in improvements in nursing efficiency (Center for Health Design, 2005).

According to Roger Ulrich, "Design isn’t just an aesthetic luxury in healthcare; it’s a core, health-related area. We’re learning that when you use scientific evidence to drive the design of healthcare environments and processes, you impact a wide variety of factors, from medical errors and nosocomial infections, to stress and staff turnover. Research into the impact of design is yielding results in economic and clinical indicators, market share, and satisfaction numbers-results that carry weight with decision makers in healthcare institutions" (Bilchik, 2002).

**Hypotheses**

1. There is a direct relationship between perceived level of odor and perceived stress among inpatient acute care nurses.
2. There is a direct relationship between perceived level of noise and perceived stress among inpatient acute care nurses.

3. There is an inverse relationship between perceived level of light and perceived stress among inpatient acute care nurses.

4. There is a direct relationship between perceived level of light and job satisfaction among inpatient acute care nurses.

5. There is an inverse relationship between perceived stress and job satisfaction among inpatient acute care nurses.

6. There is an inverse relationship between job satisfaction and turnover intention among inpatient acute care nurses.

7. There is a direct relationship between perceived stress and turnover intention among inpatient acute care nurses.

Figure 1. Causal Model of Turnover Intention
Due to the limited theoretical and/or empirical evidence, hypotheses could not be proposed for the relationships between (1) warm, stimulating colors and perceived stress and (2) perceived level of odor and job satisfaction. Therefore, the following research questions were asked.

**Research Questions**

1. Is there a relationship between warm, stimulating colors and perceived stress?
2. What is the relationship between perceived level of odor and job satisfaction among inpatient acute care nurses?
Chapter III

Methods

This chapter presents the research design used to examine the relationships between the dependent variables of perceived stress, job satisfaction, and turnover intention and each of the independent variables: (a) odor, (b) noise, and (c) light. This chapter includes discussion of the (a) research setting, (b) sample, (c) instruments, and (d) data collection method.

Research Setting

Data was gathered from full-time registered nurses who work in a 588 bed Level 1 trauma center located in northern New Jersey. This facility has been serving the community for over 100 years, setting high standards for patient care in state – of – the – art facilities with a full range of medical specialties and services. This hospital, which is a Magnet designated facility, is accredited by The Joint Commission, is a partner of the Cancer Institute of New Jersey and has primary academic and clinical affiliations.

Nurses completed surveys at work anytime prior to going home from their respective shift during uninterrupted time. This facilitated the remembering of details (i.e. odors, noise, light, color). The survey was not to be taken home for completion.

Sample

A self-administered survey of full – time staff registered nurses was used to explore the relationship between physical work environmental factors, perceived stress, job satisfaction and turnover intention among nurses working in an inpatient acute care hospital.
Inclusion criteria consisted of nurses who are (a) employed full-time (defined as working at least 36 hours per week) in direct patient care, (b) registered nurses and (c) working in one of the six major inpatient medical/surgical areas (i.e. orthopedics, cardiac, oncology, thoracic, geriatric, and neuroscience). Exclusion criteria consisted of (a) part-time or per diem employees, (b) nursing management personnel, and (c) the following clinical areas: critical care, emergency services, obstetrics, and the operating room. Full-time employees were used due to the potentially different stress experienced by part-time or per diem employees. Nurses in management positions and areas outside of the medical/surgical areas were excluded due to the well-documented differences in stressors related to job responsibilities.

A sample size of 110 was needed for investigation of 6 variables in the model (i.e. 10 subjects per variable plus 50) (Thorndike, 1978). Of the 285 surveys distributed, 116 surveys were returned which yielded an overall response rate of 41%. Of the 116 registered nurses who participated in the study, 19% worked on a cardiac – medical unit, 8% on a cardiac – surgical unit, 9% on a neuro/respiratory unit, 10% on orthopedics, 16% on oncology, 2% on a minimally invasive thoracic unit and 35% worked on more than one of the units listed above. One registered nurse did not identify the unit that she worked on. The frequency distribution of nursing units is found in Table 1.

In the initial study proposal, one additional survey instrument was included which obtained information on socio-demographic variables, employment history and level of education but was removed at the request of the Institutional Review Board of the University of Medicine and Dentistry of New Jersey.
Table 1.

**Frequency Distribution of Nursing Units**

<table>
<thead>
<tr>
<th>Nursing Unit</th>
<th>n</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac - Medical</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>Cardiac – Surgical</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Neuro – Respiratory</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>Orthopedics</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Oncology</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Minimally Invasive Thoracic Unit</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Multiple Units</td>
<td>41</td>
<td>35</td>
</tr>
<tr>
<td>Did not specify unit</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Instruments**

Standardized survey instruments were used to develop the survey tool, which assessed work environmental stressors, perceived nursing stress, job satisfaction, and turnover intention. Standardized survey instruments used in the development of the survey tool included the Perceived Stress Scale – 10 item (PSS – 10) (Cohen et. al., 1983), Nurses’ Intent to Stay Questionnaire (Taunton et. al., 1997), and the M.D. Anderson Patient Contact Staff Survey (The Center for Health Design, 2004).
Perceived Stress Scale – 10

The Perceived Stress Scale (PSS) measures the degree to which situations in one’s life are appraised as stressful (Cohen et. al., 1983). The PSS was designed for use with community samples with at least a high school education. The items are easy to understand and the response alternatives are easy to grasp. The scale measures the degree to which respondents find their lives to be unpredictable, uncontrollable, and overloading over the past month. The scale includes a number of direct queries about current levels of experienced stress. The questions are general in nature and are free of content specific to any sub-population group. In each case, respondents are asked how often they felt a certain way. Respondents rate items on a 5-point Likert scale (0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often). The original scale contained 14 items. The 14-item Perceived Stress Scale was factor analyzed, using a principal components method with varimax rotation (Cohen et. al., 1988). Consequently, a somewhat shorter version of the Perceived Stress Scale, the PSS – 10 was derived by dropping the four items with relatively low factor loadings. Factor analysis was performed on the PSS – 10 and all items positively loaded on the first factor at .42 or above. There was also a slight improvement in both the total explained variance and internal reliability of the PSS – 10 (alpha coefficient = .78) (Cohen et. al., 1988). The PSS – 10 appears to provide at least as good a measurement of perceived stress as does the longer scale and is recommended for use in future research (Cohen et. al., 1988).

Three samples were used for validation: two college student samples and one more heterogeneous sample enrolled in a smoking cessation program. Coefficient alpha reliability for the PSS was .84, .85, and .86 in samples tested (Cohen et. al., 1983). The
PSS showed adequate internal and test - retest reliability (ranges from .55 - .85) and is correlated in the expected manner with a range of self - report and behavioral criteria (Cohen et. al., 1983).

Scoring consists of summing all items to yield a total score between 0 and 40 with 0 indicating low stress and 40 high stress. Mean scores can range from 0 to 4. In this study, the mean range of scores was from .20 to 3.0. Our sample had a mean of 1.85, which would indicate moderate stress in our study population.

Nurses Intent to Stay Questionnaire

The Nurses’ Intent to Stay Questionnaire, based on previous research by Taunton et. al. (1997), was used. Permission to use the tool was obtained from Roma Lee Taunton, PhD, RN, FAAN, Professor Emeritus from the University of Kansas School of Nursing. The original questionnaire consisted of five sets of questions that measured intent to stay, satisfaction at work, satisfaction with administration, organizational commitment and work cohesion. A Likert scale of five, six, or seven positions was used so that a numerical value could be assigned to each item that could influence a RN’s decision to keep his/her job. A global score was determined for each variable. For the purposes of this study, 4 intent to stay questions and 7 job satisfaction questions were used.

The original Job Satisfaction Questionnaire utilized 15 questions but our survey tool was reduced to 7 questions at the request of the University of Medicine and Dentistry of New Jersey Institutional Review Board. The seven questions on the Job Satisfaction Questionnaire were measured on a six-point Likert scale from “strongly agree”(1) to “strongly disagree”(6). The response choices (i.e. strongly agree, etc.) were kept in alignment with the way in which the tool was created. Two items were reversed scored in
the analysis to indicate low scores equal high satisfaction. Scoring consists of summing over all items to yield a total score between 7 and 42. In the job satisfaction tool's present form, high scores indicate low satisfaction (i.e. high dissatisfaction). The mean score can range from 1 to 6. The mean range of responses in this study was 1.0 to 5.71 with an average of 2.78. This indicates that this study population is moderately satisfied with their current job.

The Turnover Intention Questionnaire consists of four questions with three being measured on a five-point Likert scale from “definitely will not leave”(1) to “definitely will leave”(5). One question was measured on a five point Likert scale from “will definitely leave in the near future”(1) to “definitely will not leave in the near future”(5). Scoring consists of reverse rating for one item and then summing over all items to yield a total score between 4 and 20. The intent to stay questions reflect the higher the score the higher the intention to turnover. The possible range of mean scores is 1 to 5. The mean range of responses in this study was from 1.0 to 5.0 with a mean of 2.37. This would indicate a moderate level of turnover intention.

The reliability of these tools was assessed using Cronbach’s alpha. The respective alphas were, 77 and .91. Content validity was determined by a review of the literature.

University of Texas M.D. Anderson Cancer Center Staff Survey

This tool focuses on the built environmental factors. It has not yet been released into the public realm. Permission to use this tool was obtained from Jason M. Etchegaray, PhD. from the M.D. Anderson Cancer Center and Anjali Joseph, PhD., Director of Research at the Center for Health Design. The survey tool asks the staff about their physical work environmental conditions, support, and compensation. The tool focuses on
the environmental factors that can interfere with and/or support staff activities. Specifically this tool is a 76 – item (Likert scale) questionnaire with a scale that ranges from “Strongly Disagree” to “Strongly Agree.” For the purposes of this study, the questions that relate to the physical work environment (i.e. odor, noise, light and color) were used. Information related to reliability and validity is limited. Content validity was determined by a review of the literature.

The Physical Work Environment Survey (PWES), a self-report scale, consists of 15 items measured on a seven point Likert scale from “strongly disagree” (1) to “strongly agree” (7). Four questions relate to noise, four to light, three to odor, two to color and two were generic environmental questions. The generic questions do not fit into any specific category. In addition, the respondents were asked one open-ended question about color (i.e. What are the colors of the walls in your patient care area?). The range of scores for noise is 4 to 28 with a mean of 1.0 to 7.0. The mean range for this study was 1.0 to 7.0 with a mean of 3.8. The range of scores for light is 4 to 28 with a mean of 1.0 to 7.0. The mean range for this study was 1.25 to 7.0 with a mean of 4.86. The range of scores for odor is 3 to 21 with a mean of 1.0 to 7.0. The mean range for this study was 1.0 to 7.0 with a mean of 4.5. The range of scores for color is 2 to 14 with a mean of 1.0 to 7.0. The mean range for this study was .5 to 7.0 with a mean of 4.37. Scoring consists of reverse ratings for five items and then summing over all items to yield a total score between 15 and 105. Higher scores indicate a positive response. The mean range of responses for this study was 1.67 to 6.47 with a mean of 4.31. This is indicative of moderate satisfaction with current workplace environmental factors. The composite score was not used to test the hypotheses.
Procedure for Data Collection

Permission to conduct the study was granted by the University of Medicine and Dentistry of New Jersey Institutional Review Board and by the Institutional Review Board of the participating hospital.

The study was personally introduced by the author, to the management of each participating nursing unit. A script was drafted for the nurse managers in order to present the study at their respective staff meetings. The script enabled the presentation of consistent study information. The Clinical Nurse Researcher at the participating hospital acted as the study facilitator. The study facilitator assisted by delivering the introductory cover letters (see Appendix F) and survey packets (see Appendices A through E) to the management of each nursing unit with instructions on which staff mailboxes to put the survey packets. The survey packets included: a) written instructions about completion and return of the survey packet; b) a demographic questionnaire; c) a physical work environment survey; d) the Perceived Stress Scale – 10 item; e) a job satisfaction questionnaire; f) a turnover intention questionnaire; and g) a self-addressed stamped envelope. A poster (see Appendix G) was displayed in each staff lounge by the facilitator one week after survey distribution. Two weeks after survey distribution, the facilitator delivered a postcard reminder (see Appendix H) to the management of each nursing unit with instructions on which staff mailboxes to put the postcard reminders. Completed surveys were returned individually to the researcher in the self-addressed stamped envelope provided in the survey packet. The surveys were to be completed at work anytime prior to going home from their respective shift during uninterrupted time. This facilitates the remembering of details (e.g. odors, noise, light, color). Participants were
instructed not to share or discuss answers with colleagues during completion of the survey. The survey was not to be taken home for completion. There is a space for the date and time of completion at the end of the survey tool. Return of the survey tool acknowledges consent to participate in the study. As an incentive to participate in the study and to show appreciation for the time and effort in completing the surveys, $10.00 Life Uniform coupons were placed in every other survey packet.

Possible risks associated with study participation are minimal. Some nurses may acknowledge their stress as a result of completing the questionnaires, as a result of heightened awareness, but this is perceived to be minimal. Benefits from participation include understanding the relationship between physical work environmental factors and the end result of staff turnover, which will give direction to Hospital Administrators as to the relative importance of reducing environmental stressors in order to increase job satisfaction.

Data Management

The SPSS (Student Version 11.0) software package was used to analyze the data. Internal reliabilities (Cronbach alphas) for each instrument were determined and ranged from .76 to .87. All instruments demonstrated adequate reliability with adjustments.

Descriptive statistics including means, standard deviations, and ranges were obtained for study variables: odor, light, perceived stress, job satisfaction and turnover intention. Questionnaires were reviewed for completion prior to data entry. No respondents were eliminated due to a high number of missing items.

All hypotheses were tested using Pearson Product – Moment correlations. Although a causal model was not proposed, based on hypothesized relationships, an
overall model was tested using regression analysis to determine variance and explanation of intention to turnover. Items were combined to get sum scores. For example, a target variable reflecting the mean of the responses of the four items on the Turnover Intention Questionnaire (TIQ) was created. The mean of the sum of these scores determined the higher the mean score the greater the chance for turnover. This was completed for each target variable.

In summary, collected data was coded and entered into a database by the investigator. Attempts were made to clean the data prior to data entry and reverse scoring was done when appropriate.
Chapter IV

Analysis of the Data

The purpose of the study was to examine the relationship between three dependent variables: perceived stress, job satisfaction, and turnover intention and three independent variables: odor, noise, and light. Data was collected from 116 full-time registered nurses using the Perceived Stress Scale – 10 (PSS – 10), the Nurses’ Intent to Stay Questionnaire, and the University of Texas M.D. Anderson Cancer Center Survey. This chapter presents findings resulting from the analysis of the data.

Statistical Description of the Variables

Sum scores for odor, measured by three questions on the Perceived Work Environment Survey (PWES), ranged from 1.0 to 7.0 ($M = 4.5$, $SD = 1.39$). For noise, which was measured by four questions on the PWES, ranged from 1.0 to 7.0 ($M = 3.8$, $SD = 1.2$). Scores for light, which was measured by four questions on the PWES, ranged from 1.25 to 7.0 ($M = 4.86$, $SD = 1.48$). Scores for perceived stress, which was measured with the Perceived Stress Scale – 10 item (PSS), ranged from .20 to 3.0 ($M = 1.85$, $SD = .48$). Scores for job satisfaction, measured by the Job Satisfaction Questionnaire (JSQ), ranged from 1.0 to 5.71 ($M = 2.78$, $SD = .97$). Scores for turnover intention, measured by the Turnover Intention Questionnaire (TIQ), ranged from 1.0 to 5.0 ($M = 2.37$, $SD = .85$). These findings are summarized in Table 2.

All variables, except light, demonstrated fairly normal distributions. Scores for perceived level of light (mean), were skewed to the right indicating a large number of responses greater than the mean.
Table 2.

Descriptive Statistics of Study Variables (Odor, Noise, Light, Perceived Stress, Job Satisfaction, Turnover Intention)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>116</td>
<td>1.0</td>
<td>7.0</td>
<td>4.5</td>
<td>1.39</td>
</tr>
<tr>
<td>Noise</td>
<td>116</td>
<td>1.0</td>
<td>7.0</td>
<td>3.8</td>
<td>1.23</td>
</tr>
<tr>
<td>Light</td>
<td>116</td>
<td>1.25</td>
<td>7.0</td>
<td>4.86</td>
<td>1.48</td>
</tr>
<tr>
<td>PSS</td>
<td>116</td>
<td>.20</td>
<td>3.0</td>
<td>1.85</td>
<td>.48</td>
</tr>
<tr>
<td>JSQ</td>
<td>116</td>
<td>1.0</td>
<td>5.71</td>
<td>2.78</td>
<td>.97</td>
</tr>
<tr>
<td>TIQ</td>
<td>116</td>
<td>1.0</td>
<td>5.0</td>
<td>2.37</td>
<td>.85</td>
</tr>
</tbody>
</table>

Psychometric Properties of the Instruments

All of the instruments used in the study demonstrated coefficient alphas for internal consistency reliability greater than .70, which Nunally (1978) states is the acceptable level for instrument reliability for basic research. The Physical Work Environment Survey (PWES) had a coefficient alpha of .82. The four items on the PWES that measured the effect of noise on staff activities had a coefficient alpha of .70, four items, which measured the effect of light, had a coefficient alpha of .87, and the three items which measured the effect of odor had a coefficient alpha of .77. The Perceived Stress Scale – 10 item (PSS) had a coefficient alpha of .76, which is similar to the values found by Cohen (1988). The Job Satisfaction Questionnaire (JSQ) portion of the Nurses
Intent to Stay Questionnaire had a coefficient alpha of .87, which is similar to the one reported by Taunton et al. (1997). Finally, the intent to stay questions which measured nursing turnover intention (TIQ) had a coefficient alpha of .82, which is similar to the one obtained by Taunton et al. (1997). Table 3 summarizes these findings.

Table 3.

**Alpha Reliability Coefficients for Study Variables (Odor, Noise, Light, Perceived Stress, Job Satisfaction, Turnover Intention)**

<table>
<thead>
<tr>
<th>Instruments</th>
<th>n</th>
<th>alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Work Environment (PWES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odor</td>
<td>116</td>
<td>.77</td>
</tr>
<tr>
<td>Noise</td>
<td>116</td>
<td>.7</td>
</tr>
<tr>
<td>Light</td>
<td>116</td>
<td>.87</td>
</tr>
<tr>
<td>PSS</td>
<td>116</td>
<td>.76</td>
</tr>
<tr>
<td>JSQ</td>
<td>116</td>
<td>.87</td>
</tr>
<tr>
<td>TIQ</td>
<td>116</td>
<td>.81</td>
</tr>
</tbody>
</table>
Hypotheses

All hypotheses were tested using the Pearson Product – Moment correlation coefficient. Two – tailed tests of significance were used to test these directional hypotheses.

Hypothesis 1

Hypothesis 1 stated that there would be a direct relationship between perceived level of odor and perceived stress among inpatient acute care nurses. The Pearson Product – Moment correlation testing this relationship was $r = -.14$, $p = .14$. Hypothesis 1 was not supported because the relationship was not statistically significant and it was inverse, rather than direct as hypothesized.

Hypothesis 2

Hypothesis 2 stated that there would be a direct relationship between perceived level of noise and perceived stress among inpatient acute care nurses. The Pearson Product – Moment correlation for this relationship was $r = -.18$, $p = .05$. Hypothesis 2 was not supported because the relationship was not statistically significant and it was inverse rather than direct as hypothesized.

Hypothesis 3

Hypothesis 3 stated that there would be an inverse relationship between perceived level of light and perceived stress among inpatient acute care nurses. The Pearson Product – Moment correlation for this relationship was $r = -.11$, $p = .24$. Based on this finding, Hypothesis 3 was supported but not statistically significant.
Hypothesis 4

Hypothesis 4 stated that there would be a direct relationship between perceived level of light and job satisfaction among inpatient acute care nurses. The Pearson Product – Moment correlation for this relationship was $r = -.12$, $p = .20$. Hypothesis 4 was not supported because the relationship was not statistically significant and it was inverse rather than direct as hypothesized.

Hypothesis 5

Hypothesis 5 stated that there is an inverse relationship between perceived stress and job satisfaction among inpatient acute care nurses. The Pearson Product – Moment correlation for this relationship was $r = .55$, $p = .00$. Hypothesis 5 was not supported because although it was statistically significant the relationship was direct rather than inverse as hypothesized.

Hypothesis 6

Hypothesis 6 stated that there is an inverse relationship between job satisfaction and turnover intention among inpatient acute care nurses. The Pearson Product – Moment correlation for this relationship was $r = .74$, $p = .00$. Hypothesis 6 was not supported because although it was statistically significant the relationship was direct rather than inverse as hypothesized.

Hypothesis 7

Hypothesis 7 stated that there is a direct relationship between perceived stress and turnover intention among inpatient acute care nurses. The Pearson Product – Moment correlation was $r = .34$, and $p = .00$. Based on this finding, Hypothesis 7 was supported both in terms of statistical significance and hypothesized direction of the relationship.
Table 4.

Summary of Results

<table>
<thead>
<tr>
<th>Hypothesized Relationships</th>
<th>Results</th>
<th>r</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ↑ level of odor ↑ stress</td>
<td>↓ odor ↓ stress</td>
<td>-.14</td>
<td>.14</td>
</tr>
<tr>
<td>2. ↑ level of noise ↑ stress</td>
<td>↓ level of noise ↑ stress</td>
<td>-.18</td>
<td>.05</td>
</tr>
<tr>
<td>3. ↑ level of light ↓ stress</td>
<td>↑ level of light ↓ stress</td>
<td>-.11</td>
<td>.24</td>
</tr>
<tr>
<td>4. ↑ level of light ↑ job satisfaction</td>
<td>↑ level of light ↓ job satisfaction</td>
<td>-.12</td>
<td>.20</td>
</tr>
<tr>
<td>5. ↑ stress ↓ job satisfaction</td>
<td>↑ stress ↑ job satisfaction</td>
<td>.55</td>
<td>.00</td>
</tr>
<tr>
<td>6. ↑ job satisfaction ↓ turnover intention</td>
<td>↑ job satisfaction ↑ turnover intention</td>
<td>.74</td>
<td>.00</td>
</tr>
<tr>
<td>7. ↑ stress ↑ turnover intention</td>
<td>↑ stress ↑ turnover intention</td>
<td>.34</td>
<td>.00</td>
</tr>
</tbody>
</table>

Research Question 1

Research question 1 inquired if there was a relationship between warm, stimulating colors and perceived stress. Reds, yellows and oranges have longer wavelengths and are considered warm stimulating colors. The Pearson Product – Moment correlation for this relationship was $r = .08$ and $p = .40$. Based on this finding, there is a direct relationship but it is not statistically significant.

Research Question 2

Research question 2 queried the relationship between perceived level of odor and job satisfaction among inpatient acute care nurses. The Pearson Product – Moment correlation was $r = -.27$ and $p = .00$. Based on this finding, there is a statistically significant inverse relationship.
Model 1

Although a specific hypothesis was not proposed to combine all independent variables to explain the dependent variable of turnover intention, all independent variables were added to a regression model using backward regression. Backward regression was used because none of the independent variables were strong predictors of turnover intention. All independent variables were entered simultaneously and “kicked out” according to their level of significance (p value).

Table 5.

Backward Regression Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Std. Error of the Square</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.591</td>
<td>.573</td>
<td>.55300</td>
</tr>
<tr>
<td>2</td>
<td>.767</td>
<td>.589</td>
<td>.574</td>
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<td>3</td>
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</tr>
<tr>
<td>4</td>
<td>.756</td>
<td>.571</td>
<td>.563</td>
<td>.55912</td>
</tr>
</tbody>
</table>

a Predictors: (Constant), JSQ, NOISE, ODOR, LIGHT, PSS
b Predictors: (Constant), JSQ, NOISE, LIGHT, PSS
c Predictors: (Constant), JSQ, LIGHT, PSS
d Predictors: (Constant), JSQ, LIGHT

The environmental factors of odor and noise did not contribute significantly to the variance in turnover intention. Likewise, perceived stress offered little contribution. Finally, level of light and job satisfaction, together, explained 56% of the variance in turnover intention.

Although the level of light was not significant in the beginning of backward regression (p = .13), as other variables were removed it became significant at steps 3 and 4 (.01 and .01 respectively). Job satisfaction stayed significant throughout steps 1 through 4 (p = .00).
Although the variables in this study were not measured completely free of error, evidence in support of minimal measurement error can be seen in the relatively high coefficient alpha reliability statistics. Pedhazur (1982) explained that the consequences of measurement error of the independent variables are underestimation of beta, which can be as much as 30%. The measurement error has been reported as a common occurrence in nonexperimental research (Pedhazur, 1982).

Schroeder (1990) noted that multiple regression results may be complicated by multicollinearity, which may be apparent if the independent variables are correlated at a level of .85 or greater. Collinearity diagnostics, including visual inspection and tolerance can be used to identify whether or not the degree of multicollinearity observed compromises the integrity of the model (Pedhazur & Schmelkin, 1991; Schroeder, 1990). Visual inspection of the correlation between the variables (perceived stress, job satisfaction, turnover intention, odor, noise, light, and color) remaining in the model was not high enough to demonstrate a problematic degree of multicollinearity. Significant correlations were less than .60 and included job satisfaction and perceived stress ($r = .55$, $p = .00$), odor and job satisfaction ($r = -.27$, $p = .00$).

Additional Findings

The only demographic variable collected was the type of medical – surgical unit the nurses primarily worked on. Focusing on the dependent variable of turnover intention, cardiac medical nurses mean score ranged from 1 to 3.75 with a mode of 2; oncology nurses mean score ranged from 1 to 4 with a mode of 2; orthopedic nurses mean score ranged from 1.75 to 5 with a spilt mode of 1.75 and 2 and 3.75 and 4; neuro/respiratory
nurses mean score ranged from 1 to 3 with a mode of 2.5, and cardiac surgical nurses mean score ranged from 1 to 4 with a mode of 1.75 and 2.

Further analysis was performed to determine differences between nursing units (i.e. cardiac – medical, cardiac – surgical, neuro/respiratory, orthopedic, oncology, minimally invasive thoracic surgery, multiple units, and one did not specify nursing unit) for all variables. There was no statistically significant difference for five of the six variables (i.e. perceived stress, job satisfaction, turnover intention, odor, noise, light). There was a statistically significant difference between units and turnover intention, \( F(7,116)=2.12, p=.05 \). Post hoc analysis could not be performed due to too few responses by participants on certain units.
Chapter V

Discussion of Findings

The purpose of this study was to examine the theoretical relationships between the dependent variables of perceived stress, job satisfaction, and turnover intention to the independent variables of (a) odor, (b) noise, and (c) light. This chapter interprets the findings of the hypotheses tested in light of the theoretical and empirical support from which the hypotheses were derived.

Perceived Level of Odor and Perceived Stress

Hypothesis 1 stated that there would be a direct relationship between perceived level of odor and perceived stress among inpatient acute care nurses. The hypothesis was derived from theory, which indicates that medicinal smells, which can be perceived as odors, stimulate anxiety, fear and stress (Jones, 1996). The hypothesis in the present study, however, was in the opposite direction and not supported when perceived level of odor and perceived stress were analyzed. Instead, an inverse relationship was found between perceived level of odor and perceived stress.

One possible explanation for the inverse relationship between perceived level of odor and perceived stress in the present study may be that people’s perceptions of odors are unreliable because when exposed to the same odor over a period of time, they can adapt to it (adaptation), or fail to notice it at all (habituation) (Engen, 1982). Adaptation is used to describe changes in odor receptors, where habituation relates to a reduction in cessation of the response to a new or startling stimulus (Engen, 1982). Adaptation occurs as a result of fatigue from continued exposure to an odor stimulus.
Hospitals are rich in olfactory stimulation. Cleaning products, medicines, excreta, infected wounds, and gastrointestinal bleeding are a few of the possibilities encountered. Due to continuous exposure to the varied smells in the hospital environment, nurses fall prey to olfactory fatigue and become accustomed to the odors that surround them on a daily basis. The investigator did not personally validate the odors on the specific nursing units. Odors can vary from moment to moment or day to day depending on the patient population at the time. Odor is a personal experience.

In this study the surveys were to be completed at work prior to going home from their respective shift during uninterrupted time. This facilitated the remembering of details (e.g. odors, etc.). The odor related questions on the Physical Work Environment survey tool were quite general and could not eliminate the subjectivity associated with the human sense of smell and the perception of odor. Adaptation could have also played an integral part in the responses. Being fatigued from the familiarity of perceived odors resulted in a low perceived stress level.

**Perceived Level of Noise and Perceived Stress**

Hypothesis 2 stated that there would be a direct relationship between perceived level of noise and perceived stress among inpatient acute care nurses. This hypothesis was based on the theoretical proposition that there is a direct relationship between noise and stress (Blomkvist, 2005). Hypothesis 2 was not supported. In this study, the hypothesis was in the opposite direction and not supported when perceived level of noise and perceived stress were analyzed. Instead, an inverse relationship was found between perceived level of noise and perceived stress.
Results from stress research indicate that an unpredictable and uncontrollable stressor generally yields a stronger stress response than a predictable and controllable event (Thompson, 1981). A predictable stressor offers greater possibilities to prepare oneself and also implicates that there are periods during which the person does not have to be prepared for the stressor (Kjellberg, 1990). Accordingly, an expected noise is generally judged as less annoying than an unexpected one. Similarly, the person who operates a machine and controls its noise is generally less annoyed by it than other people exposed to the same noise (Kjellberg, 1990). Continuous noise, which is under a person’s control by being escappable, will also lower a person’s perceived stress level.

A person’s response to noise is also influenced by his or her attitude toward the source of the noise (Kjellberg, 1990). Mc Kennell (1980) found that the persons least annoyed by the noise from the Concorde airplane were those who had the strongest patriotic feelings for the Concorde project. It is reasonable to assume that the same mechanisms are at work in the hospital setting. One would expect that some noises are a comfort to the nursing staff while caring for their patients. Familiarity with the noises may actually provide a sense of reassurance for the nurse. Noises such as pumps alarming are comforting that the equipment is functioning and that there is an extra safety net knowing that the patient is not going to be harmed by an intravenous bag running out of solution, etc.

Another possible explanation for the inverse relationship between perceived level of noise and perceived environmental stress in the present study may be due to the noise related questions on the Physical Work Environment survey tool. The questions were quite general and could not eliminate the subjectivity associated with the human sense of
hearing. The noise characteristics (i.e. frequency, duration, type, etc.) were not addressed. The questions did not have a stem or a leading sentence to provide a time frame for which to answer the question. Adaptation could have also played a role in the responses in this area as well. In this case, being familiar with the perceived level of noise resulted in a low perceived stress level.

The investigator did not observe each nursing unit to quantify the noise level. Noise levels vary from nursing unit to nursing unit depending on the patient population, equipment being used, the activity level on the nursing unit, or ongoing construction.

**Perceived Level of Light and Perceived Stress**

Hypothesis 3 stated that there would be an inverse relationship between perceived level of light and perceived stress among inpatient acute care nurses. This hypothesis was derived from theory which posits that there is a relationship between exposure to the type of light and stress (Alimoglu & Donmez, 2005; Mroczek, 2005). Alimoglu & Donmez (2005) delineated an inverse relationship between light and stress. Hypothesis 3 was supported.

The work environment for nurses in hospitals is stressful. They are required to perform a multitude of complex duties including critical patient-care tasks (i.e. dressing changes, medication administration, patient assessments). Inadequate lighting and a hectic environment are likely to compound the burden of stress. Adequate lighting conditions are essential for performance of visual tasks by nursing and poor lighting conditions can result in errors being made. It is clear that high lighting levels are needed for complex visual tasks. In this study, the investigator did not quantify or qualify the type or amount of lighting on each nursing unit. Lighting is a personal preference.
Begman and colleagues (1997) suggest that biological lighting needs of humans are different from visual lighting needs, and lack of adequate light for biological stimulation can lead to health and performance problems which can also lead to increased levels of perceived stress. This is particularly important for staffs that work night shifts, but it is also relevant for staffs that work for long periods of time without exposure to daylight. A study of 141 nurses in Turkey found that nurses who were exposed to daylight for at least 3 hours a day experienced less stress (Alimoglu & Donmez, 2005). It is uncertain in this study, how many nurses worked the day or night shift. However, in most hospitals, nursing units, break rooms, and nurses' stations do not have access to natural light but only artificial light.

To help foster a hospital – wide environment that promotes rest, relaxation, and lower stress, many hospitals are implementing “Quiet Time,” where for one hour each day, the staff closes half of the double doors to the patient care areas, departmental lights are dimmed, and blinds are lowered in patient rooms. During this time, patient activities are limited to promote rest. Both patients and staff have developed an appreciation for the time set aside for peace and quiet everyday.

**Perceived Level of Light and Job Satisfaction**

Hypothesis 4 stated that there would be a direct relationship between perceived level of light and job satisfaction among inpatient acute care nurses. This hypothesis was based on the theoretical proposition that there is a direct relationship between increased light and greater job satisfaction (Leather et al., 1998). Hypothesis 4 was not supported. Instead, an inverse relationship was found between perceived level of light and job satisfaction.
One theoretical problem that may have led to the lack of support for Hypothesis 4 was that the questions in the Physical Work Environment Survey, related to the level of lighting in the work environment, were worded more in the way of subjective impression or opinion. The questions did not specifically address the type of lighting (i.e. natural vs. artificial), the location or duration of light, or the type of work (i.e. patient care, documentation, computer).

One possible explanation for the inverse relationship between perceived level of light and job satisfaction is that different lighting conditions can change the mood of occupants of a building (Boyce et al., 2003). Whether windows and natural light improve mood and job satisfaction depends on what the individual’s preferences and expectations are. The basic problem for daylighting is that mood is subject to so many influences that unless the lighting is really uncomfortable, its influence is likely to be overshadowed by many other factors.

Nurses are focused on providing patient care and overcome many obstacles in order to care for their patients effectively and efficiently. The strength of nursing is reflected in the ability to adapt to ever changing work conditions including the patient care environment. This adaptation includes lighting conditions on the nursing unit, which are out of the nurse’s control.

A study conducted by John P. Hunt, director of facilities and distribution services at the Institute of Electrical and Electronic Engineers (IEEE) Command Center, found that due to the nature of various tasks, lighting preferences varied among groups of employees. Staff members who needed to refer to written reports and manuals required
more direct desktop lighting. Operators utilizing computer screens for their tasks wanted lower light levels.

The Right Light Consortium (www.rightlight.org) conducted a study where workers performed standard tasks under five lighting conditions. Scenarios included a regular array of three lamp parabolic fixtures, a regular array of recessed lensed troffer fixtures, a linear system of direct/indirect fixtures, the linear system plus a movable desk lamp with three light levels controlled by switching, and the linear system with the direct light output dimmable using an interface on the worker’s computer. People with dimming control reported higher ratings of lighting quality, overall environmental satisfaction, and self-rated productivity. The study results suggested a correlation between lighting choices, control and worker satisfaction.

Perceived Stress and Job Satisfaction

Hypothesis 5 stated that there is an inverse relationship between perceived stress and job satisfaction among inpatient acute care nurses. The hypothesis was derived from theory that indicates that stress due to the restructuring of healthcare delivery systems and the redesigning of nursing roles results in a high level of stress which leads to a decrease in job satisfaction (Garrett & McDaniel, 2001; Tumulty, 1994). Hypothesis 5 was not supported. A significant direct relationship was found between perceived stress and job satisfaction.

Stress is inherent in nursing today. There is a higher level of stress in medical surgical acute care nurses today due to patients being sicker and being admitted to the hospital with more co-morbidities. It appears that increasing job satisfaction is absorbing the effects of job stress. Nurses are becoming accustomed to the daily stressful
job circumstances in an acute care hospital. Nurses today feed on stress. The constant fast paced work challenges nurses to be attentive to their patients. Nurses feel good when they overcome the stressful workload and the end result is quality patient care and a job well done. Acute care nurses gain much of their job satisfaction from the experience of providing patient care. The hospital environment meets a need for excitement and stimulation that contributes to a sense of self – esteem. Nursing is very dynamic, never stable, always changing.

In a study conducted by McNeese – Smith (1998), when nurses were questioned about their job satisfaction, most nurses talked about the environment of an acute care hospital. Themes that emerged were fast pace; wholesome and pleasant environment; and variety in patients, conditions and work. These nurses enjoy the excitement of a university-affiliated hospital that treats patients with life – threatening emergencies.

The Perceived Stress Scale – 10 (PSS – 10) measures the degree to which situations in one’s life are appraised as stressful (Cohen et. al., 1983). The PSS was designed for use with community samples with at least a high school education. The scale measures the degree to which respondents find their lives to be unpredictable, incontrollable, and overloading over the past month. The questions are quite general in nature and free of content specific to any sub – population group. This present study involved nurses working in an inpatient acute care hospital. The lack of congruence between the general focus of the PSS – 10 and the specific situation of professional stress in the present study may have contributed to the lack of support for Hypothesis 5.
Job Satisfaction and Turnover Intention

Hypothesis 6 stated that there is an inverse relationship between job satisfaction and turnover intention among inpatient acute care nurses. This hypothesis was based on the theoretical proposition that there is an inverse relationship between low job satisfaction and higher turnover intention (Shader et.al., 2001). Hypothesis 6 was not supported. A significant direct relationship was found between job satisfaction and turnover intention.

Job satisfaction is a complex construct derived from attitudes and perceptions of various elements of work. Research on job satisfaction has an extensive history. Regardless of the healthcare system or the date of the study, study results continue to demonstrate that job satisfaction is one of the best predictors of turnover intention in nursing. Various nursing demographics affect nursing job satisfaction (i.e. age, marital status, years of nursing experience, level of education etc.). Unfortunately, pertinent socio-demographic variables could not be considered due to the removal from the study at the request of the Institutional Review Board of the University of Medicine and Dentistry of New Jersey. The lack of demographics makes it difficult to ascertain why the findings are the way they are.

Turnover intention arises from a variety of complex factors. The level of job satisfaction, career prospects, mobility, and satisfaction with one’s personal life all interact in the decision to leave a nursing position. In this study, the reason for leaving the current position was not indicated on the survey tool. For example, a nurse may be very satisfied right now and may have worked on one specific nursing unit for 10 years and it
is time for a change so she can challenge herself. She may decide to move onto another position in the same facility or look for a new career opportunity outside of the facility.

Perceived Stress and Turnover Intention

Hypothesis 7 stated that there is a direct relationship between perceived stress and turnover intention among inpatient acute care nurses. The hypothesis was derived from theory which indicates the more job stress the higher the anticipated nursing turnover intention (Shader et. al., 2001). Hypothesis 7 was supported.

Previous studies have provided evidence that medical - surgical nurses (i.e. inpatient acute care nurses) experience higher job stress than critical care nurses (Wakefield, Curry, Price, Mueller, and Mc Closkey, 1998). It proves that job aspects causing the most stress to medical/surgical nurses today need careful assessment especially now when patients are sicker and the nurses handle patients with more comorbidities per year than the nurses in specialty units.

In a study conducted by Gardulf et.al., about one-third of the nurses who intended to quit their jobs stated that they experienced their work as being psychologically strenuous and stressful. They also rated the work tempo higher and experienced an increased work related exhaustion and a lower quality of patient care. In several other studies, stress has been identified as a reason for nurses wanting to quit their jobs at their units (Parasuraman, 1989; Dailey, 1990; Stolte & Myers, 1995; Wai Chi Tai et. al., 1998; Collins et.al., 2000; Shader et.al., 2001). Contributory factors for nurses perceiving their work as strenuous and stressful are the demanding aspects of the job, such as, working under time pressure, work overload, lack of social support from colleagues, lack of support from superiors and a nursing shortage (Wai Chi Tai et. al., 1998; Janssen et. al.
1999). It may not be stress itself that leads a nurse to leave her job, but the physical consequences of stress (i.e. missing lunch, physical symptoms, overtime).

Job stress has been a problem for years. It not only has negative consequences for nurses, but also for their employers. Retention of nursing staff is a desirable goal for any institution. Nursing turnover is a costly problem that will continue as healthcare faces the impending nursing shortage with a new generation of nurses entering the workforce and increasing incentives for nurses to work at other institutions.

Regression Model

A number of factors (variables) can affect turnover intention including those related to the environment (i.e. odor, noise, light) and the individual person (nurse). Job satisfaction was both highly correlated and significantly related to turnover intention ($r = .74$, $p = .00$) and this relationship was maintained in the backward regression model. Level of light was not directly proposed to influence turnover intention, except through perceived stress and job satisfaction. It contributed significantly to the variance in turnover intention when other variables were eliminated.

Acute care nurses did not vary greatly in their intention to turnover ($M = 2.37$, $SD = .85$), but 56% of this variance can be explained mostly by job satisfaction and secondly, level of light. Both job satisfaction and turnover intention questions targeted the nurses’ occupation and employment as opposed to their personal life. It is evident that nurses require a certain level of light to provide care in a safe and efficient manner. A direct and significant relationship might be expected. There is still 44% of the variance of turnover intention that is unknown and warrants further investigation.
Warm Stimulating Colors and Perceived Stress

Research question 1 inquired if there was a relationship between warm, stimulating colors and perceived stress. This question was derived from previous studies that indicate warm colors, especially when accompanied by high illumination levels, have found to encourage activity, while cool colors promote more passive behavior (AHRQ, 2003). A non-significant direct relationship has been established between warm stimulating colors and perceived stress.

The perception of color is a subjective experience which is highly influenced by past events and connections between colors and seemingly unrelated stimuli (Schachtel, 1943). While perceptions of color and stress are subjective, there are some color effects that have universal meaning. Colors in the red area of the color spectrum are known as warm colors and include red, orange, and yellow. These warm colors are also viewed as active and exciting. Colors on the blue side of the spectrum are known as cool colors and include purple, blue and green. These colors are often described as soothing and passive. Most evidence suggests the lack of a single, universal psychological response to a particular color. Consequently, it is difficult to choose a color that will reduce stress in everyone.

Of the 116 responses in this study, there were 45 different colors cited. 14 responses fell within the warm color grouping. Beige was mentioned 23 times with other descriptions of beige being explained as tan, cream colored, and tanish ivory. Because color may be thought of as reflected light, the kind of light that falls on an object will affect the object’s apparent color. An object that appears bluish – green when viewed in daylight will look yellowish – green in incandescent light and blue under daylight
fluorescent lighting (Poston, 1996). A color used in several parts of an architectural space may appear to be different in hue in different places because of the variation in the amount of light to which it is exposed and also because of the close proximity of other colors. Colors will affect one another (Halse, 1968).

One theoretical problem that may have led to the lack of strong support for this research question, were the questions used in the Physical Work Environment Survey which related to the colors in the work environment. The questions were very subjective and much too general. They did not specifically address the shift worked or the type of lighting encountered (i.e. natural vs. artificial) at the time the survey tool was completed.

The investigator did not make any observations of colors on the nursing units. Color is a personal preference and adaptation plays a role in color recognition when exposed to the same colors everyday. Colors are most prominent when there is a change in the paint, wall covering etc.

Perceived Level of Odor and Job Satisfaction

Research question 2 queried the relationship between perceived level of odor and job satisfaction among inpatient acute care nurses. A statistically significant inverse relationship was determined. The investigator did not assess the degree of variation of odor on the nursing units. It is not so much the odor but the consequence or response that the odor causes (i.e. avoidance) that impacts job satisfaction.

Humans have a basic need for some control over themselves and their environment. As previously mentioned, hospitals are rich in olfactory stimulation. Nurses are continually exposed to a variety of odors which are out of their control. There is no escaping odor in the hospital setting. Odors have a strong link to the brain’s emotional
center and are often more memorable than either sights or sounds. Medicinal odors stimulate anxiety, fear and stress, while pleasant aromas can reduce blood pressure, slow respirations, and lower pain perception levels (Jones, 1996).

There is an increasing body of knowledge about how odors affect us. Emotions, behavior, and thoughts can be affected by different odors. Selected odors may trigger strong negative physical reactions in some people, while other odors have the opposite effect. Odors are closely tied to our emotions and can affect our reaction to an environment.

Odors have been linked to feelings about the workplace as well as to health and stress in the workplace. Perceived odors and air quality go hand in hand. The quality of air at work is a concern for employees and is often rated as one of the most important factors in the work environment. Feelings as though the air in the workplace is of poor quality can result in dissatisfaction with one’s job (Hawkins, 1981).

Additional Findings

We did not know what the climate of each individual unit was at the time of the study. For example, it is not known if one unit was experiencing a high census, acuity, staffing shortage etc. Data collection did occur during the summer months, a time of new graduate nurses, new residents and vacations, which are common occurrences at this time of year.

It is not surprising that there were no major differences between nursing units, except turnover intention, because every medical – surgical nursing unit, regardless of specialty, has a routine reflective of nursing practice. For example, every nursing unit has
nurses assessing patients, rounding with physicians, facilitating patient transport to procedures/surgery, interacting with family members, etc. Although there was a statistically significant difference between units for turnover intention, the reasons for this difference cannot be ascertained due to limited responses and no further investigation related to demographics and unit specific information (i.e. unit manager, residents etc.).
Chapter VI

Summary, Conclusions, Implications, Limitations and Recommendations

Summary

This study was designed to better understand the relationship between physical work environmental factors, perceived stress, job satisfaction and turnover intention among inpatient acute care nurses. The study empirically tested theoretical relationships posited between the dependent variables of perceived stress, job satisfaction, and turnover intention and each of the three independent variables of (a) odor, (b) noise, and (c) light.

Nursing was defined as the protection, promotion, and optimization of health and abilities, prevention of illness and injury, alleviation of suffering though diagnosis and treatment of human response, and advocacy in the care of individuals, families, communities and populations (ANA Nursing World, 2007). It is generally acknowledged to be a stressful profession. The nurse is confronted with a barrage of events that affect the customers and the health care system of which the nurse is a member. This constant change, with its demands, can be stress producing.

Stress is a complex psychological, physiological and behavioral response by an individual when they perceive a lack of equilibrium between the demands placed upon them and their ability to meet those demands, which over a period of time, leads to ill-health (Palmer, 1989). The physiological manifestations of stress may affect the body (e.g. heart rate, aches and pains and dizziness), the mind (e.g. poor concentration and memory, feeling tired, worrying too much) and behavior (e.g. difficulty with sleep; smoking, drinking, eating habits) (Rollnick, 2004). Nurses are exposed to a variety of
stressors due to the nature of their jobs including environmental, physical, biological, chemical and psychological hazards.

Job satisfaction has been shown to be directly affected by job stress. The more job stress, the lower job satisfaction and the higher turnover intention. The less job related stress, the higher job satisfaction and the lower turnover intention (Shader et. al., 2001). Job satisfaction has been inversely linked to turnover intention and actual turnover (Price & Mueller, 1981). This study tested the hypothesis that job satisfaction would be inversely affected by job stress.

Within the context of this study, turnover intention is defined as an internal perception of the probability that a nurse will leave employment (Price & Mueller, 1981). It refers to an individual perception rather than behavior and is seen as a contemplative stage linking the attitudinal component of job satisfaction with the behavioral component of turnover (Alexander, 1998).

Some researchers have voiced concern that the current work environment is precipitating an exodus of experienced staff (Dudek, Rentschler & Fetzer, 2006). Higher staff turnover is associated with higher levels of nursing stress (Lucas, Atwood & Hagaman, 1993). Factors as simple as physical working conditions – heating lighting, furnishings, space, noise – can create stress (Rowland, 1997). Thus, this study hypothesized turnover intention would be directly related to perceived stress.

Three hypotheses considered perceived stress in relation to environmental factors – perceived level of odor and perceived stress, perceived level of noise and perceived stress, and perceived level of light and perceived stress. The relationship between perceived level of odor and perceived stress and perceived level of noise and perceived
stress was not supported but was in fact, in the opposite direction. Odor and noise are not constant parts of the work environment but vary. Adaptation to odor and noise could have also played a role in the responses in this area as well. The survey tool used to measure odor and noise was limited and could not eliminate the subjectivity associated with the human senses and the perception of odor and noise. The relationship between perceived level of light and perceived stress was supported in the proposed direction. Light is more of a constant in the work environment. Nurses are continually aware of it. In this study population, the nurses experienced moderate stress.

Two hypotheses considered job satisfaction in relation to perceived level of light and perceived stress. The relationships were not supported but were in fact in the opposite direction. Perceived level of light, although a constant in the environment, is tuned out by nurses as they focus on their work demands. The questions about perceived environment light on the Physical Work Environment Survey were few and limited. The relationship between perceived stress and job satisfaction was in a positive direction rather than negative. The stress questionnaire used in this study (PSS – 10) did not focus on work stress but stress in general. Nurses get accustomed to the demands of their work, which is stressful. This study population is moderately satisfied with their current job.

Two hypotheses considered turnover intention in relation to job satisfaction and perceived stress. The relationship between job satisfaction and turnover intention was not supported but was in the opposite direction. The relationship between perceived stress and turnover intention was supported in the proposed direction. Overall, the Turnover Intention questionnaire had only four questions so this limited gathering data on the
perspective of the nurses. The responses for this study population indicated a moderate level of turnover intention.

The following hypotheses were theorized and tested:

1. There is a direct relationship between perceived level of odor and perceived stress among inpatient acute care nurses.

2. There is a direct relationship between perceived level of noise and perceived stress among inpatient acute care nurses.

3. There is an inverse relationship between perceived level of light and perceived stress among inpatient acute care nurses.

4. There is a direct relationship between perceived level of light and job satisfaction among inpatient acute care nurses.

5. There is an inverse relationship between perceived job stress and job satisfaction among inpatient acute care nurses.

6. There is an inverse relationship between job satisfaction and turnover intention among inpatient acute care nurses.

7. There is a direct relationship between perceived stress and turnover intention among inpatient acute care nurses.

The following research questions were investigated:

1. Is there a relationship between warm, stimulating colors and perceived stress?

2. What is the relationship between perceived level of odor and job satisfaction among inpatient acute care nurses?
The study sample was comprised of 116 full-time registered nurses who worked on the following medical – surgical nursing units: cardiac – medical, cardiac – surgical, neuro/respiratory, orthopedic, oncology, and a minimally invasive thoracic unit. Subjects worked at a 588 bed Level 1 trauma center located in northern New Jersey. Socio-demographic variable, employment history, and level of education were removed from the initial study at the request of the Institutional Review Board of the university of Medicine and Dentistry of New Jersey.

All subjects completed the Perceived Stress Scale – 10 item (PSS – 10), Nurses’ Intent to Stay Questionnaire, and the built environment factors portion of the University of Texas M.D. Anderson Cancer Center Staff Survey, at work anytime prior to going home from their respective shift during uninterrupted time. All instruments demonstrated good reliability for internal consistency in this sample with coefficient alphas ranging from .76 to .87.

The correlational hypotheses were tested using the Pearson Product Moment correlation coefficient. Hypothesis 1, which stated that there would be a direct relationship between perceived level of odor and perceived stress among inpatient acute care nurses, was not supported ($r = -.14, p = .14$). Hypothesis 2, which stated that there would be a direct relationship between perceived level of noise and perceived stress among inpatient acute care nurses, was not supported ($r = -.18, p = .05$). Hypothesis 3, which stated there would be an inverse relationship between perceived level of light and perceived stress among inpatient acute care nurses, was supported ($r = -.11, p = .24$). Hypothesis 4, which stated there would be a direct relationship between perceived level of light and job satisfaction among inpatient acute care nurses, was not supported.
(r = -.12, p = .20). Hypothesis 5, which stated that there would be an inverse relationship between perceived stress and job satisfaction among inpatient acute care nurses was not supported (r = .55, p = .00). Hypothesis 6, which stated there would be an inverse relationship between job satisfaction and turnover intention among inpatient acute care nurses, was not supported (r = .74, p = .00). Hypothesis 7, which stated that there would be a direct relationship between perceived stress and turnover intention among inpatient acute care nurses, was supported (r = .34, p = .00). Research question 1 inquired if there was a relationship between warm, stimulating colors and perceived stress. Based on the findings of Pearson Product – Moment correlation for this relationship (r = .08, p = .40), there is a direct relationship but it is not significant. Research question 2 queried the relationship between perceived level of odor and job satisfaction among inpatient acute care nurses. A statistically significant inverse relationship was found (r = -.27, p = .00).

Conclusions

Conclusions that may be drawn from this study, based on this sample of 116 full-time registered nurses working on the medical – surgical units at a Level 1 trauma center located in northern New Jersey, are as follows:

1. Perceived level of odor is not significantly related to perceived stress. The relationship between perceived level of odor and perceived stress was not significant. The Pearson Product – Moment correlation coefficient of -.14 indicates low correlation between these two variables. Therefore, not much of a relationship exists between these two variables. This was somewhat expected based on the limited evidence on this relationship.
2. Perceived level of noise is not significantly related to perceived stress. The Pearson Product – Moment correlation coefficient of -.18 indicates low correlation between these two variables. Therefore, not much of a relationship exists between these two variables in this study. This was somewhat expected due to the limited evidence on this relationship.

3. There is a relationship between perceived level of light and perceived stress but it is not significant. The Pearson Product – Moment correlation of -.11 indicates low correlation between these two variables. Therefore, not much of a relationship exists between these two variables. This was somewhat expected due to the limited evidence on this relationship.

4. Perceived level of light is not significantly related to job satisfaction. The Pearson Product – Moment correlation of -.12 indicates low correlation between these two variables. Therefore, not much of a relationship exists between these two variables in this study. This was somewhat expected due to the minimal evidence on this relationship.

5. Perceived stress is significantly related to job satisfaction. The Pearson Product – Momentum correlation of .55 indicates a moderate correlation between these two variables. This was anticipated due to the strong theoretical and empirical evidence supporting this relationship.

6. Job satisfaction is significantly related to turnover intention. The Pearson Product – Moment correlation of .74 indicates high correlation between these
two variables. This relationship was anticipated due to the high number of theoretical and empirical studies available on this relationship.

7. Perceived stress is significantly related to turnover intention. The Pearson Product – Moment correlation of .34 indicates a moderate correlation between these two variables. This relationship was anticipated due to the strong theoretical and empirical evidence supporting this relationship.

8. A relationship has been established between warm stimulating colors and perceived stress. The relationship between warm stimulating colors and perceived stress was not significant. The Pearson Product – Moment correlation of .08 indicates low correlation between these two variables. Therefore, not much of a relationship exists between the two variables in this study. This was somewhat expected due to the limited evidence on this relationship.

9. Perceived level of odor is significantly related to job satisfaction. The Pearson Product – Moment correlation of -.27 indicates a low correlation between these to variables. Therefore, not much of a relationship exists between the two variables. This was somewhat anticipated based on the limited evidence on this relationship.

**Implications for Environmental and Occupational Health in Nursing**

A hospital is a bricks – and – mortar framework for the care that is provided within. (Martin, 2000). By having a greater understanding of how the physical environment of a healthcare facility affects how the staff members perceive their environment, we can begin to translate research into practice and have a greater
understanding of how evidence-based design research can be used to optimize the health care experience for everyone, including the nursing staff (Mroczek, et.al., 2005).

Findings from this study can be used to influence policy development and practices in hospital design and nursing unit renovation. Input from nursing staff is critical. Nurses are able to provide excellent patient care in suboptimal conditions. They still need to fight to be recognized as healthcare professionals. Hospital and nursing administration need to listen to them, recognize their contribution and allow them to participate in decision making about the nursing physical work environment. Too often nurses are left out of this process, which ultimately results in an increase in stress and a decrease in job satisfaction.

Limitations

Procedure:

1. The current study was conducted in one healthcare center, a teaching hospital that encouraged research. As a result, a variety of nursing environments could not be sampled.

2. Unfortunately, pertinent socio-demographic variables could not be considered due to the removal from the study at the request of the Institutional Review Board of the University of Medicine and Dentistry of New Jersey.

3. It was impossible to control the conditions under which the questionnaires were completed. The nurses were free to answer the questionnaire if they chose to but it is likely that nurses suffering from high stress did not answer it. The same may be true for nurses who were considering leaving the organization, who had a low level of job satisfaction or commitment to the organization.
4. The investigator did not personally validate the observations of color, the level of odor, noise, or light on each nursing unit but depended on the subjectivity associated with the human senses.

5. Unequal response rates between units limited post hoc analysis to determine differences between units.

**Survey:**

6. The questions on the Physical Work Environment questionnaire were quite general and could not eliminate subjectivity associated with the human senses (i.e. level of odor, noise etc.).

7. The Perceived Stress Scale – 10 measures the degree to which situations in one’s life are appraised as stressful (Cohen et. al., 1983).

8. The original job satisfaction questionnaire submitted to the Institutional Review Board of the University of Medicine and Dentistry of New Jersey utilized fifteen questions but was reduced to seven questions at their request.

9. The Turnover Intention Questionnaire did not allow for explanation of why the nurse was planning to leave the hospital.

**Recommendations**

The theoretical basis and empirical findings of this study point the direction for future research.

1. Replicate this study in a variety of institutions with varied aesthetics.

2. Include nursing demographics that affect nursing job satisfaction (i.e. age, marital status, years of nursing experience, level of education, etc.).
3. The investigator must perform direct observations to validate the level of odor, level of noise and the level of light on each nursing unit.

4. Develop a more applicable physical work environment survey tool that has a time sensitivity to it (i.e. in the past thirty days) including a more explicit description of levels of odor and natural vs. artificial light.

5. A stress questionnaire that focuses on job - related stress would be recommended for use in future research.

6. A more comprehensive job satisfaction questionnaire should be used in future research.

7. A short development question should be added to the end of the Turnover Intention Questionnaire,” If you intend to leave this hospital, what are your reasons?” This would enable the institution to determine what the reasons are for leaving and which reasons are controllable. Mangers who consider these factors may improve their staff retention.

8. Strategies to ensure the highest possible response rate per unit need to be explored and subsequently implemented in collaboration with key nursing personnel.
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Appendices
Appendix A

Demographic Questionnaire

Please respond to the following question by placing a check after the appropriate response.

1. Focus of medical/surgical unit (check all that apply):
   ___ Cardiac - Medical
   ___ Cardiac - Surgical
   ___ Neuro. /Respiratory
   ___ Orthopedic/Trauma
   ___ Oncology
   ___ Minimally invasive thoracic surgery
   ___ Other
Appendix B

Physical Work Environment Survey

Please circle the one number that most closely represents your level of agreement with each statement below. The following questions consider the physical environment of your building.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. The noise level in my work environment is not conducive to patient care.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>3. The noise level does not interfere with patient communication.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>4. The noise level in my work environment is acceptable.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>5. The noise level in my work environment often makes it difficult to work.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>6. The level of lighting in my work environment is conducive to patient care.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>7. The level of lighting in my work environment is acceptable.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>8. The level of lighting in my work environment often makes it difficult to work.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>9. There is plenty of light in my work environment for the staff to see what they are doing.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>10. The level of odor in my work environment is acceptable.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>11. The level of odor in the air in my work environment is not conducive to patient care.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>12. The level of odor in my work environment often makes it difficult to work.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>13. The color scheme of the walls in my work environment is conducive to patient care. a. What are the colors of the walls in your patient care area? ________________</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>14. The colors in my work environment make it a warm and cheerful place to work.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>15. There is a place I can go in or near my building to relax when the stress is high.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
<tr>
<td>16. My work environment has features which are pleasant to look at.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td>DK</td>
</tr>
</tbody>
</table>
Appendix C

Perceived Stress Scale - 10 Item

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, please indicate with a check how often you felt or thought a certain way.

17. In the last month, how often have you been upset because of something that happened unexpectedly?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often

18. In the last month, how often have you felt that you were unable to control the important things in your life?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often

19. In the last month, how often have you felt nervous and "stressed"?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often

20. In the last month, how often have you felt confident about your ability to handle your personal problems?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often

21. In the last month, how often have you felt that things were going your way?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often

22. In the last month, how often have you found that you could not cope with all the things that you had to do?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often

23. In the last month, how often have you been able to control irritations in your life?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often

24. In the last month, how often have you felt that you were on top of things?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often

25. In the last month, how often have you been angered because of things that were outside of your control?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often

26. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
   ____ 0=never   ____ 1=almost never   ____ 2=sometimes   ____ 3=fairly often   ____ 4=very often
## Appendix D

### Job Satisfaction Questionnaire

<table>
<thead>
<tr>
<th>Items 27-33 are about how you feel about your job in this facility. Mark the response that reflects how much you agree or disagree with each statement.</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Tend to agree</th>
<th>Tend to disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>27. I am fairly well satisfied with my job.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>28. I would not consider taking another job.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>29. Most of the time I have to force myself to go to work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>30. Most days I am enthusiastic about my work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>31. I like my job better than the average worker does.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>32. Each day on this job feels like it will never end.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>33. I find real enjoyment in my work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Appendix E

Turnover Intention Questionnaire

What are your intentions about your present job? Please respond to the following questions in terms of your intentions. Please circle your response.

34. Which of the following statements most clearly reflects your feelings about continuing in your current job?
   A. Definitely will not leave
   B. Probably will not leave
   C. Uncertain
   D. Probably will leave
   E. Definitely will leave

35. How do you feel about your future in the hospital overall?
   A. Definitely will not leave
   B. Probably will not leave
   C. Uncertain
   D. Probably will leave
   E. Definitely will leave

36. Do you expect to move to another job in the hospital in the near future?
   A. Definitely will not leave
   B. Probably will not leave
   C. Uncertain
   D. Probably will leave
   E. Definitely will leave

37. Do you expect to leave the hospital in the near future?
   A. Will definitely leave in the near future
   B. The chances are quite good that I will leave
   C. The situation is uncertain
   D. The chances are very slight that I will leave
   E. Definitely will not leave in the near future

Date: ____________ Time of completion: ________________

Thank you for your time and careful consideration of these questions
Appendix F

DESCRIPTION OF STUDY PARTICIPATION

The Relationship Between Physical Work Environmental Factors, Perceived Stress, Job Satisfaction, and Turnover Intention Among Inpatient Acute Care Nurses

You are being asked to participate in a research study looking at the relationship between physical work environmental factors (i.e. odors, noise, light, and color), perceived stress, job satisfaction and turnover intention because you are a registered nurse working in an inpatient acute care hospital. This investigation is a collaborative effort with the University of Medicine and Dentistry of New Jersey – School of Public Health (UMDNJ-SPH).

Your involvement will require completion of a survey that asks questions about your feelings about stress on your job and satisfaction on the job. Please complete the survey prior to going home from your shift during uninterrupted time. The questionnaire should be completed on your own without sharing your responses with others at work.

The benefits of participating in this study include a better understanding of how physical work environmental factors affect perceived stress, job satisfaction and turnover intention among inpatient acute care nurses. There is no cost for participation.

Your participation is voluntary and confidential. Do not place your name on any part of the questionnaire. You may choose not to participate but we encourage active participation since your responses are very important to understanding the relationship between physical work environmental factors, perceived stress, job satisfaction and turnover intention. Your return of the questionnaire acknowledges your consent to participate in this study. The time to complete this survey is estimated at 15-20 minutes.

Please return your completed questionnaire in the self-addressed stamped envelope provided and mail at the post office of your choice within 7 days of receiving your materials. Thank you in advance for your participation in this investigation.

You may contact Diane Applebaum at 732-453-2966 or applebdi@umdnj.edu if you have any questions or comments about the survey.

Diane Applebaum, RN, MPH, CIC – Principal Investigator
Graduate Student
UMDNJ – School of Public Health
STAFF REMINDER

Please remember to complete the research survey you received in your mailbox and return in the self-addressed stamped envelope provided by July 12, 2007.

Thank you.

Diane Applebaum, RN, MPH, CIC – Principal Investigator
Graduate Student
UMDNJ – School of Public Health
Appendix H

Reminder Postcard
Two Weeks after Survey Distribution

The Relationship Between Physical Work Environmental Factors,
Perceived Stress, Job Satisfaction, and Turnover Intention Among
Inpatient Acute Care Nurses

To Acute Care Staff Nurses
Just a reminder to complete and return the research survey you received.
Thank you.
Appendix I

Curriculum Vitæ

Diane Helen Applebaum

EDUCATION

2002 – 2008
University of Medicine and Dentistry – School of Public Health
Piscataway, New Jersey
Doctor of Public Health
Concentration in Environmental and Occupational Health

1998 – 2002
University of Medicine and Dentistry – School of Public Health
Piscataway, New Jersey
Master of Public Health
Concentration in Environmental and Occupational Health

1986 – 1995
Upsala College
East Orange, New Jersey
Bachelor of Science
Major: Human Resource Management

1969 – 1972
Muhlenberg Hospital School of Nursing
Plainfield, New Jersey
Nursing Diploma

WORK EXPERIENCE

2008 – present
Nurse Manager – Long Term Acute Care Hospital (LTACH)
Kindred Hospital New Jersey – Rahway, New Jersey

2005 – 2008
Infection Control Practitioner/Employee Health Coordinator/ Safety Officer, Kindred Hospital New Jersey – Rahway

2004 – 2005
Nurse Manager – Medical – Surgical Unit/ Hemodialysis
Somerset Medical Center, Somerville, New Jersey

1991 – 2004
Nurse Manager – Medical – Surgical Units
Solaris Healthcare System, Edison, New Jersey

1989 – 1991
Per Diem Staff Nurse – Medical – Surgical Unit
Muhlenberg Regional Medical Center, Plainfield, New Jersey

1983 – 1991
Infection Control Coordinator
Muhlenberg Regional Medical Center, Plainfield, New Jersey