Hospital Room Design and Health Outcomes of the Aging Adult

A Thesis

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of

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Dedication

This dissertation is dedicated to my husband John and our children Ryan, Kelsey, and Joe. May you always choose to dance.

AND

To my parents Ben and Barbara Garzon: The foundation you built has made the attainment of this doctoral degree possible.
Acknowledgements

As anyone who has completed a doctoral degree can attest to it is not a solitary journey. There are many individuals along the way who provide direction, encouragement, and material support. On my journey there have been many who offered all of that and more. First, I would like to acknowledge my committee. Dr. H. Michael Dreher, my supervising professor, has supported my efforts throughout the time I have been at Drexel and has been instrumental in helping me persevere through the difficult times. Dr. Jan Stichler has been supporting me throughout this program, first as my clinical preceptor, and then as a member of my committee. She has given of her time generously to develop my expertise in the area of health design. Dr. Alice Poyss has provided invaluable insight to the process. I would also like to acknowledge Dr. Gloria Donnelly, my first advisor, for her mentoring and support throughout my time at Drexel.

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INTRODUCTION: Since 2006, the American Institute of Architects has recommended that private rooms become the industry standard for all new construction of acute care hospitals. Healthcare design researchers contend that private rooms decrease infection, facilitate healthcare workers efficiency, provide space for families to stay and provide greater access to privacy. While links between room type and health outcomes have been described in the literature, the actual relationship between these two variables has not been determined nor is it clear whether a “one size fits all” approach to hospital design is appropriate for all patient populations. The purpose of this study is to determine the differences in the rate of falls and hospital acquired infections (HAI) in the hospitalized older adult for those admitted to private versus semi-private rooms and to explore whether being at risk for social isolation is a contributing factor to either event.

METHODS: This retrospective case comparative design utilized a sample of patients admitted to the University Medical Center of Princeton in 2006. Patient records were randomly selected through the hospitals admission/discharge/transfer system. The records were then divided into two groups based on room type. Data collected included demographics, incidence of falls and HAI and risk for social isolation,

RESULTS: All patients were over 65 years old and were admitted to the hospital for a variety of diagnoses. Length of stay was between 3 and 10 days. There was no significant difference between the type of room and the likelihood of falling. ($p = .37$).
The relative risk of falling in a private room was 4.01 compared to being in a semi-private room, but there was no significant difference in the occurrence of HAI based on room type ($p = 1.0$). The risk of social isolation variable was unable to significantly affect which hospitalized older adults will suffer a negative outcome, fall or HAI, ($p=0.52$).

CONCLUSION: Room type may play a role in the occurrence of falls in the hospitalized older adult, but room type in and of itself does not increase the chance of acquiring an infection while in the hospital. In addition, being at risk of social isolation does not affect the likelihood of having an adverse outcome; however the presence of risk for social isolation was 40% and needs to be further explored.
Hospital Room Design and Health Outcomes of the Aging Adult

Chapter 1: Introduction

Background

The aging of our population has resulted in an increased incidence of acute conditions that require hospitalization (Ulrich, 1992). In addition to the rising rate of age-related illnesses, changes in the makeup of our populace such as increasing life expectancy, immigration, and rising fertility rates may lead to a 46% increase in inpatient bed demand by 2027 (Cama, 2005; Solucient, 2003). To meet this demand, new hospitals are being designed and built at a rapid pace. Currently in the United States, there are 500 facilities being planned, designed, and constructed (Chadhury, Mahmood, & Valente, 2003). It is believed that healthcare construction will continue to grow to $67.2 billion in 2012 (FMI, 2008). Given this unprecedented building boom, and the related costs of healthcare construction it is imperative that principles of evidence-based design are utilized to create an environment where healing is most likely to occur. Healthcare design is where design decisions are based on research or evidence (Cama). This approach will ensure that care delivered in these new facilities is safe, efficient, and of the highest quality. In the hospital, the patient room is the place where the patient spends most of his or her time, receives treatments, undergoes procedures, and is provided nursing care and other therapeutic interventions. Therefore, logically it is the design of the patient room that may primarily affect the healing and well-being of the patient (Lorenz, 2007).

In 2006, the American Institute of Architects (AIA) recommended that private rooms become the industry standard for all new construction of acute care hospitals (2006). Healthcare design researchers contend that private rooms decrease infection,
facilitate healthcare workers efficiency, provide space for families to stay with loved ones, and provide greater access to privacy. In addition, they claim that noise levels, a patient’s likelihood of falling, and medication errors are greatly reduced (Joseph, 2006; Ulrich, Quan, Zimring, Joseph, & Choudary 2004). While links between room type and health outcomes have been described in the literature, the actual relationship between these two variables has not been determined nor is it clear whether a “one size fits all” approach to hospital design is appropriate for all patient populations.

One of the adverse events that are commonly associated with environmental concerns in the patient room is falls (Hendrich, Nyhuis, Kippenbrock, & Soja, 1995; Krauss, Nguyen, Dunagan, Birge, Constantinou et al., 2007; Tzeng & Chang, 2008). The occurrence of falls in the hospital setting is largely determined by patient traits. One of those traits that have been closely associated with the risk of falling in the hospital is patient age (Fisher, Krauss, Dunagan et al., 2005; Hendrich et al., 1995; Vassallo, Amersy, Sharma, &Allen, 2000). The Centers for Disease Control and Prevention (CDC) state that falls are the third most common cause of unintentional injury or death across all age groups and the first leading cause among people 65 years and older (2007). This data does not differentiate between falls that happened at home and those that occur in hospitals. The majority of falls in the hospital occur in patient rooms when patients are alone attempting to get to the bathroom (Hendrich, Fay, & Sorrels, 2002; Krauss et al., 2005; Tzeng & Chang, 2008). However, there has been a lack of literature as to the type of room the patient was in and how room type may have related to the fall. Given this information, it may be hypothesized that some patients may benefit in sharing a room as patients can assist each other and call for help as needed (Chadhury, et al., 2003).
Healthcare-associated infection (HAI) rates have also been implicated in increasing morbidity and mortality in hospitalized patients (IOM, 1999). The few studies that have been conducted examining the effect of room type on HAI have been primarily in pediatric populations and these studies have determined that HAI decreases in the private room model (Anderson, Bonner, Schiefle, & Schneider, 1985; Ben Abraham et al., 2002). Nevertheless, there is no real evidence to support this claim in adult patients.

Lastly, several studies have looked at patient preference for room type. One of the primary reasons that some patients prefer semi-private rooms is avoidance of social isolation (Pease & Finlay, 2002; Rowlands & Noble, 2008). Social isolation itself has been implicated in cognitive and functional decline in the older adult (Ryan, 1998). Social support has also been shown to be an important factor in reduction of stress, and promotion of healing in the hospitalized patient (Ulrich & Gilpin, 2003) and may be an indirect indicator of risk for social isolation.

In light of this increasing body of knowledge in the emerging field of Healthcare Facility Design, it is necessary to critically evaluate the effect the patient room has on health outcomes both physiologically and psychologically. Design specifications such as the all-private room design potentially add greater than 14% to the overall total construction costs of a new hospital (Chadhury et al., 2003). The costs of falls, HAI, and prolonged stays due to functional decline in the older adult have been well documented. With the rising costs of healthcare, it is logical to require providers and hospital designers/architects to make room construction decisions based on the best evidence available. There is therefore, a critical need to determine the appropriate type of room that promotes positive health outcomes in the hospitalized older adult.
Statement of Purpose

The purpose of this study is to determine the differences in the rate of falls and HAI in the hospitalized older adult for those admitted to private versus semi-private rooms. In addition, this study will also evaluate whether risk of social isolation can predict a difference in the rate of falls or HAI in patients who are in private or semi-private rooms.

Research Aims and Research Hypotheses

1. **Determine whether the incidence of falls in older adults differs between room type, (private or semi private).**
   
   Our working hypothesis is that older adults age 65 or over in private rooms will fall more frequently than older adults in semi-private rooms.

2. **Determine whether the incidence of HAI in older adults differs between room type, (private or semi private).**
   
   Our working hypothesis is that older adults aged 65 or over in private rooms will have no difference in the incidence of hospital-acquired infection than older adults in semi-private rooms.

3. **Determine whether risk of social isolation can predict the likelihood of a negative outcome falling and/or developing a new HAI based on room type.**
   
   Our working hypothesis is that older adults aged 65 or over who are at risk for social isolation will have a higher incidence of negative outcomes falls and/or healthcare-associated infections regardless of room type.
Conceptual and Theoretical Framework

This study represents an addition to a growing body of research that is evaluating the effects of hospital design on the health and well-being of patients. Maslow’s Hierarchy of Needs forms the theoretical and conceptual framework underlying this study. Maslow categorized all human needs into a hierarchy: 1) physiological, 2) safety, 3) social, 4) esteem, and 5) self-actualization (1987). In order to progress from level to level a person must satisfy the needs of the level they are at. For example, a person must satisfy their physiological needs like food, water, and life saving interventions prior to fulfilling their need to be safe. Persons then need to feel safe in their environment. The need for social interaction is next, followed closely by esteem or what we receive from our actions and relationships with others. Self-actualization occurs when we experience meaning and fulfillment in life.

Maslow’s Hierarchy has been utilized as a framework for providing patient care for the past 50 years. A priority among healthcare providers is to do no harm and in order to meet this imperative it is necessary for us to meet the physiological needs of patients while keeping them safe and providing an environment that is conducive to healing. The Institute of Medicines (IOM) definition of quality reflects Maslow’s Hierarchy. This definition states that healthcare must be safe, effective, timely, efficient, equitable, and patient centered (2001).

Maslow’s Hierarchy can be further expanded to include models that protect the patient from harm. The Situational Model of Nurse Protection developed by this investigator is one such model (Lorenz, 2007). This model illustrates the effect of the
environment on the vulnerability of the person. The hospital environment in and of itself may pose a risk to homeostasis.

There are three phases in the Situational Model of Nurse Protection. The three phases are described in Table 1.

Table 1.

*The three Phases of the Situational Model of Nurse Protection*

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<th>Pre-protective Phase or Stage of Vulnerability</th>
<th>Protective Phase</th>
<th>Post-protective Phase</th>
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<td>Perceived threat occurs, Physiological</td>
<td>Protection provided by self or other, Physiological</td>
<td>Prevention of illness or injury</td>
</tr>
<tr>
<td>Threats of illness or injury, Require action, Warning, Time limited for action</td>
<td>Physiological</td>
<td>Development of effective or maladaptive coping strategies</td>
</tr>
<tr>
<td></td>
<td>Require action</td>
<td>Gives relief followed by pleasure and/or relaxation</td>
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The first phase is the pre-protective phase, in this phase the patient maintains homeostasis when a threat is perceived. This is the stage where the threat may be assessed and identified by the nurse. In this phase, risk of developing an adverse outcome is assessed and appropriate actions are taken to mitigate risk. As an example, a patient is identified as at risk for falling and a fall prevention plan is put into place. Assessment of risk is the first step in meeting the safety needs of the patient. In phase 2, the protective phase, a protective action is required after the threat has occurred. An example of this phase may be the establishment of interventions to prevent recurrent falls after the patient
has fallen. In phase 3, the post-protective phase, the patient continues to balance the potential threats but is able to do so with decreasing protection provided by the nurse. Phase 3 is returning the patient to a previous level of functioning after an acute illness (Lorenz, 2007).

Understanding Maslow’s Hierarchy of Needs allows healthcare providers to prioritize interventions based on the basic human need that is not being met. The application of a model that provides a framework for assessment, intervention, and evaluation of outcomes, extends the application of Maslow’s Hierarchy of Needs and allows patient healing to occur.

In this study, it is suggested that the type of room the patient is placed in may have considerable effect on their safety and their ability to heal. It is this study’s hypothesis that room type plays a role in preventing falls in the older adult and decreasing risk of adverse events, therefore contributing to their ability to return to their previous level of functioning. Out of Maslow’s Hierarchy of needs, several assumptions about safety arise: 1) the physical environment of the hospital room plays a part in keeping patients safe, 2) the design of the environment contributes to the ability to meet social needs of older adult patients, and 3) if safety and social needs of older adult patients are met, they have a greater likelihood of returning to their previous level of functioning prior to hospitalization.

Definitions

The variables measured in this study include the independent variables of room type and risk of social isolation and the dependent variables of falls and HAI. The
conceptual and operational definitions for study variables and terms include the following:

**Room Type** - private or semi-private. Operationally, patients were determined to be in a private room when assigned to a single occupancy room on admission. Patients were determined to be in a multi-occupancy room if the room assigned was able to accommodate more than one patient, but some patients assigned to multi-occupancy rooms may have been alone in the room.

**Falls** - Falls are defined conceptually as an occurrence in which a patient involuntarily descends to the floor (Schendimann, Buhler, De Geest, & Milisen. 2008). The operational definition of a fall for the purposes of this study was any occurrence in which a patient involuntarily descended to the floor whether witnessed or un-witnessed. This is the definition of a fall at the University Medical Center at Princeton. The occurrence of a fall was determined by a review of the patient record where the fall was documented by a healthcare provider in the progress notes.

**Healthcare-Associated Infections** - Healthcare-associated infections (HAI) are defined conceptually as infections that patients acquire during the course of receiving treatment for other conditions within a healthcare setting (CDC, 2009). The operational definition of a HAI for the purposes of this study was the acquisition of an infection by the patient during the course of the hospitalization that was not present on admission to the hospital. The occurrence of a HAI was determined by a review of the patient record where an infection that was not documented on the admission history and physical was noted on the record in the physician progress notes and supported by symptomatology and diagnostic testing.
Social Isolation- The conceptual definition of social isolation is the state of living without companionship, social support, or social connectedness. It is the absence of significant others that provide someone to interrelate with, trust and depend on in times of need (Cantor, & Sanderson, 1999). The operational definition for social isolation for the purposes of this study is the determination of ‘risk of social isolation.’ Lack of redundancy of social ties is a primary criterion for assessing risk of social isolation. (Lubben, Blozik, Gillman, Illife von Renteln Kruse, et al. 2006). Risk of social isolation was identified in this study by use of a numerical value assigned to six possible combinations of responses to the support network options asked as part of the nursing admission process when patients are admitted to the hospital (see Appendix A). Patients were asked what their support networks were. Responses ranged from living alone with no support network to living with others with multiple support networks.

Chapter Summary

In summary this chapter describes the purpose of this study and the hypothesis to be tested. The four variables to be examined: room type, social isolation, falls and HAI are defined both conceptually and operationally. This chapter has described the reasons why the evaluation of room type as it relates to patient care is an important component of the evaluation of design based interventions. The study is based on Maslow’s Hierarchy (1987) and the Situational Model of Nurse Protection (Lorenz, 2007). Based on these frameworks the following assumptions were made: 1) the physical environment of the hospital room plays a part in keeping patients safe, 2) the design of the environment contributes to the ability to meet social needs of older adult patients, and 3) if safety and
social needs of older adult patients are met they have a greater likelihood of returning to their previous level of functioning prior to hospitalization.
Chapter 2: Review of the Literature

Does Room Type in the Acute Care Hospital Affect Health Outcomes?

There has been a plethora of studies on room type and its effect on patient outcomes over the course of the past 10 years. The studies can be divided into four categories. These include cost of service, management and design, risk and prevention of hospital acquired injuries, and the effect of the environment on healing. In 2003, Chaudhury and colleagues did an extensive review and analysis of the literature on the use of single-patient rooms versus multiple occupancy rooms in the acute care environment. This review is currently published in electronic format only and is available through the Center for Health Design Web site (www.healthdesign.org). Two of the questions this review was directed at answering related to patient outcomes based on room type.

1. What are the advantages and disadvantages in disease control and falls prevention in single occupancy rooms versus double occupancy rooms in acute care settings?
2. What are the therapeutic impacts of single occupancy versus double occupancy hospital rooms?

In this comprehensive review, most of the articles that were reviewed were non-empirical and provided general overviews of the topics. Of 222 reviewed articles, only 86 were empirical designs. Of these 86 empirical studies, relatively few were published in peer-reviewed journals. There was no substantive review of the methodology used in this research. Because of the large numbers of non-research studies, the authors made several conclusions about the use of private rooms versus semiprivate rooms that are not supported by the evidence. An example of this was a citation with limited data from one
facility that reported a decrease in fall rates after hospital renovations from a semi-private room model to a private room model (Hendrich, Fay, & Sorrels, 2002). The authors proposed this decline in falls was due to increased family presence, although this was not supported by the evidence. In the new private rooms, family presence was encouraged by the creation of a family space in the room; however, family presence was not studied.

In 2004, Ulrich et al. did a review of the literature on the role of the physical environment in the hospital of the 21st century. This literature review examined more than 600 studies that establish how hospital design affects clinical outcomes in four areas. The first area is reduction of staff stress and fatigue, and increasing effectiveness to delivering care. This section of the review largely focused on improving staff safety through environmental measures. These environmental measures looked at decreasing infections and injuries in healthcare workers. Studies on increased effectiveness and staff satisfaction primarily centered on time spent walking as well as lighting and auditory or visual distraction and how these factors can be minimized through design. The second area was improving patient safety. This part of the review highlighted the research on prevention of infection using single occupancy rooms and strategies to increase hand washing among healthcare providers. Additionally studies were reviewed on the design impact on falls, medication errors, and privacy. The third category of studies was stress reduction and improved outcomes. These studies were specific to the design elements that reduce noise, improve sleep, and reduce spatial disorientation. Ulrich et al. also reviewed studies that showed evidence that light and scenes from nature, as well as provision of social support, reduced depression and resulted in better outcomes for patients. The last category was the improvement of overall healthcare quality. In this
section, the review focused on single bedded rooms and interior design elements that improve health outcomes. No new evidence was introduced on the patient room issue from the previous review done by Chaudhury.

In 2008, Ulrich et al. expanded the review of the literature done in 2004. The results of this review included more studies that guide hospital design. The results were organized according to three outcomes: patient safety, other patient outcomes and staff outcomes. In this review, the authors continue to make a case for single occupancy rooms to prevent HAI. The studies, which show a clear advantage of the single occupancy room in preventing HAI, are limited to those patients who have airborne infections (Beggs, 2003; Li et al., 2007; Ulrich & Wilson, 2006). This review of the literature supports the premise that single occupancy rooms may reduce infections spread by contact transmission. The rationale for this is that single occupancy rooms are thought to facilitate cleaning and decontamination (Ulrich & Wilson, 2006). The authors also suggest that single patient rooms may improve hand-washing rates among health care providers. This suggestion is based on studies in that decreased infection rates by more strategic placement of sinks but did not measure hand-washing rates (Goldman, Durbin, & Freeman, 1981; McManus et al., 1994; Mulin et al., 1997). The authors end the discussion by stating that hospitals ought to provide a higher proportion of single rooms in order to separate patients upon admission and identify potential pathogens thus preventing cross infection (Ulrich & Wilson, 2006). No mention of single rooms as a fall prevention strategy was made.

Discussions concerning the most optimal hospital design have been ongoing since the mid 1800s. In 1850, Florence Nightingale wrote two books, which were seminal texts
on the practice of nursing and hospital design. She was an advocate for the ward-style nursing unit, which held large numbers of patients. The foundation upon which she based this approach was on increasing staff efficiency, providing superior supervision, thereby elevating the quality of care. Nightingale argued that the risk versus benefit ratio of efficiency and better health outcomes for patients superseded the need for individual privacy. (Nightingale, 1859) Nightingale’s transformation of the health care environment created hospitals where healing rather than dying was the expected outcome. This change in the way hospitals were viewed resulted in the use of hospitals by not only the poor but also the wealthy. The wealthy individual created a demand for privacy and by the mid-twentieth century, hospitals were mainly private and semi-private rooms (Miller & Swensson, 1995). However, as late as the 1970s, there were still supporters of the ward-style patient room. These supporters contend that single occupancy rooms offered greater privacy for patients, but forfeited the benefit of continuous supervision afforded in multi-bed wards (Thompson & Goldin, 1975). This all-private room movement has been described as a manifestation of the desire of society rather than one with proven improved health outcomes. In the United States, the ward concept began to be rejected after World War II. By the early 1970s, most hospitals had a mix of private rooms, semi-private rooms, and small wards (Verderber & Fine, 2000).

Recently, there have been several publications that advocate the private room for various reasons. These reasons include cost considerations as well as privacy and risk aversion justification. Bobrow, Thomas, Kobus, Payette, and Skaggs state that 100 percent occupancy can be attained in single patient rooms (2000). Studies done in the realm of infection control claim that hospital-acquired infections are reduced in single
patient rooms, even when controlling for hand washing practices and air quality (Kappstein & Daschner, 1991; Muto et al., 2003; Shirani et al., 1986; Ulrich, 2003).

There have been limited studies in specific patient populations to determine what type of room may have the best outcomes for a specific population. In a recent study of maternity rooms, it was identified that nursing staff were better able to respond to the needs of patients in single occupancy maternity rooms, availability of equipment was maximized, and overall privacy was increased (Janssen, Harris, Soolsma, Klein & Seymour, 2001). However, some studies have been conducted that indicate that some patients prefer the company of other patients (Pease, 2004; Rowlands & Noble, 2008). Although, these studies have primarily been done in patients who were dying, there may be value to exploring other patient populations.

Due to changing demographics, increases in ambulatory care, advancements in technology, and increases in patient acuity, patient care has undergone a metamorphosis in the past 50 years. It has been suggested that the physical environment has a considerable influence on the health and safety of patients. However, it is only recently that hospitals are being designed with the goal of promoting patient safety (Reiling, 2006). Hospitals and patient rooms need to be designed to speak to the ever changing healthscape, therefore the type of patient room required needs to be determined by evidence based design principles that are patient population focused, have therapeutic benefits, reduce inefficiencies, decrease risk of hospital related injuries, and increase staff productivity (Chaudhury et al., 2003). Specifically, the design of the patient room needs to take into consideration the vulnerability of patients and make design modifications that
will diminish the risks to the patient and improve the ability of the healthcare provider to better care for the patient (Reiling).

The Hospitalized Older Adult and Room Design

It is apparent that poor outcomes in hospitalized older adults are largely dependent on the effect of the acute illness, the patient’s baseline vulnerability, and the hazards of hospitalization. Older adult patients have an increased incidence of acute illness, which makes them more vulnerable to iatrogenic complications. The rate of iatrogenic complications in the hospitalized older adult is said to be as high as 29-38% (Podrazik & Whelan, 2008). All of these factors result in a greater frequency of hospitalizations, longer length of stays, and an elevated risk of readmissions (Podrazik & Whelan). In addition, hospitalized older adults have an increased risk for functional losses resulting in an inability for them to return their previous level of function (Tucker et al., 2006). Studies have shown that all of the factors that play a role in functional loss in the older adult during hospitalization. These factors however, are interrelated and demand an interdisciplinary patient specific approach that promotes contributions from all team members with the goal of improving functional status and quality of care as well as reducing length of stay and readmissions.

Patients who are 65 years and older are responsible for about 50% of all hospital admissions (Podrazik & Whelan, 2008). In spite of that, few hospitals have specific programs designed to meet the needs of older adults (Landefeld, Palmer, Kresevic, Fortinsky & Kowal, 1995). In an attempt to improve outcomes in the older adult population and prevent hospital-acquired complications as well as functional losses, there has been a move towards designing specific units geared towards the older adult patient.
The first of these units was the Acute Care for the Elderly (ACE) inpatient unit. An ACE unit is a defined unit that uses an interdisciplinary team of geriatric specialists to provide an increased level of attention to the patient’s ability to function, specific treatment of common geriatric disorders and an integrated discharge plan combined with pharmaceutical management to maximize clinical outcomes. ACE units are designed to provide an environment both social and physical that satisfies the needs of individual patients (Jayadevappa, Bloom, Raziano, & Lavizzo-Mourey 2003).

The first unit opened in 1990 at Case Western Reserve University Hospital as part of a multicenter trial to determine if patients could maintain or achieve independence in activities of daily living through the integration of four care elements. These four elements were a specially designed environment, patient centered care, planning for discharge, and review of medical care. The environment included carpeting, handrails, uncluttered hallways, large clocks, calendars, elevated toilet seats, and door levers. The type of room, private or semi-private, interestingly, was not discussed. The results of this study concluded that specific changes in the provision of care could lead to improvement in a group of acutely ill older adults to perform basic activities of daily living at the time of discharge and reduce the frequency of transfer to a long-term care facility (Landefeld, Palmer, Kresevic, Fortinsky & Kowal, 1995). Another study that compared 54 pre-ACE unit patients and 146 post-ACE unit patients demonstrated a decrease in length of stay from 6.6 to 6.4 days (Flaherty, 1998). There was no discussion of environmental changes made to the ACE units in this study.

Later, Flaherty and colleagues designed a similar unit at St. Louis University Hospital. The specially designed environment included a day room/dining area for
patients, mini nurse’s stations close to the patient rooms, and an area to hold multidisciplinary team meetings. Again, there was no mention of private versus semi-private rooms (2003). In addition, a new type of room was designed for the confused and/or demented patient. This four-bed room was called the Delirium Room (DR). It is part of the ACE unit and its primary goal is to provide a safe environment for the patients housed there. In a typical nursing unit, confused patients are cared for in private or semi-private rooms where they are isolated from others. They are often placed in physical restraints for protection and given medications for agitation. In the DR, nursing care is provided in a manner that allows the patients to be restraint free and keeps the use of calming medications to a minimum. In a one-year study done on this unit, mortality was zero, the patient fall rate was near zero, and the use of medications for agitation was lower than those found in previous studies on delirious patients (Flaherty et al., 2003). This descriptive study demonstrated that there are some patient characteristics where constant supervision is necessary and the use of a multi-bed room may be preferable to a single occupancy room. Patients who are frail and/or delirious are more likely to fall in hospitals, therefore multi-occupancy patient rooms with increased surveillance may be the most appropriate level of care for these patients (Jones et al., 1991; Sutton et al., 1994; Tutuarima, van der Meulen, de Haan, van Straten & Limburg, 1997; Tzeng & Chang, 2008).

There is a noticeable absence of studies that have evaluated the modifications to the physical environment in an ACE model of care. One study did survey 16 hospitals with ACE units looking specifically at characteristics of ACE units and characteristics of hospitals associated with ACE units. However, the only environmental characteristic that
was surveyed was the number of beds in the unit (Jaydevappa, et al. 2003). Given the importance of the environment to promoting healing and prevent adverse events it is critical to study the effect of the built environment on the clinical outcomes of the hospitalized older adult.

Does Room Type Play a Role in the Rate of Falls in the Hospitalized Older Adult?

Since October 2008, the occurrence of falls in the hospital setting is considered by the Centers for Medicare and Medicaid Services (CMS) to be a “never event” or an event that should be preventable. Therefore, the CMS has identified patient falls as one of the eight Hospital Acquired Conditions (HACs) that the increased cost of treatment for the fall will no longer be reimbursable to the hospital. (Lewis, 2008)

The Joint Commission classifies individual risk factors for falls as intrinsic or extrinsic (Tzeng & Chang, 2008). Intrinsic risk factors are specific to the individual patient and include age related changes, a history of falling, decreased visual acuity, impaired cognition, and disorders of the musculoskeletal system. Extrinsic risk factors are outside of the individual patient and are associated with the physical environment. Environmental factors that pose risk include the design of the patient room, heights of beds and chairs, lack of modifications to support safe ambulation, medication, and inadequate lighting (Tzeng & Chang). In a Joint Commission review of sentinel events submitted due to fatal falls, they found there were five principle reasons that fatal falls occurred. They are: 1) inadequate staff communication and incomplete orientation and training, 2) incomplete patient assessments and reassessments, 3) environmental issues, 4) incomplete care planning and unavailable or delayed care provision, and 5) inadequate organizational culture of safety (Tzeng & Chang). Although environmental issues are
third on the list, most hospitals are not first designed to enhance safety, thereby preventing falls, nor have they incorporated the concepts of evidence based design into their renovations and construction projects (Reiling, 2006; Runy, 2006).

The occurrence of falls in the older adult is common, costly, and dangerous (Brainsky et al., 1997; Englander, Hodson & Terregrossa, 1996; Hoskin, 1998; Hosp Case, 2000; Krauss, et al., 2007; Rubenstein, Josephson, & Robbins, 1994; Rubenstein, Powers, & MacLean, 2001; Tzeng & Chang, 2008). The CDC states that falls are the third most common cause of unintentional injury or death across all age groups and the first leading cause among people 65 years and older (2007). This data does not differentiate between falls that happened at home and those that occur in hospitals. Individuals over the age of 65 account for one-third to one-half of people who fall each year (Cumming, Sherrington, Lord, Simpson, Vogler, Cameron, et al., 2008; Kannus et al., 1999). Ninety percent of hip fractures occur to people older than 70 who have fallen. For deaths attributed to falls, 70% were aged 85 or greater. Those living in nursing homes are more likely to fall than people living in their own homes are, and women living in nursing homes are more likely to fall than men (Commodore, 1995; Padilla Ruiz, Bueno Cavanillas, Peinado Alonso, Espigares Garcia & Galvez Vargas, 1998; Runge, 1997; Steinweg, 1997; Thapa, Brockman, Gideon, Fought & Ray, 1996).

Patient falls in the hospital are connected to higher hospital costs (Jones, Simpson & Pieroni, 1991; Sutton, Standen & Wallace, 1994). It is estimated that the projected cost per fall with injury to hospitals in 2007 would be at least $6,437.00 and the average cost per fall would be $425.00 (Tzeng & Chang, 2008). Injuries due to falls are the fifth leading cause of death in the older adult and the direct care costs of fall related injuries
are expected to be greater than $85 billion by the year 2020 (Englander et al., 1996).

Additional costs may be incurred by individual patients due to lost income. On top of this, the cost of falls to society can be considered by analyzing the trends in health care expenditures per capita, which has increased from $2,813 in 1990 to $7,498 in 2007, which is 16.2% of the U.S. gross domestic product (Henry J. Kaiser Family Foundation, 2007).

Fall prevention has been a focus of acute care hospitals particularly since the Joint Commission identified the need to reduce the risk of patient injuries from falls by making it a National Patient Safety Goal in 2005. In addition, falls were identified by the American Nurses Association as a nursing sensitive indicator meaning that this indicator could be most improved through nursing care approaches to the problem (2002). Several studies have identified multifaceted strategies to prevent falls, which include, identification of risk, routine checks, toileting rounds, management of medications, physical therapy consults, lowering bed height, use of alarms, and bedside checks of the environment (Cumming et al. 2008; Heindrich et al. 1995; Krauss et al. 2008; Schwendimann, et al. 2008; Tzeng & Chang, 2008). Interventions utilized in the physical environment to prevent falls to date have largely looked at modifications to the physical environment that include non-slip flooring, improved lighting, and grab rails (Chang, 2004). Research done in the 1990s supports these modifications in the home where a significant reduction in falls was seen (Thompson, 1996; Ytterstad, 1996); however, these modifications did not reduce nursing home falls. This may be related to the fact that the nursing homes may have already had those modifications in place. Although, many of these interventions have been put in place and in some reportedly have decreased falls.
There are no studies that specifically identify any one intervention that has decreased the rate of falling. The majority of falls occur in patient rooms when patients are alone attempting to get to the bathroom (Hendrich et al., 1995; Krauss et al., 2007), but there has been an unfortunate lack of literature related to the type of room, private or semi private, that the patient was in at the time of the fall. Given this information, it may be hypothesized that some patients may benefit from sharing a room as patients can assist each other and call for help as needed (Chaudhury et al., 2003). Data on increased patient supervision and monitoring to prevent falls has been inconclusive (Boswell, Ramsey, Smith, & Wagers, 2001; Cumming et al., 2008; Hendrich et al., 1995). Patient falls may also be reduced in private rooms that have space for family members to stay (Ulrich et al., 2004). The hospital environment, and more specifically the design and/or type of the hospital room appear to have a substantial effect on the prevention of falls and the safe care of patients. However, there is little conclusive evidence to support a specific design or type of hospital room where falls may occur less frequently (Reiling, 2006; Runy; 2006; Tzeng & Chang, 2008).

Healthcare-Associated Infection and the Hospitalized Older Adult

One of the leading causes of death in the United States is Healthcare-Associated Infection (HAI), commonly also referred to as “Hospital Acquired Infections.” A report released by the CDC in May 2007, reported that an estimated 1.7 million infections and 99,000 associated deaths occur in American hospitals each year. The costs of these infections exceed $4.5 billion. HAI is seen more frequently in patients who are immunocompromised due to age, underlying diseases, or medical/surgical treatments (Weinstein, 1998). Several elements contribute to the rising rate of HAI. They are low
hand washing rates by staff between patient contact, more immunocompromised patients, hospital renovations creating risk of airborne fungal diseases, and increasing use of antibiotics (Joseph, 2006). Two studies have found that private rooms are more desirable than multi-bed rooms in preventing airborne infection (Anderson, Bonner, Scheifele & Schneider, 1985; Ben-Abraham et al., 2002). This is largely due to the ability to isolate patients and to provide high quality HEPA filtration and negative or positive air pressure (Joseph, 2006).

The majority of infections contracted in hospitals are acquired through contact pathways (Bauer, Ofner, Just, Just & Daschner, 1990; Page & Institute of Medicine, 2004). Although infectious pathogens can contaminate surfaces, surfaces are not frequently identified as the primary cause of transmission from patient to patient (Sehulster & Chinn, 2003). The principle cause of contact transmission between patients is the lack of hand washing by healthcare workers (Larson, 1988; Ulrich, Quan, Zimring, Joseph, & Choudary, 2004). There have been a few studies suggesting that providing conveniently located sinks in private rooms reduces HAI (Ulrich et al., 2004). These studies were largely comparison studies done in ICUs that were multi-bed units with few sinks. Hand washing frequency was not studied. In one study that compared an open ICU with few sinks to single-bed rooms with one sink per room, there was a non-significant increase in hand washing but no decline in infection incidence. Ulrich and colleagues also take the position that multi-bed rooms are more difficult to decontaminate thoroughly and therefore potentially play a part in the spread of infection in the hospital (2004).

All the evidence in this area is circumstantial. In addition to the lack of hand washing, other identified variables affect the incidence of HAI in patients. The Agency
for Healthcare Research and Quality (AHRQ) states that hospitals with less than adequate staffing levels have higher rates of poor patient outcomes (Stanton & Rutherford, 2004). In addition, Needleman, Buerhaus, Mattke, Stewart, and Zelevinsky found a relationship between nurse staffing levels and several adverse patient outcomes, including urinary tract infections, pneumonia, shock, upper gastrointestinal bleeding, and longer length of stay (2002). Based on the previously stated information, it is apparent that room type may not be a causative factor in the development of HAI in the hospitalized older adult.

Hospitalized older adults are at an increased risk for poor outcomes (Hart, Birkas, Lachmann & Saunders, 2002). Hospital associated complications such as acute confusion and healthcare-associated Infections are common among the older adult, resulting in increased morbidity and mortality. Twenty-nine to thirty-eight percent of older adult patients experience at least one iatrogenic complication (Porvadik & Whelan 2008). There is no evidence that suggests that HAI will be reduced in the older adult population if they are assigned to a single room. In 2003, Stelfox, Bates, and Redelmeier conducted a study on the care issues of patients in isolation. The objective of this study was to examine the quality of care received by patients isolated for infection control purposes. They discovered that when patients were placed in isolation for infection control reasons the quality of care they received was different from those patients who were not isolated. Controlling for acuity, isolated patients were twice as likely as non-isolated patients to experience an adverse event, length of stay was longer, and patients were less satisfied with their care.

The numerous variables that affect the acquisition of HAI in the hospitalized older adult as well as the potential consequences of isolating the older adult in a private room
require that further research be done to understand the relationship between infection control, private rooms, and other adverse events that affect the hospitalized older adult. Evidence is necessary to establish the type of room that contributes to the health and well-being of the hospitalized older adult.

Social Isolation in the Hospitalized Older Adult

Social isolation is a variable that has been correlated with health outcomes in the hospitalized older adult. The definition of social isolation is the state of living without companionship, social support, or social connectedness. It is the absence of significant others that provide someone to relate with, trust, and depend on in times of need. Lack of social connectedness has been associated with poorer health related quality of life (Cantor & Sanderson, 1999). Additionally, the socially isolated suffer impaired health status, have an increased consumption of health care resources, and have negative outcomes from acute interventions such as cardiac surgery (Ellaway, Wood & MacIntyre, 1999; Ruberman, Weinblatt, Goldberg & Chaudhary, 1994). A recent study published in The British Journal of General Practice that evaluated the risk of social isolation reported that more than 15% of older adults are at risk, but risk is not associated with an increased use of healthcare services (Iliffe, Kharicha, Harari, Swift, Gilman & Stuck, 2007).

Social isolation has also been implicated in mental illness, distress, dementia, suicide, and premature death (Ellis & Hickie, 2001). The World Health Organization (WHO) has determined that preventing social isolation is required to maintain good health (WHOQOL Group, 1998). The degree of risk of social isolation is comparable with that of cigarette smoking and other physiological and psychosocial risk factors. The primary factor that contributes to or diminishes social isolation is the quality and/or
quantity of personal relationships (de Jong Gierveld, 1998). Other factors include friendliness with neighbors and social initiation, geographic location, living alone or homelessness, and ethnicity (de Jong Gierveld). Social support provides a buffer for individuals who are in crisis. While social support is only one contributing factor to social isolation, the absence of social support may remove the buffer contributing to negative health outcomes (Cobb, 1976). Lack of redundancy of social ties is associated with lower levels of social support (Fuhrer & Stansfeld, 2002). Physical status and mental health status are also considered predictors of social isolation as are communication losses associated with aging (Plouffe & Jomphe Hill, 1996). In addition, economic resources such as employment status and income are variables that also affect social isolation (de Jong Gierveld & van Tilburg, 1999). The prevalence of social isolation is between 3% and 25% in the general population (Hawthorne, 2006). In later life, there is a link between loneliness, social isolation, and neglect (Baltes & Smith, 2002). These links are related to difficulties with cognitive impairment, performing activities of daily living, declining health status, fear of falling, partner loss, and institutionalization (van Oostrom, Tijhuis, de Haes, Tempelaar & Kromhout, 1995; Illife et al., 2007).

Social isolation is also related to the concept of “loneliness” and both terms are often used interchangeably to describe the same phenomena. However, they have different definitions and are clearly different phenomena. Weiss defines social isolation as the objective state of having minimal contact with other people; while loneliness refers to the subjective state of negative feelings associated with perceived social isolation. Weiss further describes loneliness as a decreased level of contact with others than what is
desired or the absence of a companion (1982). In the absence of appropriate identification and intervention, social isolation in the older adult can lead to loneliness (Rodgers, 1998).

Thirty to fifty percent of all hospitalized older adults experience a decline or actual impairment in cognitive function during hospitalization (Danner, Beck, Heacock, & Modlin, 1993; Foreman, 1986). Cognitive decline has been associated with increased patient falls as well as other negative sequela (Catchen, 1983). Lack of social support, which is a contributing factor to social isolation, has been linked to cognitive decline (Rook, 1985). Weis’s interactional theory of emotional and social isolation and his model of social provisions have been used to explain the evolution of cognitive decline. This thought process indicates that the prevailing psychosocial environment is an important determinant of mental status. Provision of social support as a means of preventing social isolation is important when hospitalization is necessary (Cox & Verdieck, 1994). One example of the detrimental effects of social isolation in the hospital is highlighted by a study done by Pacquet and colleagues that assessed the social facilitation of older adult patients’ food intake. This research study concluded social interaction during mealtime facilitates food intake (2008).

Avoidance of social isolation has been identified as a factor in the prevention of negative outcomes in the hospitalized older adult. In addition to identifying patients who are at risk on admission, it is important to design environments that allow for contact with others. This study will examine whether the older adult who presents with an increased risk of social isolation will be more likely to fall or develop a new HAI if placed in a private or semi-private room. The type of room the hospitalized older adult is placed in may play a role in the ability to maintain a connection with others while hospitalized.
Further evidence is required to determine if the single patient room promotes positive health outcomes in this population.

Significance for Nursing Practice

Nursing is defined 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” (American Nurses Association, 2004, p. 6). This definition takes on new meaning when nursing is faced with decisions about patient care that may seriously affect the health outcomes of the individual. The hospital setting has been associated with medical errors and deaths that are thought to be preventable (Page, 2004). It is in this context that the bedside nurse must make decisions around the care of his/her patients, which protect, promote, and optimize the patients’ health and abilities.

Five factors have been identified which, if considered in the design of healthcare facilities may improve patient outcomes. They are psychologically supportive environments, patients’ sense of control, social support, positive distractions, and reduced negative distractions (Smith & Hellmuth, n.d.). These five factors can be further delineated to provide a theoretical foundation for the design of patient care areas to promote healing.

Nurses practicing at the point of service have the most knowledge about the environment that supports the tenets of the therapeutic environment.

Older adult patients pose a special consideration due to their unique physiological and psychosocial characteristics that increase their risk of suffering an adverse outcome in the hospital. This study seeks to contribute to a growing body of knowledge that will assist nurses to make clinical decisions that will result in positive health outcomes for
older adult patients. If private rooms are to become the gold standard in hospitals it is necessary to describe more precisely and accurately how the type of room affects the clinical outcome of the patient. In addition, the ability of the environment to protect the patient from hospital related injuries and errors are an important component of this study. Changes in the models of nursing care and establishment of evidence-based practice have been shown to impact health outcomes in the older adult after hospitalization (Flaherty et al., 2003; Landefeld, Palmer, Kresevic, Fortinsky & Kowal, 1995). It is imperative that nurses have an accurate understanding of the unique needs of the older adult and how the environment influences their needs.

Chapter Summary

The hospitalized older adult is rapidly becoming the largest consumer of healthcare. It is estimated that by 2021, 12.2 million or 19.5% of Americans will be over the age of 65 (Hollywood, 2006). It is imperative that hospitals and other healthcare facilities be designed in a manner that promotes positive health outcomes that do not create unnecessary expense to the consumer. The construction of all private room hospitals may lend greater than 14% to total construction costs (Chaudhury et al., 2003). Is this extra cost necessary or even desirable?

HAIs and falls occur frequently in the hospitalized older adult and are known to be a major cause of morbidity and mortality (Ben-Abraham et al., 2000). Since the cost of HAIs and falls in the hospital increase the cost of hospitalization due to increased length of stay, added diagnostic procedures and/or surgeries, and litigation (Hendrich et al., 1995), it is necessary, even mandatory, that hospital executives and designers of
healthcare facilities promote and disseminate research that improves care and decreases the cost to the consumer.

In this review of the literature, it is apparent there is little empirical evidence to support the recommendation by the AIA, which requires that all new hospital construction be private rooms (Chaudhury et al., 2003; Lorenz, 2007). This is particularly not evident as it relates to specific patient populations such as the hospitalized older adult. In fact, there is evidence to support that a multi-bed model may be more suitable in this population (Flaherty et al., 2003). Although there are conflicting studies that suggest a private room model may be advantageous, there are still many questions left unanswered and the rigor of the studies, particularly as they relate to falls and infection, is not sufficient to do more than suggest what may be the appropriate room type for any patient population. Room type has been shown to play a part in the patient’s ability to heal and the nursing staff’s ability to provide therapeutic care. This study is one of increasing importance as new hospitals are designed and built and the population ages.
Chapter 3: Methods

Introduction

This study employed a retrospective case comparative design to determine the differences in falls and HAI in patients who were admitted to private rooms versus semiprivate rooms. The groups that were compared consisted of the population of patients over the age of 65 in private or semi-private rooms with a LOS of 3 to 10 days.

Sample Size Estimation

Sample size estimation was conducted for a retrospective study comparing two groups using corrected Chi Square because the observed frequencies of falls will be less than five. This estimation was based on the frequency of falls in the over 65 population. The reported frequency of these events is .30 (Kannus et al., 1999; Rubenstein, Powers & Maclean, 2001). Therefore, for an independent dichotomous outcome study with an alpha level of .05, 150 patient records were needed to provide 80% power. An additional 10% for 166 patient records were abstracted to account for the potential of missing data.

Recruitment of Subjects

After human subject approval, the patient’s medical records were selected from the medical surgical units at University Medical Center at Princeton (UMCP). UMCP is a 308-bed acute care community teaching hospital located in Princeton, New Jersey. This hospital cares for a variety of patients with fifty percent of them over the age of 65 (PCHS demographic data, 2007). Specialties include cardiology, general medicine and surgery, orthopedics and maternal child health. Since patient information was abstracted retrospectively, the only approvals required were through the Internal Review Board at UMCP and Drexel University. The inclusion criteria included:
• Patients over the age of 65
• Patients with a length of stay of at least 3 days and not greater than 10 days
• Patients being cared for on a general medical surgical unit

Exclusion criteria were:

• Patients with a clinical history of dementia
• Patients who had been bedridden prior to admission
• Patients admitted directly from a nursing home
• Patients in isolation for an identified infection
• Patients who are incontinent
• Patients who have been readmitted in the last 30 days

Measures

Demographic data included gender, age, length of stay and fall risk on admission to the hospital (see Appendix B). Gender and age were collected from the face sheet of the chart. Fall risk was collected from the nursing admission assessment. Incidence of falls and HAI were collected by review of the nursing and physician progress notes. Once an HAI was identified in the progress note it was verified through laboratory and diagnostic data. Risk factors for social isolation included living alone, living with others, support network options, redundancy of support network options (i.e. more than one), and family framework options. These indicators were abstracted from the nursing admission assessment of each patient (see Appendix A).

Protection of Human Subjects

This study was a retrospective study involving the collection or study of existing data, documents, and records from an acute care hospital. This data was collected in such
a manner that the subjects could not be identified, directly or through identifiers linked to the subjects.

Although there are no specific regulations governing research with older adult subjects, it is generally agreed that older adults are not usually in need of special protections except in the circumstances of cognitive impairment and institutionalization. Under those conditions, the same considerations are applicable as with other non-older adult subjects in the same circumstance. This study excluded subjects from nursing homes and those with a clinical history of dementia.

This study involved the collection of patient data from an acute care hospitalization. The records were randomly selected from all patient records of patients age 65 and above. The records were selected via computer program and were de-identified by the Hospital Information Management Department before they were given to the investigator for abstraction. Since the records were de-identified before the investigator was given access, there was no need to obtain informed consent. There was no risk to the patient in this study. Confidentiality was assured with de-identified records and random selection of the records that were abstracted. This study qualified for exempt review under the Office of Human Research Protection and the Department of Health and Human Services.

Inclusion of Women, Minorities, and Children

The sample was selected randomly via computer program. Woman and minorities were present in the sample as they are in the population. Children were not included as this study was specific to those 65 and older.
Data and Safety Monitoring Plan

This study did not implement a clinical trial so a formal data and safety-monitoring plan was not proposed.

Compensation to Subjects

Since subjects were not identifiable, there was no compensation.

Procedures

Fall data, HAI data, length of stay (LOS) data, and social isolation risk data were abstracted from the charts of 166 patients 65 years of age or older and admitted within a five-month period, January thru May 2006. Patient consent was not obtained as fall and HAI data are currently collected by the hospital for public reporting purposes, and patient records were de-identified prior to abstraction. The procedure for abstraction was as follows:

1. The Hospital Information Management Department (HIM) generated a list of patients who met the age criteria of 65 and over and who were admitted to UMCP beginning in January 2006
2. The sample was randomized by selecting every third record from the computer-generated list of records. Records were selected in groups of 50
3. Records were de-identified through the hospital’s Hospital Information Management Department before being released to the investigator
4. All records were reviewed to assure that it met all the inclusion criteria and had no reason for exclusion
5. The records were then divided into two groups based on room type private or semi-private
6. Once 83 records of one type of room were obtained, only rooms of the other type were included.

7. Records were then abstracted by the PI and a research assistant using the data collection form (Appendix B).

The complete record was reviewed for assurance that the patient met the inclusion criteria. Two hundred thirty-nine patient records were therefore reviewed and 73 were excluded due to missing data or inability to meet the inclusion criteria. The chart review was labor intensive as the charts were partially electronic and partially on paper. All of the nursing documentation is in the electronic medical record while the majority of the physician documentation is in the paper chart. This created some challenges for the investigator and research assistant as there was little to no standardization of the physician documentation making it time intensive to find needed information. In addition the handwriting of the physicians was often not legible which made it difficult to interpret. In contrast the nursing documentation was concise, and easy to read. Required information was documented in the same place in every record making it less complicated to obtain the data. The research assistant (RA) was trained by the PI on data abstraction. Five records were abstracted simultaneously and reviewed by the PI and RA to assure completeness and accuracy of the data.

Data Management and Analysis

All data was managed by the PI and RA. Data entry and analysis to test the three research hypotheses was done using Microsoft Office Excel 2007® (Microsoft Corp., 2007) and SPSS® version 16.0.1 (SPSS, Inc., 2003). Means and standard deviations were calculated for the continuous variable of LOS. Descriptive statistics were computed for
all demographic variables. Frequency data and percentages were calculated for the categorical variables of falls and HAI. The frequency method selected was Chi-Square. An independent samples t-test was used to identify any significant sociodemographic differences between the groups for scale level variables such as age. Chi-Square Analysis was used to identify any differences in categorical level sociodemographic variables.

Patient risk of social isolation (RSI) was assessed by evaluating the presence or absence of factors that determine whether a patient was socially isolated. The contributing factors that were assessed in this research study are: living alone, living with others, support networks which include the presence of friends and family, and a redundant support network which infers that there are more than one friend or family member available to provide support if needed.

The degree of risk for social isolation was determined by assigning a number to each factor or combination of factors that are present. For example, four factors contribute to the degree of risk for being socially isolated. These factors may exist singly or in combinations. These factors are:

A. living alone
B. living with others
C. support network in place
D. redundant support network in place

There are six possible assessments that can be made and each was assigned a number from 1-6, the higher the number the greater the degree of risk of social isolation. If a patient lives alone but has a daughter, she is considered to have a support network and if she is active in a church group that would be considered a redundant support
network. The patient would then be rated ACD. A is living alone, C is having one support network and C is having a redundant support network. A rating of ACD would give her a risk of Social Isolation score of a 2. This means that she is at low risk for social isolation. Scoring 3 or greater is considered to be at risk for social isolation. Table 2 shows the Risk for Social Isolation Rubric.

Table 2.

<table>
<thead>
<tr>
<th>Risk for Social Isolation Rubric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total #</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

The odds ratio is used to estimate relative risk. In this study, we attempted to determine what risk room type and being socially isolated plays in the outcomes of falls and HAI in the hospitalized older adult. Logistic regression was utilized to determine whether being at risk for social isolation will affect the probability of a negative outcome (falls, HAI) and what part room type plays in these outcomes.

To analyze the first hypothesis “older adults in private rooms will fall more frequently than older adults in semi-private rooms,” the primary method of statistical
analysis used was Chi-Square. Chi-Square compares the actual number or frequency in each group and determines whether two variables are independent of each other. Data was arranged into a contingency table. The contingency table shows the relationship between room type and falls. This multidimensional Chi-Square tests the null hypothesis that the two variables are independent of one another. In addition to Chi-Square an odds ratio was calculated. The odds ratio was used to estimate the relative risk of falling and being in a private or semi private room.

To analyze the second hypothesis “older adults aged 65 or over in private rooms will have no difference in the incidence of healthcare associated infection than older adults in semi-private rooms” the primary method of statistical analysis used was Chi-Square. Chi-Square compares the actual number or frequency in each group and determines whether two variables are independent of each other. Data was arranged into a contingency table. The contingency table shows the relationship between room type and HAI. This multidimensional Chi-Square tests the null hypothesis that the two variables are independent of each other. For both the first and second hypotheses, the Pearson Chi-Square was calculated to see if there is a difference between the categorical variables. It is utilized because the sample size is greater than 100.

To analyze the third hypothesis “older adults over the age of 65 who are at risk for social isolation will have a higher incidence of negative outcomes (falls or HAI) regardless of room type” the primary methods of statistical analysis is the odds ratio and logistic regression. The odds ratio was used to estimate how the relative risk of social isolation and room type affected the outcome of falls and HAI. Logistic regression was
utilized to determine whether being at risk for social isolation affected the probability of a negative outcome.

Chapter Summary

Chapter 3 outlined the methods and design of this retrospective case comparative study. The three primary hypotheses were described and the statistical analyses used to test the assumptions were described in detail. The primary statistical analyses utilized in this study were Chi-Square and Logistic Regression.
Chapter 4: Findings and Results

Introduction

The purpose of this chapter is to present the results of the study. The chapter begins with a discussion of the data collection process that was performed prior to statistical analysis, followed by a discussion of how the sample size was determined and the procedures utilized to obtain the sample. Descriptive statistical analysis of the data collection form and all sources of data along with the research hypotheses will be analyzed and presented. The chapter concludes with a summary of the findings.

All data was managed using Microsoft Excel 2007® for Windows®. This spreadsheet was used to 1) track all records that were abstracted; 2) assure that there were no duplicate records; and 3) verify that all required data was abstracted and recorded properly. This investigator along with one research assistant abstracted all of the records.

Prior to conducting any statistical analysis, the data was screened to assure accuracy, to test for the presence of duplicate records, and to determine that assumptions for the use of non-parametric statistics were met. Discussion of the assumptions for each respective statistical test is included in the chapter and will be integrated and presented with the recorded findings. After all data was screened, statistical analyses were performed using SPSS® 16.0 for Windows®.

Calculation of Sample Size

Sample size estimation was conducted for a retrospective study comparing two groups. This estimation was based on the frequency of falls in the over 65 population which has a reported frequency of .30. This means that one in every three older adults will fall each year (CDC, 2009; Kannus et al.; 1999; Rubenstein, Powers, & Maclean, 2001). Therefore, for an independent dichotomous outcome study with an alpha level of
.05, 150 patient records were needed to provide 80% power. An additional 10% resulting in a final sample of N=166. It is important to note that the reported frequency of falling is in the general population of those over the age of 65 and not limited to those who fall in the hospital.

Sampling Design and Subject Recruitment

After securing Institutional Review Board approval from both Drexel University and University Medical Center at Princeton (UMCP), data collection began. Collection of data from the patient records took place over a 9-month period beginning in April of 2008 and ending in January of 2009 (although the initial plan was that this data collection could be completed in 90 days, but the investigator had unanticipated delays). UMCP is a 308-bed acute care community teaching hospital located in Princeton, New Jersey. This hospital cares for a variety of patients and 50% of them are over the age of 65 (PHCS demographic data, 2007). Specialties include cardiology, general medicine, general surgery, orthopedics, and maternal child health. A proportional stratified probability sampling method was used in this study described in Chapter 3.

UMCP’s Hospital Information Management Department provided the records for this study (refer to page 33). Records were randomized by generating a list of patients who met the age criteria (65 and over) admitted to UMCP beginning in January of 2006. From this list, every third record was pulled until 50 records were accumulated. Paper copies of the face sheet, nursing admission record, progress notes, vital signs, medication administration records, emergency depart records (where applicable), lab and radiology reports, history and physicals, consults, and discharge summaries were generated for each record. The records were then de-identified and supplied to the researcher. The researcher
and research assistant then reviewed each record to assure that it met all inclusion criteria and had no reason for exclusion. The record was then placed in a group of private or semi-private. This process was repeated in batches of 50 records until 83 records for each group were obtained. The semi-private room group met its goal of 83 records first. At this point no further semi-private records were reviewed, only private room records were reviewed until 83 records were obtained for the private room group. Once both groups were complete, study data abstraction commenced. Two hundred thirty-nine charts were abstracted.

Figure 1 represents a schematic summary of the randomized clinical retrospective study identifying how the sample was obtained.

Figure 1. Schematic Summary of Sample (N=166)
Patients were excluded for the following reasons, a clinical history of dementia, bedridden prior to admission, admitted directly from a nursing home, incontinence, isolated for an infection, readmission within 30 days, LOS less than 3 days or greater than 10 days, and, transferred to a non-medical surgical unit. Figure 2 presents a schematic summary of the reasons for exclusion within this sample.

Figure 2. Reason for Exclusion (N=73)

The patients selected for this study were only admitted to general medical surgical units within the hospital, and were not admitted to any critical care or hard telemetry units at any point during their admission except for during sedating procedures and/or surgical procedures.
The hospital unit geographic distribution of subjects can be seen in Figure 3.

![Figure 3. Hospital Unit Geographic Distribution of Subjects (N=166)](image)

**Descriptive Statistics from Data Collection Form**

**General Study Variables**

**Age** - The mean age of the 166 patients was 80.08. The range of ages of subjects was from 66 to 104. Means and standard deviations for the total sample are noted in Table 3.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>166</td>
<td>66</td>
<td>104</td>
<td>80.08</td>
<td>7.02</td>
</tr>
</tbody>
</table>

Table 3.

**Descriptive Statistics for Age (N=166)**
Table 4 indicates the means and standard deviations of age for each group of patients in private (P) or semi-private (S) rooms.

Table 4.

*Descriptive Statistics for Age and Room Type (N=166)*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>83</td>
<td>80.35</td>
<td>6.77</td>
</tr>
<tr>
<td>P</td>
<td>83</td>
<td>79.82</td>
<td>7.29</td>
</tr>
</tbody>
</table>

A *t*-test was calculated to determine if there was any significant difference between the two groups, private or semi-private, with regard to age. No significant difference was reported (*t* = .49, *df* = 164, *p* = .63). Table 5 indicates the comparison of age and room type.

Table 5.

*Independent *t*-test for Age and Room Type (N=166)*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Mean Difference in Age by Room Type</th>
<th><em>t</em></th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-Private</td>
<td>.53</td>
<td>.49</td>
<td>.63</td>
</tr>
<tr>
<td>Private</td>
<td>.53</td>
<td>.49</td>
<td>.63</td>
</tr>
</tbody>
</table>

*Note. p = .63*
Age was categorized using age stratification such that “Young-old” includes ages 65-75, “Old” includes ages 76-85, and “Old-old” includes ages greater than 85. This age stratification is presented in Figure 4.

A Chi-Square Analysis was performed to determine if there was significance in the size of the Age groups. A Chi-Square test shows these differences to be significant ($\chi^2 = 23.18$, $df = 2$, $p < .01$) and is shown in Table 6.

Table 6.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>N</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young-old</td>
<td>46</td>
<td>23.18</td>
</tr>
<tr>
<td>Old</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Old-old</td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>

Note. $p < .01$
**Gender** – There was a larger percentage of females than males in the study. The distribution of gender is presented in Figure 6.

![Gender Distribution](image)

*Figure 5. Gender Distribution (N=166)*

Among private room subjects, 48 were female and 35 were male. Among semi-private room subjects, 54 were female and 29 were male. Across both room types, there indeed were more females than males; however, Chi-Square Analysis did not find a significant difference between the groups based on gender ($\chi^2 = .92, df = 1, p = .34$).
Table 7 portrays gender across room types.

Table 7.

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Females</th>
<th>Males</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>48</td>
<td>35</td>
<td>.92</td>
</tr>
<tr>
<td>Semi-Private</td>
<td>54</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

*Note. p = .34*

The mean age of women was slightly higher than that of men. Table 8 displays the mean and standard deviation of age for each gender.

Table 8.

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>102</td>
<td>80.37</td>
<td>6.82</td>
</tr>
<tr>
<td>Male</td>
<td>64</td>
<td>79.62</td>
<td>7.34</td>
</tr>
</tbody>
</table>

While ages for females and males appeared similar, a $t$-test was conducted to determine if there was a significant difference in age with regard to gender. There was no significant difference in age between men and women in the study sample ($t = .67$, $df = 164$, $p = .51$). The comparison between gender and age is shown in Table 9.
Table 9.

**Comparison of Age and Gender by t-test (N=166)**

<table>
<thead>
<tr>
<th>Mean Difference in Age by Gender</th>
<th>t</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>.75</td>
<td>.67</td>
</tr>
<tr>
<td>Male</td>
<td>.75</td>
<td>.66</td>
</tr>
</tbody>
</table>

*Note. p = .51*

The distribution of patients who fell by gender can be seen in Figure 6.

*Figure 6. Distribution of Fall by Gender (n=5)*
A Chi-Square analysis was performed to ascertain if there was a relationship between gender and falls. This analysis revealed a significant relationship between gender and falls ($\chi^2 = 8.22$, df = 1, $p = .01$) as displayed in Table 10 as more males than females fell.

Table 10.  
*Chi-Square Comparison Between Falls and Gender (N=166)*

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>102</td>
<td>0</td>
<td>8.22</td>
</tr>
<tr>
<td>Male</td>
<td>59</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>161</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

*Note. $p = .01$*

The distribution of HAI by gender is portrayed in Figure 7.

*Figure 7. Distribution of HAI by Gender (N=166)*
A Chi-Square test was completed to look for a relationship between HAI and gender. Results, displayed in Table 11, indicate that there was no significant relationship between the occurrence of HAI and gender ($\chi^2 = 1.07, df = 1, p = .49$).

<table>
<thead>
<tr>
<th>HAI</th>
<th>No</th>
<th>Yes</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>95</td>
<td>7</td>
<td>1.07</td>
</tr>
<tr>
<td>Male</td>
<td>62</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>157</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

*Note. p = .49*

**Length of Stay (LOS)** - The patient records abstracted demonstrated a LOS of 3-10 days with ALOS (average length of stay) being 5.88 days. Means and standard deviations for the total sample are noted in Table 12.

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS</td>
<td>166</td>
<td>5.88</td>
</tr>
</tbody>
</table>
Table 13 depicts the LOS for each primary diagnosis category.

Table 13.

<table>
<thead>
<tr>
<th>Primary Diagnosis Category</th>
<th>n</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical</td>
<td>94</td>
<td>6.10</td>
<td>2.11</td>
</tr>
<tr>
<td>Oncology</td>
<td>21</td>
<td>6.05</td>
<td>1.99</td>
</tr>
<tr>
<td>Ortho</td>
<td>37</td>
<td>5.24</td>
<td>1.59</td>
</tr>
<tr>
<td>Surgical</td>
<td>14</td>
<td>5.86</td>
<td>1.66</td>
</tr>
</tbody>
</table>
The Tamhane Test for multiple comparisons were conducted based on observed means looking for significant differences in LOS between the four primary diagnosis categories. No significant differences were determined. The results of these comparisons can be seen in Table 14.

Table 14.

<table>
<thead>
<tr>
<th>(I) Dx Type</th>
<th>(J) Dx Type</th>
<th>Mean Difference (I-J)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oncology</td>
<td>.05</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>Ortho</td>
<td>.85</td>
<td>.08</td>
</tr>
<tr>
<td>Surgical</td>
<td>.24</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>-.05</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Oncology</td>
<td>Ortho</td>
<td>.80</td>
<td>.54</td>
</tr>
<tr>
<td>Surgical</td>
<td>.19</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>-.85</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>Ortho</td>
<td>Oncology</td>
<td>-.80</td>
<td>.54</td>
</tr>
<tr>
<td>Surgical</td>
<td>-.61</td>
<td>.82</td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>-.24</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Surgical</td>
<td>Oncology</td>
<td>-.19</td>
<td>1.00</td>
</tr>
<tr>
<td>Ortho</td>
<td>.61</td>
<td>.82</td>
<td></td>
</tr>
</tbody>
</table>
The mean LOS for private rooms was slightly higher than that for semi-private rooms and is depicted in Table 15.

Table 15

<table>
<thead>
<tr>
<th>Room Type</th>
<th>n</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>83</td>
<td>5.83</td>
<td>2.04</td>
</tr>
<tr>
<td>P</td>
<td>83</td>
<td>5.93</td>
<td>1.91</td>
</tr>
</tbody>
</table>

When a $t$-test was calculated examining LOS by room type, no significant difference was established ($t = -0.32$, df = 164, $p = .75$) (see Table 16).

Table 16.

<table>
<thead>
<tr>
<th></th>
<th>Mean Difference in LOS by Room Type</th>
<th>$t$</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-Private</td>
<td>-.10</td>
<td>-.32</td>
<td>.75</td>
</tr>
<tr>
<td>Private</td>
<td>-.10</td>
<td>-.32</td>
<td>.75</td>
</tr>
</tbody>
</table>

*Note. p = .75*
LOS for males was higher than for females and is depicted in Table 17.

Table 17.

*Length of Stay by Gender (N=166)*

<table>
<thead>
<tr>
<th>Gender</th>
<th>n</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>102</td>
<td>5.74</td>
<td>1.85</td>
</tr>
<tr>
<td>Male</td>
<td>64</td>
<td>6.11</td>
<td>2.14</td>
</tr>
</tbody>
</table>

In addition, gender was not found to be significant with regard to LOS on *t*-test (*t* = -1.20, df = 164, *p* = .23) as seen in Table 18.

Table 18.

*Independent Samples t-test Comparison of LOS and Gender (N=166)*

<table>
<thead>
<tr>
<th>Mean Difference in LOS by Gender</th>
<th><em>t</em></th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>-0.37</td>
<td>-1.2</td>
</tr>
<tr>
<td>Male</td>
<td>-0.37</td>
<td>-1.2</td>
</tr>
</tbody>
</table>

*Note. p = .23*

*Risk of Social Isolation* (RSI) – Determination of risk of social isolation was made using a rubric that assigns a number to each factor or combination of factors contributing to social isolation that are present. Four factors contribute to the degree of risk for being socially isolated. The factors are: 1) living alone; 2) living with others; 3) a support network in place; and 4) a redundant support network in place. These factors may exist
singly or in combinations. There are six possible assessments that can be made and each was assigned a number from 1-6, the higher the number the greater the degree of risk for social isolation. Refer to pages 36 and 37 for details of RSI. The scores were extracted from the nursing admission assessment (see Appendix B). The nursing assessment done at admission collects data about the patient on their support network. Presence of support networks have been identified in the literature as a crucial component of preventing social isolation (Hawthorne, 2006; Illife, 2007; Lien-Geisen, 1993; Lubben et al., 2006). The risk of social isolation is reported to increase with age (Illife et al. 2007). Figure 8 shows the distribution of Risk for Social Isolation.

Figure 8. Distribution of Risk for Social Isolation (N=166)
Table 19 identifies the risk of social isolation by age group.

Table 19.

<table>
<thead>
<tr>
<th>RSI by Age Group (N=166)</th>
<th>Age Group</th>
<th>Old</th>
<th>Old-Old</th>
<th>Young-Old</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Lower Risk (1, 2)</td>
<td>47</td>
<td>22</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28.3%</td>
<td>13.3%</td>
<td>18.7%</td>
<td></td>
</tr>
<tr>
<td>At Higher Risk (3, 4)</td>
<td>37</td>
<td>14</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22.3%</td>
<td>8.4%</td>
<td>9.0%</td>
<td></td>
</tr>
</tbody>
</table>

Using the age stratification model chi square analysis did not find a significant difference in RSI across age groups. ($\chi^2 = 6.44$, df = 6, $p = .38$). This analysis is shown in Table 20.

Table 20.

<table>
<thead>
<tr>
<th>Chi-Square Comparison of RSI and Age Group (N=166)</th>
<th>Age Group</th>
<th>Young-Old</th>
<th>Old-Old</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Lower Risk (1, 2)</td>
<td>31</td>
<td>47</td>
<td>22</td>
<td>6.44</td>
</tr>
<tr>
<td>At Higher Risk (3, 4)</td>
<td>15</td>
<td>37</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

Note. $p = .38$
The comparison of RSI by gender is presented in Table 21. Both genders had more subjects at lower risk for social isolation.

Table 21.

*Risk of Social Isolation by Gender (N=166)*

<table>
<thead>
<tr>
<th>Count</th>
<th>F</th>
<th>M</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Lower Risk (1, 2)</td>
<td>55</td>
<td>45</td>
<td>100</td>
</tr>
<tr>
<td>At Higher Risk (3, 4)</td>
<td>47</td>
<td>19</td>
<td>66</td>
</tr>
</tbody>
</table>

A Chi-Square Analysis was performed to determine if the risk for social isolation (RSI) was different in men versus women. Interestingly, this analysis, shown in Table 22, did find that gender is significant, and men have a lower RSI than women ($\chi^2 = 16.21, df = 3, p = .01$).

Table 22.

*Chi-Square Comparison of RSI and Gender (N=166)*

<table>
<thead>
<tr>
<th>RSI</th>
<th>Females</th>
<th>Males</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Lower Risk (1, 2)</td>
<td>55</td>
<td>45</td>
<td>16.21</td>
</tr>
<tr>
<td>At Higher Risk (3, 4)</td>
<td>47</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>

*Note. p = .01*
Table 23 describes the RSI by room type. Private rooms had more subjects at lower risk in this sample.

Table 23.

<table>
<thead>
<tr>
<th>RSI by Room Type (N=166)</th>
<th>Room Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSI</td>
<td></td>
</tr>
<tr>
<td>At Lower Risk (1, 2)</td>
<td>61</td>
</tr>
<tr>
<td>At Higher Risk (3, 4)</td>
<td>22</td>
</tr>
</tbody>
</table>

In order to determine whether there was a relationship between the two independent variables of RSI and room type, a Chi-Square Analysis was performed. This analysis showed that there was significance, whereby patients who have a lower RSI tend to be assigned to private rooms. Since room assignment was not controlled in this study, it is not possible to know whether the patient requested the private room or what other variables may have affected the room assignment ($\chi^2 = 12.36$, df = 3, $p = .01$). The results of the analysis are below in Table 24.

Table 24.

<table>
<thead>
<tr>
<th>Chi-Square Comparison of RSI and Room Type (N=166)</th>
<th>Room Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSI</td>
<td></td>
</tr>
<tr>
<td>At Lower Risk (1, 2)</td>
<td>61</td>
</tr>
<tr>
<td>At Higher Risk (3, 4)</td>
<td>22</td>
</tr>
</tbody>
</table>

Note. $p = .01$
Primary Diagnosis Category - The patient records abstracted revealed several primary diagnosis categories. Distribution of primary diagnosis categories is shown in Figure 9.

![Pie chart showing distribution of primary diagnosis categories]

Figure 9. Distribution of Primary Diagnosis Category (N=166)

Medical diagnoses included congestive heart failure, coronary artery disease, pneumonia, dehydration, and GI bleeding. Surgical diagnoses were generally orthopedic surgeries, primarily elective and a few abdominal surgeries. Oncology admissions were usually related to treatment of symptoms due to cancer treatments and pain.

Fall Risk - Fall risk data was gathered on all 166 patients. Out of the 166 patients, 69.3% were identified as being a fall risk on admission. Fall risk was assessed on admission to the hospital only using the Schmid Fall Risk Assessment (Schmid, 1990) (see Appendix C). The Schmid Fall Risk Assessment Tool is designed to assess the patients’ risk of falling. This evaluation of risk guides the practitioner in the selection of appropriate strategies to minimize the risk of falling and prevent injuries.
The tool assesses risk by determining the status of the patient in five key areas that if present have proven to have a high correlation to the likelihood of falling. They are mobility, mentation, elimination patterns, prior history of falling, and taking anti-convulsants, tranquilizers, psychotropic or hypnotic medication. The patient status is then scored 0, 1, or 2, on a particular item. Patients who score a total of 3 or greater are determined to be at risk for falling (Schmid, 1990). Distribution of fall risk is presented in Figure 10.

*Figure 10. Distribution of Fall Risk (N=166)*
Age, in and of itself, is not considered an independent risk factor for falls (Hendrich, 2003; Schmid, 1990). However, since falls are the leading cause of unintentional death or injury in individuals over the age of 65 (CDC, 2009), a comparison of fall risk by age was completed and can be seen in Figure 11.

![Figure 11. Percent at Risk for Falls by Age Group (N=166)](image)

Age was shown to have an effect on fall risk. Hospitalized older adults in this sample were at a greater risk of falling the older they were \((x^2 = 11.33, \text{ df } = 2, p < .01)\). The results of this comparison can be seen in Table 25.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Fall Risk</th>
<th>(x^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Young-old</td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td>Old</td>
<td>26</td>
<td>58</td>
</tr>
<tr>
<td>Old-old</td>
<td>4</td>
<td>32</td>
</tr>
</tbody>
</table>

*Note. p < .01*
The distribution of fall risk by gender is displayed in Figure 12.

![Figure 12. Distribution of Fall Risk by Gender (N=166)](image)

Although male gender is considered an independent risk factor for falling (but it is not part of the Schmid tool), a comparison of fall risk and gender in this sample did not show a significantly greater risk of falling for men than women, based on the assessment of risk on admission. ($\chi^2 = 1.33, df = 1, p = .30$) The results of this analysis are presented in Table 26.

Table 26.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Fall Risk</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Female</td>
<td>28</td>
<td>74</td>
</tr>
<tr>
<td>Male</td>
<td>23</td>
<td>41</td>
</tr>
</tbody>
</table>

*Note. $p = .30*
A Chi Square analysis was performed to determine if patients in certain primary diagnosis categories would have a greater likelihood of being at risk for falling. This analysis showed a significant relationship between fall risk and having an orthopedic or surgical primary diagnosis. There was a higher probability for fall risk among orthopedic patients and a lower likelihood of being assessed as a fall risk for surgical patients ($\chi^2 = 10.27, \text{df} = 3, p = .02$).
Table 27 presents the results of this Chi-Square analysis.

Table 27.

*Chi-Square Comparison of Fall Risk and Primary Diagnosis Type (N=166)*

<table>
<thead>
<tr>
<th>Diagnosis Type</th>
<th>Fall Risk</th>
<th>( \chi^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical</td>
<td>32</td>
<td>62</td>
</tr>
<tr>
<td>Oncology</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Orthopedic</td>
<td>5</td>
<td>32</td>
</tr>
<tr>
<td>Surgical</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

*Note. p = .02*

Research Questions

**Question 1:** “Does the incidence of falls in older adults differ between room types private or semi-private?”

Out of 166 patient records abstracted there were 5 falls identified. One fall was in a semi-private room and four were in private rooms as displayed in Table 28.

Table 28.

*Number of Falls by Room Type (N=166)*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Falls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>No</td>
</tr>
<tr>
<td>Semi-Private</td>
<td>82</td>
</tr>
</tbody>
</table>
A Chi Square Analysis and a Fishers Exact Test were performed to determine if there was a significant difference in the number of falls in the private versus the semi-private room. Assumptions underlying the Chi Square Analysis include a sufficiently large sample size. The minimum sample size is determined by the number of observations per cell. It is recommended there be at least five expected observations per cell. Since this sample had 2 cells that were less than 5, a Fishers Exact Test was performed. Results revealed there was no significant difference between the type of room and the likelihood of falling ($\chi^2 = 1.86, df = 1, p = .37$). This finding did not support the assumption that more falls would occur in private rooms. Table 29 presents the results of the Chi Square Analysis and the Fishers Exact Test.

Table 29.

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Falls</th>
<th>Exact Sig.</th>
<th>Exact Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td>$\chi^2$</td>
</tr>
<tr>
<td>Private</td>
<td>79</td>
<td>4</td>
<td>1.86</td>
</tr>
<tr>
<td>Semi-Private</td>
<td>82</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fisher’s Exact Test</td>
<td></td>
<td></td>
<td>.37</td>
</tr>
</tbody>
</table>

Note. $p = .37$

Due to the low numbers of patients with documented falls (3%), a second calculation to determine the relative risk of falling in a private room versus a semi-private room was calculated. The relative risk compares the probability of falling in each group. A relative risk equal to 1.0 implies that falling is equally probable in both groups. A
relative risk greater than 1.0 implies the probability of falling in a private room is more likely than falling in a semi-private room. Finally, a relative risk less than 1.0 indicates that the probability of falling in a private room is less likely than in a semi-private room. This analysis revealed that the relative risk of falling in a private room is 4.01, suggesting there is a 4.01 times greater probability of falling in a private room than a semi-private room. Calculation of relative risk therefore, indicates there is a difference in falls between the two groups, with the assumption supported that more falls would occur in private rooms.

Question 2: “Does the incidence of Healthcare-Associated Infections (HAI) differ in older adults in private or semi-private rooms?”

Healthcare-associated infections are defined conceptually as infections that patients acquire during the course of receiving treatment for other conditions within a healthcare setting (CDC, 2009). The operational definition of a HAI for the purposes of this study was the acquisition of an infection by the patient during the course of the hospitalization that was not present on admission to the hospital.
Out of 166 patient records abstracted there were 9 occurrences of HAIs. See Table 30 below for the distribution.

Table 30.

<table>
<thead>
<tr>
<th>Room Type</th>
<th>HAI</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Private</td>
<td>78</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>47.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Semi-Private</td>
<td>79</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>47.6%</td>
<td>2.4%</td>
</tr>
</tbody>
</table>

With 4 HAIs in private rooms and 5 in semi-private rooms a Chi Square Analysis and a Fishers Exact Test were performed to determine if there was a significant difference in the number of occurrences of HAI and room type. The statistical assumptions were the same for this hypothesis as in the previous hypothesis. Results indicated that there was no significant difference in the occurrence of HAI based on room type ($\chi^2 = .12, df = 1, p = 1.00$).
Table 31 identifies the analysis below. This finding supported the assumption that the occurrence of HAI is not dependent on room type.

**Table 31.**

*Chi-Square Analysis and Fisher’s Exact Test for HAI and Room Type (N=166)*

<table>
<thead>
<tr>
<th>Room Type</th>
<th>HAI</th>
<th>Exact Sig.</th>
<th>Exact Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td>χ²</td>
</tr>
<tr>
<td></td>
<td>(2-sisded)</td>
<td>(1-sisded)</td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>78</td>
<td>5</td>
<td>.12</td>
</tr>
<tr>
<td>Semi-Private</td>
<td>79</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Fisher’s Exact Test</td>
<td>1.00</td>
<td>.50</td>
<td></td>
</tr>
</tbody>
</table>

*Note. p = 1.00*

Question 3: “Can risk of social isolation predict incidence of falls or incidence of HAI based on room type.”

The distribution of patients determined to be at risk for social isolation indicated that while the majority of patients were not determined to be at risk for social isolation, a large percentage were. See Table 32 below for the distribution.

**Table 32.**

*Patients Determined to be at Risk for Social Isolation (N=166)*

<table>
<thead>
<tr>
<th>Risk for Social Isolation</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Lower Risk (1-2)</td>
<td>100</td>
<td>60.3</td>
</tr>
<tr>
<td>At Higher Risk (3-4)</td>
<td>66</td>
<td>39.7</td>
</tr>
<tr>
<td>Total</td>
<td>166</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Logistic regression analysis was utilized to determine whether being at risk for social isolation affected the probability of a negative outcome. The Rubric for determining Risk for Social Isolation (RSI) screen was previously explained on pages 34 & 35. In this study, a fall or an HAI was considered a negative outcome. Logistic regression is used to predict a dependent variable on the basis of categorical independent variables. In this logistic regression, the categorical independent variables were room type and RSI and the dichotomous outcome variable was a negative outcome, either a fall or HAI. The assumptions underlying the use of logistic regression are as follows: it does not assume a linear relationship between the dependent and the independent variables, the dependent variable need not be normally distributed, the dependent variable does not have to be homoscedastic for each level of independent variable, normally distributed error terms are not assumed, and interval level data is not required. Results from the logistic regression indicated that the model was unable to significantly predict who will develop a negative outcome, either a fall or a HAI.

Table 33.

<table>
<thead>
<tr>
<th></th>
<th>95.0% C.I. for $e^B$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Negative Outcome</td>
<td></td>
</tr>
<tr>
<td>$B$</td>
<td>$Wald$</td>
</tr>
<tr>
<td>Room Type *</td>
<td>-.60</td>
</tr>
<tr>
<td>RSI **</td>
<td>-.16</td>
</tr>
</tbody>
</table>

Note. * $p = .53$, ** $p = .52$
The interpretation of the coefficient values $B$ and the corresponding $e^B$ values for a fall or HAI depending on RSI or room type to occur is in Table 34. This finding did not support the assumption that older adults at risk for social isolation will have a higher incidence of falls and HAIs regardless of room type.

Table 34.

<table>
<thead>
<tr>
<th>Room Type</th>
<th>RSI</th>
<th>Prob.HAI</th>
<th>Prob. Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>1</td>
<td>5.19%</td>
<td>1.97%</td>
</tr>
<tr>
<td>S</td>
<td>2</td>
<td>4.94%</td>
<td>1.32%</td>
</tr>
<tr>
<td>S</td>
<td>3</td>
<td>4.70%</td>
<td>0.88%</td>
</tr>
<tr>
<td>S</td>
<td>4</td>
<td>4.47%</td>
<td>0.59%</td>
</tr>
<tr>
<td>P</td>
<td>1</td>
<td>6.29%</td>
<td>6.31%</td>
</tr>
<tr>
<td>P</td>
<td>2</td>
<td>5.99%</td>
<td>4.29%</td>
</tr>
<tr>
<td>P</td>
<td>3</td>
<td>5.70%</td>
<td>2.89%</td>
</tr>
<tr>
<td>P</td>
<td>4</td>
<td>5.43%</td>
<td>1.94%</td>
</tr>
</tbody>
</table>

The assumptions for logistic regression were met as the dependent variables were not normally distributed. The data were analyzed for multicolinearity reviewing the correlations between the independent variables it was evident that the correlations were not sufficiently high (all less than .8) to indicate that multicolinearity existed in the data. A contingency table analysis revealed that there was no significant relationship between a negative outcome and RSI ($\chi^2 = 3.32$, df = 3, $p = .35$). However, the data reveals that Chi-
Square identified a statistically significant relationship between the independent variables of room type and RSI (see pg. 57). Specifically, patients with lower RSI tend to be assigned private rooms ($\chi^2 = 12.36$, df = 3, p = .01).

Post-Hoc Analysis

Exploring the Patients Who Fell and Who Developed HAIs

The analyses of the data on falls and HAI lead to several questions regarding the subjects who fell or developed a HAI. These questions and the analysis are described in the following section and the patients who fell are described with more detail in Table 35.

Table 35.

Table: Patients Who Fell (n=5)

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Group</th>
<th>LOS</th>
<th>Diagnosis</th>
<th>Activity at time of fall</th>
<th>Location of fall</th>
<th>At Risk Medication</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>75</td>
<td>Young-old</td>
<td>4</td>
<td>Mesothelioma with ascites</td>
<td>Walking in room</td>
<td>In the room</td>
<td>Ativan</td>
<td>Alone in private room</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
<td>Young-old</td>
<td>7</td>
<td>Sigmoid volvulus with peritonitis</td>
<td>Going to the BR</td>
<td>In the room</td>
<td>No</td>
<td>Alone in private room</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
<td>Old-old</td>
<td>5</td>
<td>Acute Gout</td>
<td>Going to the BR</td>
<td>In the BR</td>
<td>Gabapentin, Seroquel</td>
<td>Alone in BR in SP room</td>
</tr>
<tr>
<td>4</td>
<td>79</td>
<td>Old</td>
<td>9</td>
<td>N/V dehydration</td>
<td>Going to the BR</td>
<td>In the Br</td>
<td>Restoril</td>
<td>Alone in private room</td>
</tr>
<tr>
<td>5</td>
<td>86</td>
<td>Old-old</td>
<td>10</td>
<td>Acute renal failure</td>
<td>Going to the BR</td>
<td>In room</td>
<td>Gabapentin, Ambien</td>
<td>Alone in private room</td>
</tr>
</tbody>
</table>
Question 1: Was there a difference in age in the group who fell and the group that did not?

Five patients fell out of the 166 patients included in the study. The mean age of the fallers was 81. All fallers were 75 or older, and members of the old-old or old age group. This finding is consistent with the reported experience of patients who fall although age in and of itself is not considered to be an independent risk factor (Ash et al., 1998; Hendrich, 2007). Table 36 identifies the comparison of age between fallers and non-fallers.

Table 36.

<table>
<thead>
<tr>
<th>Fall</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>161</td>
<td>80.06</td>
<td>7.04</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>81.00</td>
<td>6.75</td>
</tr>
</tbody>
</table>

An independent samples $t$-test was performed on age between the fallers and non-fallers to determine if there was a significant difference between the groups. No significant difference was identified in age ($t = -2.96$, df. = 164, $p = .77$) (see Table 37).
Table 37.

Independent Samples t-test on Age Between the Fallers and Non-fallers (N=166)

<table>
<thead>
<tr>
<th></th>
<th>Mean Difference in Age</th>
<th>t</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fallers</td>
<td>-.94</td>
<td>-1.30</td>
<td>.20</td>
</tr>
<tr>
<td>Non Fallers</td>
<td>-.94</td>
<td>-.30</td>
<td>.77</td>
</tr>
</tbody>
</table>

Question 2: Was there a difference LOS in the group who fell and the group that did not?

The average LOS for all the patients that fell was 7.00 days. A comparison of LOS between those who fell and those who did not is described below in Table 38.

Table 38.

Comparison of LOS Between Fallers and Non-fallers (N=166)

<table>
<thead>
<tr>
<th>Fall</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>161</td>
<td>5.8</td>
<td>1.95</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>7.0</td>
<td>2.55</td>
</tr>
</tbody>
</table>
An independent samples $t$-test was performed on LOS between the fallers and non-fallers to determine if there was a significant difference between the groups. No significant difference was identified in LOS ($t = -1.30$, $df = 164$, $p = .20$) despite the fallers having a 17% increase in length of stay (see Table 39).

Table 39.

<table>
<thead>
<tr>
<th></th>
<th>Mean Difference in LOS</th>
<th>$t$</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fallers</td>
<td>-1.16</td>
<td>-1.30</td>
<td>.20</td>
</tr>
<tr>
<td>Non Fallers</td>
<td>-1.16</td>
<td>-1.30</td>
<td>.20</td>
</tr>
</tbody>
</table>

**Question 3:** Was there a difference in gender in the group who fell and the group that did not?

All of the fallers in the sample were men. Men fall more than women do in the general population. In 2003, Hendrich, et al. discovered male gender was an independent risk factor for falls.

**Question 4:** What were the circumstances surrounding the falls?

All of the patients who fell were alone in their room at the time of the fall. Interestingly, the one patient who fell in the semi-private room was alone in the bathroom at the time of the fall. Four out of the five fallers were either in the bathroom or on their way to the bathroom. As has been noted previously in this paper, most falls occur when patients are alone in their rooms attempting to get to the bathroom (Hendrich, Fay, & Sorrels, 2002; Krauss et al., 2005; Tzeng & Chang, 2008).
Question 5: Were there other factors that may have contributed to the fall?

Four of the five patients were taking medications that have been shown to increase the risk of falling. Antiepileptics and benzodiazepines are considered independent risk factors because of their effect on the central nervous system. Administration of these medications may cause cerebellar ataxia, weakness, and gait changes (Hendrich, 2007). Only one faller scored at risk for social isolation. Therefore, it does not appear that risk of social isolation had an effect on the fallers. Three of the five patients who fell were identified as at risk for falls on admission to the hospital. Both of the patients who were not identified as being at risk for falls were on medications known to increase risk.
Question 6: What were the circumstances surrounding the development of the HAI?

Nine patients in this sample acquired an infection in the hospital. Specific details of the patients who acquired infections can be found in Table 40.

Table 40.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Age Group</th>
<th>LOS</th>
<th>Diagnosis</th>
<th>Type of Infection</th>
<th>Immuno-suppressed</th>
<th>Urinary Catheter</th>
<th>Room Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>77</td>
<td>Old</td>
<td>6</td>
<td>DJD L knee</td>
<td>UTI</td>
<td>no</td>
<td>Yes</td>
<td>S</td>
</tr>
<tr>
<td>2</td>
<td>87</td>
<td>Old-old</td>
<td>10</td>
<td>L hip fx.</td>
<td>UTI</td>
<td>no</td>
<td>Yes</td>
<td>S</td>
</tr>
<tr>
<td>3</td>
<td>69</td>
<td>Young-old</td>
<td>7</td>
<td>L patella fx</td>
<td>UTI</td>
<td>no</td>
<td>no</td>
<td>S</td>
</tr>
<tr>
<td>4</td>
<td>82</td>
<td>Old</td>
<td>7</td>
<td>Colon mass</td>
<td>C-diff</td>
<td>no</td>
<td>N/A</td>
<td>S</td>
</tr>
<tr>
<td>5</td>
<td>83</td>
<td>Old</td>
<td>8</td>
<td>N/V dehydration</td>
<td>UTI</td>
<td>yes</td>
<td>no</td>
<td>P</td>
</tr>
<tr>
<td>6</td>
<td>83</td>
<td>Old</td>
<td>9</td>
<td>Rectal bleeding</td>
<td>UTI</td>
<td>no</td>
<td>no</td>
<td>P</td>
</tr>
<tr>
<td>7</td>
<td>79</td>
<td>Old</td>
<td>6</td>
<td>Pneumonia</td>
<td>C-diff</td>
<td>yes</td>
<td>no</td>
<td>P</td>
</tr>
<tr>
<td>8</td>
<td>77</td>
<td>Old</td>
<td>7</td>
<td>GI bleed</td>
<td>UTI</td>
<td>no</td>
<td>Yes</td>
<td>P</td>
</tr>
<tr>
<td>9</td>
<td>86</td>
<td>Old-old</td>
<td>8</td>
<td>Hip fx</td>
<td>UTI</td>
<td>yes</td>
<td>Yes</td>
<td>P</td>
</tr>
</tbody>
</table>

Two of the infections were *Clostridium difficile* (C-diff) and the remaining seven were urinary tract infections (UTIs). C-diff is acquired by contact and often occurs in patients who are taking multiple antibiotics or who may be immunocompromised. Both patients who developed C-diff were on Fortaz and one of the patients was an oncology patient who was undergoing chemotherapy and radiation for pancreatic adenocarcinoma.
Urinary tract infections in the hospital are the most commonly reported HAI and are responsible for 40% of all HAIs. UTI’s are most often related to the presence of an indwelling urinary catheter (CDC, 2009). In this sample of the seven patients with UTI’s, four of them had an indwelling catheter at some point during their stay. All four of the patients who had indwelling catheters had them in for four days or longer.

*Question 7: Was there a difference in age in the group that developed an HAI and those who did not?*

An analysis of the patients who developed HAIs revealed that the average age was 80.33. A comparison of age between those that developed HAIs and those that did not is shown in Table 41.

Table 41.

*Comparison of Age and HAIs and No HAIs (N=166)*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>157</td>
<td>80.07</td>
<td>7.10</td>
</tr>
<tr>
<td>Yes</td>
<td>9</td>
<td>80.33</td>
<td>5.55</td>
</tr>
</tbody>
</table>
An independent samples $t$-test was performed to test for significant difference in age between those who developed infections and those who did not. There was no significant difference in age ($t = -.11$, df = 164, $p = .91$) between the two groups (see Table 42).

Table 42.

<table>
<thead>
<tr>
<th>Independent Samples t-test Comparison of Age and HAIs (N=166)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Difference in Age</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>HAIs</td>
</tr>
</tbody>
</table>

Question 8: Was there a difference LOS in the group that developed an HAI and those who did not?

The average LOS for patients who developed infections was 7.56. This was a 31% increase in LOS for the patients who developed infections. This comparison can be seen in Table 34. This comparison can be seen in Table 43.

Table 43.

<table>
<thead>
<tr>
<th>Comparison of LOS and HAIs and No HAIs (N=166)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAI</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

An independent samples $t$-test was performed to determine if there was a significant difference in the LOS between those who were infected and those who were not. This
analysis presented in Table 44 showed that there was a significant difference in LOS between the two groups ($t = -2.68$, $df = 164$, $p = .01$).

Table 44.

<table>
<thead>
<tr>
<th>Independent Samples $t$-test Comparison of LOS and HAI and No HAI (N=166)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Difference in LOS</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>HAI</td>
</tr>
<tr>
<td>No HAI</td>
</tr>
</tbody>
</table>

Summary of Findings

The summary of findings of this study will first address the overall sample and then second a summary of the primary findings of this study.

Overall, the summary of findings in this study can be identified as follows:

1. The mean age of all subjects was 80.8. There was no significant difference in age between patients in semi-private rooms or those in private rooms.
2. There was no significant difference in age between the two groups private or semi-private ($p = .63$).
3. Although there were more females (61%) than males (39%) in both groups, there was no significant difference of gender between patients in semi-private rooms versus private rooms ($p = .34$).
4. The average age of the men in this sample was 79.62 and the average age of the female was 80.37. There was no significant difference in age between men and women ($p = .51$).
5. LOS was between 3-10 days with the average LOS being 5.88 days. There was no significant difference in LOS by primary diagnosis category or room type ($p = .75$).

6. Gender was not found to be significant with regard to LOS ($p = .23$).

7. Forty percent of this sample was found to be at higher risk of social isolation.

8. There was no significant difference in RSI across age groups ($p = .38$).

9. Gender was found to be significant in the assessment of RSI. Men have a lower RSI than women ($p < .01$).

10. RSI was found to be decreased in patients in private rooms ($p = .01$).

11. Of the three primary diagnosis categories of patients, 56% of the sample had a medical diagnosis, 31% had a surgical/orthopedic diagnosis, and 21% had an oncologic diagnosis.

12. Sixty-nine percent of the patients were assessed to be at risk for falling on admission.

13. Fall risk was found to be significant when compared with age. The older the patient the more likely they would have been assessed at risk for falls. Fifty-two percent were assessed at risk in the young-old group, 68% in the old group, and almost 90% of the old-old group.

14. Fall risk was not found to be significant when compared with gender ($p = .30$).

15. One hundred percent of the fallers were men and all of the fallers were alone at the time of the fall.

16. All of the fallers were over the age of 75.

17. Three of the five fallers were not assessed to be at risk for falling on admission to the hospital.
18. Age \((p = .77)\) and LOS \((p = .20)\) were not found to be significantly different between the fallers and the non-fallers.

19. Four of the five fallers were taking medication that increases the risk of falling.

20. There was a significant difference in LOS in those patients who developed and HAI and those who did not. LOS of stay was increased by 31% in the patients who developed a HAI.

21. Of the nine patients who developed HAI seven of them had UTIs.

**Primary Study Findings**

1. The relative risk of falling in a private room was 4 times greater than the risk of falling in a semi-private room.

2. There was no significant difference in the occurrence of HAI in patients admitted to private or semi-private rooms \((p = 1.00)\).

3. Risk of social isolation did not affect incidence of falls \((p = .40)\) and/or new hospital acquired infections \((p = .86)\) regardless of room type.

**Chapter Summary**

The sample of 166 patient records constituted a variety of different diagnoses and reasons for hospitalization. Both groups, subjects assigned to private and semi-private rooms, were equivalent on all demographic variables. Over half of the patients were hospitalized for medical conditions, approximately one third had a surgical procedure, and the remaining patients had an oncologic diagnosis. The study did have representation from both males and females, and although there were more females than males, this was not statistically significant. All subjects in both groups were 65 or over and admitted to a private or semi private room for no less than 3 days and no greater than 10 days. A large
percentage of patients were considered to be at risk for falling (69.3%), which is not uncommon in this patient population. Thirty percent of falls occur in the population of adults over the age of 65 (Kannus et al., 1999; Rubenstein, Powers, & Maclean, 2001). However, it is of particular importance to note that 3 out of the 5 fallers were not assessed to be at risk on admission. There are multiple reasons why these patients were not assessed to be at risk and this will be addressed in Chapter 5.

The relative risk of falling in a private room versus a semi private room was calculated as approximately 4 times greater. This finding would support the assumption that falls would occur more frequently in this patient population when individuals are alone in a private room.

The second research question posed whether older adults in both semi private rooms and private rooms would have differences in the incidence of HAIs was not supported by Chi-Square and Fisher’s Exact Test. The types of infections (C-diff & UTIs) acquired by the patients in this sample would not have been prevented by isolating the patients in a private room.

Finally, the third research question, which posed whether RSI could predict the occurrence of adverse outcomes such as falls and HAI in older adults, was not supported by the data. RSI was assessed by evaluating the patients’ individual living arrangements and support network options assessed on admission to the hospital.

In summation, this study presents more evidence that hospital design affects the health outcomes of the hospitalized older adults. The results indicate that private rooms may be a risk factor for the occurrence of falls in those over the age of 65 and that these patients are not at any additional risk of contracting an infection if they are assigned to a
semi-private room. Additionally, although social isolation is a common problem in older adults and leads to adverse outcomes in the hospital this study indicated that adequate assessment measures to evaluate the patients risk for social isolation are not routinely utilized in the hospital.
Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

This chapter will discuss the results of the study. The chapter begins with discussion of the research questions, research hypotheses, other central findings identified in Chapter 4, and several findings derived from the overall study results. Discussion of the sample and post–hoc analyses of the demographic data as they relate to the study follows. This chapter will describe how Maslow’s Hierarchy of Need theory was operationalized in this study, as well as this investigators proposed use of Maslow’s framework as a tool to assure that the basic human needs of safety and social needs are met in the hospital. The chapter concludes with implications for nursing practice, overall study conclusions, limitations, recommendations for future investigations and a study summary.

Discussion of Sample

Hospital Unit Geographic Distribution - This study had a good distribution of subjects across three medical/surgical units and three different diagnosis categories. The largest group of patients presented with medical primary diagnoses, (56%) followed by surgical primary diagnoses, (31%) with the smallest group of patients having an oncologic primary diagnosis (13%).

Age - The mean age for all hospitalized subjects in this study was 80.08. Fifty-one percent of patients in this sample were in the old category (75-85), 27% percent were in the young old category (65-74), and 22% were in the Old-old category (older than 85). The largest age group in this study was the Old category (75 - 85). This is consistent with nationally reported trends. The American Hospital Association reported, in 2002, that
patients over the age of 74 account for 48.5% of all patient days. The number of individuals in the 75-85 age group has increased 15% since 2000 (AoA, 2008).

**Gender** - The distribution of gender in this study was 61.4% female and 38.6% male. This is consistent with gender distribution in older adults in the general population. The Administration on Aging (AoA) reports that in the general population of people over the age of 65, the distribution of gender is 57.8% female and 42.2% men (2008).

**Length of Stay** - The average length of stay for this patient population was 5.88 days. This length of stay was somewhat longer than the average Medicare LOS, which is 5.2 (AHD, 2006) and the reported LOS by the AoA, which is reported at 5.5 days (2008). The average Medicare LOS at UMCP is 5.2 days (Performance Improvement Dashboard, 2006). This difference in LOS in this study could be related to the increased LOS in the patients who acquired infections. The patients who fell also had a 17 percent longer length of stay than the patients who did not. Although this was not statistically significant, it could be another reason for the difference between the LOS of the study sample and the average Medicare LOS at UMCP. In addition, the variability in LOS is often physician practice dependent and could be indicative of delays in disposition, if the patients were to be discharged anywhere other than home. This is a problem for hospitals and a difficult one to manage, because physicians are paid for every visit they make in the hospital regardless of LOS, but hospitals only are paid for the number of hospital days expected for that diagnosis.

**Fall Risk** - Sixty-nine percent of patients were identified as being at risk for falling on admission. Due to the lack of consistent measurement among hospitals for identifying risk, it is impossible to compare the numbers of those patients assessed for fall risk with
other populations. Fall risk was assessed by the use of the Schmid Fall Risk Assessment (Schmid, 1990). Of the 5 patients who fell, 3 were identified at risk for falls on admission. Since fall risk was only measured on admission to the hospital, it is possible that the patient’s condition changed and that the fall risk changed by the time of the fall. Fall risk has many variables which include mobility, elimination, mentation, and medication history. Since many of these factors can change during the course of a hospitalization fall risk must be assessed more frequently to actually determine what patients are at risk for falling. Appropriate interventions can then be put in place to prevent the fall.

There was a higher probability for fall risk among orthopedic patients and a lower likelihood of being assessed as a fall risk for surgical patients. This finding was likely due to the alteration of mobility exhibited by orthopedic patients on admission to the hospital. Conversely, patients admitted to the hospital for general surgical procedures often do not have mobility issues on admission.

There are a large number of risk assessment tools with various patient fall risk factors included, but very few have been statistically validated (Hendrich, 2006). In fact, the lack of accuracy of many tools creates difficulties for caregivers in implementing strategies to reduce falls (Myers, 2003). The Schmid tool was studied and tested for accuracy in 1990. However, it is not been updated since that time, is not based on current research, and most notably, lacks male sex as an independent risk factor for falling (Schmid, 1990).

Another point of concern is that the three patients who were identified at risk still fell. All three of them were placed in private rooms and the only preventions strategies
that were documented were that the patients were educated on using their call bells and not getting out of bed without assistance. These interventions, while part of an effective fall prevention program, are not sufficient, in and of themselves, to prevent falling. It is important to note that this sample was obtained in the first five months of 2006. In 2005, the goal of “Reducing the risk of patient harm resulting from falls” (TJC, 2005) first appeared on the National Patient Safety Goal List. Hospitals were expected to be in, compliance with the goal beginning January 1, 2006. However, an evidence of compliance review of the standard in June of 2006 showed lack of compliance in several areas, most notably patient education and documentation (Lorenz, Personal file, July 15, 2006).

Research Questions and Research Hypotheses

*Question One*: “What is the difference in the incidence of falls in older adults in private or semi private rooms?”

There were five falls in the study sample of 166 patients. Four of the five falls occurred in a private room and one in a semi-private room. Using a Chi square analysis, there was no statistically significant difference between those that fell in private rooms versus semi-private rooms because of the small numbers of falls. However, the relative risk of a patient falling in a private room was four times greater than for a patient falling in a semi-private room, because four of the five falls were in private rooms. The one fall that occurred in a semi-private room occurred in the bathroom when the patient was alone. It is significant that all of the patients who fell were alone at the time of the fall and the falls were un-witnessed. This is consistent with current literature, as most patients
are alone at the time of the fall, and the falls are un-witnessed (Bernis-Dougherty & Delaune, 2008; CDC, 2009; Hendrich, 2007).

The extrapolated calculated fall rate for the fallers in this study was 5.12 per 1000 patient days. This rate was higher than the fall rate at UMCP in 2006 of 2.92 per 1000 patient days (Nursing performance improvement dashboard, 2006). The higher fall rate reported in this study may be at least partly explained by the age of the sample (versus the age of all patients admitted to UMCP in 2006), and the potential underreporting of falls among all age groups, (personal correspondence, Risk Management Department, UMCP, 2009). Low fall rates do not necessarily equate with effective fall prevention programs. Low fall rates can sometime even be attributed to patients being left in a bed or a chair and thus becoming deconditioned, thereby creating other opportunity for an adverse event to occur (Graf, 2006; McMurdo & Harper, 2004).

Analysis of the findings of this study indicates the first research hypothesis in this study was only partially supported. While Chi-Square Analysis found no statistical difference in fall rates between older adult patients in semi-private rooms versus private rooms, the odds ratio used to determine relative risk did. While conflicting findings in this case are likely due to the inability to conduct a robust analysis based on the low number of documented falls, the odds ratio analysis supports other prior evidence and this study’s first assumption that patients who are alone in their rooms fall more often (Hendrich et al., 1995; Krauss et al., 2007). In addition, four of the five patients fell attempting to get to the bathroom. Greater than 50% of patient falls occur while patients are trying to get to the toilet, return from the toilet, or while trying to exit the bed to get to
the toilet. This is a common problem, even in those patients who are awake and alert (Hendrich, 2006).

Private rooms have been described as both a factor that may increase the likelihood of falls, as well as a factor to prevent falls (Choudry, 2003; Barach, 2008). The reasons for these two varying points of view are related as they both assume that having someone else in the room to offer or call for assistance would prevent the fall from occurring. In the case of the private room, there is a belief, although not supported by the evidenc-based literature, that families are more likely to spend more time visiting in a private room and therefore will be available to offer assistance (Barach, 2008; Choudry, 2004; Hendrich, 2003). In the semi-private room, it is the presence of a roommate who could potentially remind the other patient to call for help. This is the first study to look at the type of room the older adult patient is assigned to as one of the causes for falls in the hospital. This study focused on the population of hospitalized older adults over the age of 65 where the risk of falling is higher than in the general population. Several studies have demonstrated that older adult patients, particularly those who are frail and/or delirious who are more likely to fall in the hospital, benefit from multi-occupancy patient rooms with increased surveillance (Flaherty et al., 2003). The results of this study indicate that patients in private rooms have a greater risk of falling than patients in semi-private rooms. Further research is indicated to validate the results of this study and to quantify the degree of risk posed by the type of room.

Question Two: “What is the difference in the incidence of hospital acquired infections in older adults in private versus semi-private rooms?”
Among the patients selected for inclusion in this study, there were 9 occurrences of HAI, 4 in private rooms and 5 in semi-private rooms. Therefore, HAI are no more likely to occur in patients admitted to private rooms versus semi-private rooms. Since the majority of infections contracted in hospitals are contracted through contact transmission (Bauer, Ofner, Just, Just, & Daschner, 1990; Joseph, 2006; Page & Institute of Medicine, 2004), this is not an entirely unexpected finding even if hypothetically it seems almost reasonable to assume there would be more infections in semi-private rooms than in a single private room. However, the principle cause of contact transmission between patients is poor hand washing by healthcare workers (Larson, 1988; Ulrich, Quan, Zimring, Joseph, & Choudary, 2004) and nurses and other direct care providers enter both types of rooms with the same likely practice of substandard hand washing. Infectious pathogens can contaminate surfaces, but surfaces are not frequently identified as the primary cause of transmission from patient to patient (Sehulster & Chinn, 2003). There have been a few studies suggesting that providing conveniently located sinks in private rooms reduces HAI (Ulrich et al., 2004). These studies were comparison studies done in ICUs that were multi-bed units with few sinks. Infections rates before and after these studies were documented but hand washing rates were not. In one study that compared an open ICU with few sinks to single bed rooms with one sink per room, there was a non-significant tendency to increase hand washing, but no decline in infection incidence (Muto, 2003). Ulrich and colleagues also take the position that multi-bed rooms are more difficult to decontaminate thoroughly and therefore potentially play a part in the spread of infection in the hospital (2008). It is true that there have been studies where even after cleaning infectious pathogens can still be found in the room, however, it is
unclear as to why they were not decontaminated appropriately (French et al, 2004; Jeanes et al., 2005). All the evidence in this area is circumstantial. In addition to the lack of hand washing, other identified variables affect the incidence of HAI in patients. The Agency for Healthcare Research and Quality (AHRQ) states that hospitals with less than adequate staffing levels have higher rates of poor patient outcomes (Stanton & Rutherford, 2004). In addition, Needleman, and colleagues found a relationship between nurse staffing levels and several adverse patient outcomes. These adverse patient outcomes included urinary tract infections, pneumonia, shock, upper gastrointestinal bleeding, and longer length of stay (2002).

While there have been two studies that have found that private rooms are more desirable than multi-bed rooms in preventing airborne infection (Anderson, Bonner, Scheifele & Schneider, 1985; Ben-Abraham et al., 2002). These two studies were done in the pediatric population not among adult populations. The reasons that private rooms were found to be more beneficial in this pediatric population is due to the ability to isolate patients and to provide HEPA filtration and negative or positive air pressure in the room (Joseph, 2006).

The extrapolated calculated HAI rate for the patients in this study was 10.17 per 1,000 patient days or 5%. This rate was higher than the HAI rate at UMCP in 2006 of 5.37 per 1,000 patient days or 2.5% (UMCP, 2006). This higher infection rate reported in this study may be at least partly explained by the age of the sample (versus the age of all patients admitted to UMCP in 2006). Since increased age in and of itself can be a risk factor for the development of iatrogenic complications due to decreased immunocompetence and immobility (Graf, 2006). Since 78% of the infections in this
sample were urinary tract infections and UTIs account for 40% of all HAIs (CDC, 2009) this may also have affected the rate. Additionally, two of the patients who developed a HAI were admitted with hip fractures. These patients were both in the old-old age category and had lengths of stay of 8-10 days. Hip fractures themselves have been associated with functional decline in the older adult and the occurrence of iatrogenic events, which can lengthen hospitalization (Graf, 2006). This finding however, does not indicate that private rooms are independently associated with lower rates of HAI. Therefore, other factors as described above may have been causative of the infections in this population of patients.

The average LOS for patients in this study who developed HAI was significantly longer when compared to the patients who did not develop a HAI. The reasons for the statistically significant prolonged LOS are not clear upon closer examination of the record. Since this population of patients is already at risk for the occurrence of adverse outcomes in the hospital it is not unlikely that the treatment of the infections caused the increased LOS in and of itself. A more thorough review of the records did not reveal any disposition delays which may have contributed to this phenomenon. There was also no other identifiable factors such as a fall or an adverse reaction to a medication that would have impacted the LOS. Therefore it is presumed that the increased LOS was due to the development of the HAI.

*Question three: “Can risk of social isolation predict the likelihood of a negative outcome (fall or HAI) based on room type.”*

All patients in this study were assessed for the risk of social isolation (RSI) on admission to the hospital using a newly create rubric. A review of the literature indicates
there are links between lack of social support, risk of social isolation, cognitive decline, and iatrogenic events in older adults who are hospitalized (Catchen, 1983; Danner, Beck, Heacock, & Modin, 1993; Foreman, 1986). RSI is not typically assessed on admission to the hospital or to most hospitals, however this study was designed to address whether socially isolated older adults may indeed be at increased risk for falls or even HAI’s. Therefore, in order for RSI to be assessed in this patient population it was necessary for this investigator to utilize elements from the nursing admission assessment to identify patients that may be at risk for social isolation. The nursing admission assessment includes four factors that are assessed on admission to the hospital that were used in the determination of this risk. The contributing factors that were assessed in this research study are: living alone, living with others, support networks which include friends and family, and a redundant support network which infers that there are more than one friend or family member available to provide support if needed. Since this tool was not tested for validity and reliability, patients were assessed not to be at risk but to be at higher or lower RSI.

Although 66 out of 166 patients (39.7%) were assessed to be at greater risk for social isolation on admission, the premise that older adults at risk for social isolation will have a higher incidence of falls and/or HAI’s, regardless of room type, was not supported in this study. There was no significant difference in adverse outcomes regardless of risk for social isolation. Interestingly, only 1 of the patients who fell in this study (out of 5) was assessed to be at greater risk of social isolation and 4 of the 9 patients who developed HAI were assessed to be at greater risk of social isolation. This finding was unexpected in that the literature clearly identifies social isolation as an indicator for the occurrence of
adverse events in the hospital (Cantor & Sanderson, 1999; Ellaway, Wood, & MacIntyre, 1999; Ruberman, Weinblatt, Goldberg, & Chaudhary, 1994). However, the literature does state that although the risk of social isolation is reportedly greater than 15% in older adults, risk is not necessarily associated with an increased use of healthcare services (Illife et al., 2007). So being at risk may not necessarily be an indicator of true social isolation. Risk of social isolation was measured by assessing social support and redundancy of social ties because social support provides a buffer for individuals who are in crisis (Cobb, 1976; Furher & Stanfield, 2002). However, social support is only one variable used in assessing social isolation and using a rubric that used a nursing admission assessment that focused so heavily on social support may not lead to a true and accurate measurement of social isolation.

In this study, risk of social isolation was utilized as a potential predictor of adverse outcomes due to the literature on social isolation, which describes social isolation as a variable that has been correlated with negative health outcomes in the hospitalized older adult (Cantor & Sanderson, 1999). Since risk for social isolation was not identified as an independent risk factor for the development of an HAI or fall in the hospital in this study, this data may suggest that more sophisticated tools for identifying socially isolated patients are indicated. It is concerning however, that 40% of the patients were classified at higher risk of social isolation. This finding could be an indicator that a more specific assessment tool would have yielded a different result.

Discussion of Post-Hoc Findings

Interestingly, the results of this study indicated a relationship between patient room assignments and risk of social isolation. Patients with lower risk of social isolation
were statistically more likely to be assigned to private rooms. Because this was a retrospective study, room assignment was not controlled. Patients are assigned rooms as they are available based on their diagnosis and level of care required. Private rooms may be requested and are generally assigned based on availability. Patients with low risk of social isolation may request private rooms either to maintain privacy or to accommodate family members participating in their care, which may have contributed to this finding. It is also likely that this could have been a random occurrence and not the result of patient or family selection.

Additionally, gender appears to play a role in risk for social isolation. Men were assessed to be at lower risk than women were in this sample. The literature reports that the risk of social isolation is elevated in older men (Broese & van Tilburg, 2003; Illife et al., 2007). This is contrary to the findings in this study. In addition, social network studies propose that older people with low socioeconomic status are more vulnerable to social isolation (Broese & van Tilburg, 2003; Illife et al., 2007). Since this sample consisted of patients that were treated at the University Medical Center at Princeton, which is located in a highly educated, affluent community, these socioeconomic factors may have skewed the statistics for social isolation. Since indicators of socioeconomic status were not collected, it is not possible to determine if socioeconomic status is the reason for these divergent findings. In addition, the Administration on Aging (AoA), reports that older men (65 or older) are more likely to be married than older women, 73% of men versus 42% of women. Forty-two percent of older women (65 or older) were widows in 2007 (AoA, 2008). Marital status of the sample may have had an impact on these findings.
Marital status was not collected, therefore that is a limiting factor to further analyzing this result.

Other Significant Findings

Beyond discussion of the research questions and research hypothesis, there were other central findings identified in Chapter 4, and several findings that emanated from overall study results.

1. All of the patients who fell were men.

This study determined there is a four times greater risk of falling in a private room than in a semi-private room and all of the fallers in this study were men in private rooms. Because RSI was lower in men in this study, and private rooms had more subjects at lower risk, the assumption could be made that males may have self selected their private room. These male patients may have self selected a private room because they had family members who would be staying or frequently visiting with them. However, this seems to be unlikely, in that the period for data collection, was during a high census period in the hospital when bed availability is at a premium and bed assignment is largely on a first come first serve basis. These findings were more likely due to the inability of the RSI rubric to effectively assess risk. Another factor could be that the male sex is considered an independent risk factor for falling. Men are considered more likely than women to take risks, “go it alone” and ignore instructions (Hendrich, 2007). In fact, in a qualitative study done by Horton in 2006 where gender responsibility as it relates to fall was studied, older men perceived themselves as responsible and rational individuals who believe they can reduce their own risk of falling. This is in contrast to women who tend to blame themselves or others for their falls. These differing perceptions had an influence on the
actions they took to prevent falling. At UMCP, it is reported that significantly more men fall than women (Personal correspondence, Nursing PI Coordinator, 2009). The Schmid fall risk assessment used at UMCP does not include male gender as a risk factor.

2. Four of the five patients who fell were alone in their room at the time of the fall.

Those patients who were alone in their rooms at the time of the fall were all in private rooms. A limitation of this study was although the remaining patient who fell was in a semi-private room it is unknown whether the patient had a roommate at the time of the fall. The fall occurred in the bathroom where the patient was alone and was documented as an un-witnessed fall. This is consistent with the literature that states that most falls occur in the room when the patient is alone (Hendrich, et al., 2002; Krauss et al., 2005; Tzeng & Chang, 2008). Private rooms have been identified as a potential risk factor because there is no roommate to remind an at risk person to call for assistance (Barach, 2008). Older adults often become confused and disoriented when in the hospital, in addition the unfamiliarity of the environment, can create a risk of falling for the patient. There is also the likelihood that caregivers may be in the room more often when there are two patients to care for. In a recent visit to a brand new all private room hospital in the Midwest, this investigator was told by caregivers there, the older adult patients did not like the private rooms and complained that they never saw anyone. Interestingly, although fall rates seem consistent with pre-occupancy rates, they have not had a fall with injury since moving into their new facility. It is difficult to hypothesize why this has occurred because they did not control for all of the variables that may affect falling.

3. All of the patients who fell, with the exception of one, was in either the bathroom or attempting to get to the bathroom.
More than 50% of falls occur when patients are attempting, to get to the bathroom, coming back from the bathroom, and trying to get out of bed to get to the bathroom. This finding is consistent with other studies that have found that most falls occur when patients are alone in their rooms attempting to get to the bathroom (Hendrich, et al., 2002; Krauss et al., 2005; Tzeng & Chang, 2008). Four of the five patients who fell were in private rooms and the patient in the semi-private room was alone in the bathroom at the time of the fall. This takes us back to patients who are alone have a higher risk of falling than patients who have another person in the room.

4. **Four of the five patients who fell were taking medications that have been shown to increase the risk for falling.**

   Eighty percent of the patients who fell were taking antiepileptics and benzodiazepines. Antiepileptics and benzodiazepines are considered independent risk factors because of their effect on the central nervous system (Hendrich, 2003; Schmid, 1990). Polypharmacy, which is defined as more than six drugs, is a widespread problem that contributes to fall risk. However, when lists of drugs are added to fall risk assessments, patients, who are not at risk for falls may be assessed at risk for falling even if there are no apparent drug side effects. For this reason, it may be more effective to evaluate and predict fall risk based on the existence of side effects exhibited by the patient (Hendrich, 2006). This is why multidisciplinary fall teams, where a pharmacist is part of the team, are highly effective in reducing fall risk and falls.

5. **LOS was not significantly different in the group of patients who fell.**

   In the group of fallers, there was no significant difference in age or length of stay between fallers in private or semi-private rooms. The fact that LOS was not significantly
different coincides with the fact that there were no significant injuries sustained in the group who fell. All of the fallers were men, which is consistent with the literature (Heindrich, 2007). Forty percent of the patients who fell were not identified as at risk for falling upon admission. This could be explained by the fact that risk was only assessed on admission and as a patient’s condition changes, the risk of falling may change. This could also be an indicator that the fall risk assessment tool is not sensitive enough to capture all patients at risk. Male sex is not identified as a risk factor in the Schmid Fall Risk Assessment Tool (Schmid, 1990). Since 2006, the fall prevention program has changed significantly at UMCP. In 2006, fall risk was only being assessed on admission. Since the condition of the patient may change from the time of admission, risk is now being assessed at a minimum of twice per day. Since all nursing clinical documentation is done at UMCP on the electronic medical record (EMR) the nursing staff are reminded each shift to assess the patient for falls. If this assessment ascertains that a patient is at risk, the nurse is then directed to a care plan where the prevention strategies are documented. In addition, the fall risk and associated prevention plan flow to the hand off communication tool, which is used to give shift report, necessitating that the nurses discuss fall risk and strategies to prevent falling. The possibility exists that all of the fallers would have been assessed at risk sometime during their stay and appropriate prevention strategies would have been put in place. The use of the Schmid tool has also been evaluated and this evaluation will be discussed further in the Implications for Nursing Practice Section of this chapter.

6. Patients who developed HAI had a significantly longer LOS than patients who did not develop a HAI.
T-tests were performed to determine if there was a difference in LOS between the group that developed a HAI and those that did not. Results indicated that there was a significant difference in LOS. This may have been due to the treatment required to treat the infection. All documented infections were treated with an appropriate course of antibiotics. This difference supports the findings reported by the CDC in 2007 that the costs of HAI’s exceed $4.5 billion with an average cost of $400 per day. The additional cost at minimum was approximately $7,000. This necessitates hospitals to decrease HAIs, particularly in light of the fact that the Centers for Medicare and Medicaid Services (CMS) consider HAI to be a “never event” or an event that should be prevented. Therefore, the CMS has identified HAI as one of eight hospital-acquired conditions for which the increased cost for treatment will no longer be reimbursable to the hospital (Lewis, 2008).

Seven of the nine patients who developed infections had urinary tract infections. All of these patients had indwelling catheters and four of them had them in for four days or longer. The CDC reports that the urinary tract is the most common site of a hospital acquired infection, and accounts for more than 40% of infections reported by hospitals each year, and affect 600,000 patients. Patients with catheters in place for four days or longer have a 100% chance of acquiring an infection (2009).

Limitations

1. Because the number of documented falls was small, the sample size was too small for a more robust analysis.

The initial sample size was determined by a power analysis based on the rate of falls in the general over 65 population of .30. The general population rate of falls was
used because fall rates in hospitals vary widely by institution. The reason for these varying rates lies in the way individual organizations identify, define, and report a fall. At UMCP, the definition of a fall is any occurrence in which a patient involuntarily descends to the floor whether witnessed or unwitnessed. This operational definition is commonly used, but is not nationally consistent throughout healthcare organizations. Inconsistent application of definitions and state reporting requirements lead to underreporting of falls and rates that vary widely, which makes it difficult to determine how many falls actually occur in hospitals. A more accurate number could have been determined by using the actual number of falls at UMCP in the prior year, although for the reasons stated above that may have not yielded a different result (see page 89). An alternative would have been to examine the charts of 83 fallers and 83 occurrences of HAI.

2. **Limitations to the generalizability of the sample.**

The study sample was a convenience sample drawn from the patient population of a 308-bed community hospital in Princeton, New Jersey. As was discussed earlier, some of the findings in this study may have been skewed due to the affluent community that UMCP serves, particularly the findings related to risk of social isolation.

3. **The inclusion criteria may have indeed eliminated documented “fallers” and those who acquired a HAI.**

Another limitation was the narrow inclusion criteria, which may have screened out patients who were at higher risk for developing adverse outcomes, including patients admitted from nursing homes, patients who were incontinent, patients with a clinical history of dementia, patients who are bedridden, patients readmitted within the last 30 days and those with lengths of stay longer than 10 days. Patients who fell and sustained
injury or who had severe HAIs may have been excluded from the sample if their stay exceeded 10 days due to treatment required for the fall or HAI. The decision to exclude patients who met the above criteria was done in an effort to control other variables that may have more likely contributed to the fall or the development of the HAI. The risk of falling and developing HAIs is higher in the frail hospitalized older adult. The above criteria were developed in an attempt to exclude these patients so that a more decisive correlation could be drawn between room type and the occurrence of the fall or HAI. Additionally patients who have longer lengths of stay are more likely to develop an adverse outcome due to deconditioning (Graf, 2006).

4. High rates of RSI may be due to flaws in risk for social isolation rubric.

Since RSI is not routinely assessed on admission to the hospital, a rubric was developed based on the available data in the admission assessment that evaluated social network options and individual living arrangements. Since social isolation is clearly identified as a risk factor for negative health outcomes, it was unexpected that the relationship between assessment of risk and falling or developing an HAI was not significant. In addition, the fact that 40% of this hospital population studied was noted to be at higher RSI indicates that the rubric needs more reliability and validity testing to establish whether this is an accurate finding or not. Social support is considered a key correlate of social isolation (Hawthorne, 2006). Because of the importance of this indicator in assessing risk and the fact that the information was readily available on the nursing admission assessment social support was used as a determinant to assess this risk. However, social support is only one variable affecting risk of social isolation, so it is difficult to determine if the numbers assessed to be at risk were accurate. The
characteristics associated with risk of social isolation are many and would have been
difficult to collect in a retrospective study. However, adding sociodemographic data as
well as level of functioning, and numbers of medications would have yielded information
that would have made risk of social isolation easier to determine.

5. Actual number of falls may be under reported.

There may have been patients who fell who were not reported as falls. The reason
for this is that although falls are specifically defined at UMCP as an unplanned descent to
the floor, there is likelihood that patient falls that were assisted to the ground or did not
appear to result in injury may not have been documented or reported. It is the policy at
UMCP that all falls are documented in the patient’s record by both the nurse and the
physician who evaluates the patient after the fall. In addition, an incident report must be
filed with the department of risk management. All of the falls recorded were documented
in both the nursing and physician progress notes with the exception of 1 that was not
documented in the nurse’s progress notes. Incident reports were unable to be evaluated
because the records were de-identified. None of the charts reviewed documented a “near
fall.” Near falls are not likely in this setting because if the patient has an unplanned
ascent to the floor assisted or not, it is counted as a fall. Adverse event reporting is
encouraged and non-punitive however; lack of an integrated fall prevention program in
2006 may have contributed to potential underreporting of falls.

6. It is difficult to determine whether the extended LOS that was significant in the
   patients who developed HAI was due to the HAI or other circumstances.

Since HAI data is not coded, it is difficult to determine whether the HAI actually
caused the extended LOS. Review of the discharge/transfer records and progress notes
did not reveal any delays in disposition due to the treatment of the HAI. However, there could have been a disposition delay particularly if the patient was to be transferred to another healthcare facility that was not documented.

7. **Lack of sociodemographic data.**

Because this was a retrospective study, data collection was limited to data that was easily obtained in the medical record. Other important information that may have been helpful in analyzing the sample would have been marital status and measures of socioeconomic status. In addition, more data could have been collected to aid in the assessment of RSI, specifically, level of functioning, educational level, number of chronic conditions, usage of medications, and fall history.

8. **The retrospective design of the study.**

Because this was a retrospective study identification of the causative factors for some of the findings were difficult due to the inconsistency of what is charted in the medical record. Content in the medical record is often physician dependent. Additionally the design of the study prevented the investigator from collecting data that would have been pertinent to the evaluation of social isolation in the population studied. In a retrospective design the likelihood of missing data exists. Therefore this study was designed to minimize that risk but that may also have resulted in the loss of important information. Since this study was done from records obtained in 2006, it may not have been indicative of current practice patterns and issue.

9. **Reliability of the Data**

The reliability of the data collected from the patient chart is questionable due to a variety of factors: the difficulty in obtaining accurate information from the physician
written documentation, the possibility of the underreporting of falls due to changes in the
fall prevention program and the negative connotations associated with patient falls by
caregivers. Additionally, the HAI’s may not have been documented in a way that it was
evident that the infection occurred in the hospital. Laboratory and diagnostic
confirmation was not always available so this may have caused the research team to not
count an HAI that actually should have been counted.

Implications for Nursing Practice

Evidence presented in this study suggests that the type of room the patient resides
in during an acute hospitalization in a general hospital unit may have an impact on the
prevention of occurrence of adverse events such as falls. It further suggests that private
rooms may pose a risk to the hospitalized older adult in that patients in private rooms
have a four times greater risk of falling. In addition, there is no evidence to support the
theory that private rooms prevent the development of HAIs in hospitalized older adults,
despite the fact that this may be a logical assumption. And based on this study, it remains
unproven in the evidence-based literature that a semi-private room will necessarily
contribute to a HAI.

Based on these results, professional nurses should carefully assess older patients
for the type of room that will provide a safe environment that protects the patient from
hospital related adverse outcomes. The type of room the patient is assigned to should take
into account age, fall risk, disease process, required therapies, family involvement, and
personal preference. In this study, it is clear that the fall risk assessment tool used at
UMCP maybe inadequate to accurately assess the fall risk of this patient population. In
late 2008, a pilot study was done on one unit at UMCP where the Hendrich II tool was
evaluated and compared to the Schmid. Surprisingly, out of 37 patients evaluated, 20 were found to be at risk using the Schmid and 21 were found to be at risk using the Hendrich II. This was not a controlled study and no statistical analyses were done, but the decision was made to continue to use the Schmid and focus our efforts on strategies to prevent falls and reduce injuries. Although the other tool is considered more reliable and valid, due to the number of changes we were making in the fall prevention program at that time it was believed that there would be better compliance if some pieces of the program remained unchanged. One of the changes made in the program; however was to assess fall risk minimally twice a day since the patient’s condition can change throughout the course of the hospitalization. Re-assessment of fall risk is an important component of any fall prevention program. It is important that healthcare providers clearly understand that many factors can cause a patient to fall and all of them must be considered when making intervention decisions.

Another finding in this study was that 4 of the 5 patients who fell were either in the bathroom or on their way to the bathroom. This is consistent with the literature on falls (Hendrich, 2006). This finding has significant implications for nursing practice in that fall prevention programs that address this issue should be adopted. This includes toileting rounds and the adoption of policies that do not allow patients at risk to be left alone in the bathroom.

Since private rooms, in and of themselves, do not appear to be a risk factor for the development of HAI, it is imperative that all healthcare providers understand the mechanism by which HAI occurs in all patient populations and take measures to prevent HAI. These measures should include appropriate hand washing following CDC
guidelines, using appropriate isolation precautions when indicated, and developing protocols that guide the management of indwelling urinary catheters.

Additionally, although this study did not report that risk of social isolation is a causative element in predicting which patients will suffer a fall or HAI, the patients’ social needs should be assessed and appropriate interventions put in place to reduce the risks associated with social isolation. These risks include cognitive decline, loneliness, and falls (Catchen, 1983; Danner, Beck, Heacock, & Modlin, 1993; Foreman, 1986; Rodgers, 1998). Certainly, while approximately 40% of the sample found to be at risk for social isolation may be representative of the hospitalized older adult population; this finding, if indeed accurate, would have enormous implications for the types of psychosocial interventions we are providing the hospitalized older adult.

Implications for Nursing Science

Finally, there is evidence from this study that can contribute to nursing science and theory. Maslow’s Hierarchy of Needs outlines the requirement that a person’s safety and social needs must be met before higher level needs can be realized. This study was focused on the environment that the patient resides in while hospitalized as a potential factor in the occurrence or prevention of adverse events in the hospital. It is a priority for healthcare providers to establish an environment that meets the physiological needs of patients while keeping them safe. Additionally, it is necessary to create environments that are conducive to healing. Determining the type of room that is most advantageous to the well being of the hospitalized older adult and contributes to positive outcomes supports the attainment of human needs as defined by Maslow.
The Situational Model of Nurse Protection has been suggested as one method to achieve these goals (Lorenz, 2007). Patients need to feel safe and secure in the hospital environment. The assessment of patients’ safety and security needs provides a method for the prevention of adverse events during hospitalization. The use of this model in conjunction with Maslow’s Hierarchy of needs frameworks could be used as a theoretical basis for the design of studies that assess patients’ safety and protection needs.

Implications for Architectural and Hospital Design

This study has several implications for the emerging field of evidence-based design within the disciplines of architecture and hospital design. In 2006, the American Institute of Architects (AIA) recommended that private rooms become the industry standard for all new construction of acute care hospitals (AIA, 2006). The decision to adopt this recommendation was made based on the premise that private rooms decrease infection, facilitate healthcare workers efficiency, provide space for families to stay with loved ones, and provide greater privacy. In addition, it has been said that noise levels, a patient’s likelihood of falling, and medication errors are greatly reduced (Joseph, 2006; Ulrich, Quan, Zimring, Joseph, & Choudary, 2004). The purpose of this study was to provide empirical evidence that the all-private room model, while it may be preferable for some of the reasons listed above, is not the answer for all patients.

The results of this study add to the body of knowledge in healthcare design and challenge the previous beliefs that the all-private room hospital reduces falls and HAIs in all patient populations. The evidence provided by this study indicates that private rooms may increase the risk of falling in the population of hospitalized older adults and private rooms do not have an impact on the occurrence of HAI.
Previous studies on the effect of private rooms on falls have largely been post– occupancy evaluations, which while showing significantly decreasing falls in the new construction, did not control for all of the variables that cause falls making it impossible to link the decrease in falls directly to the private room. The most notable of these evaluations is the one completed after the renovation of a Cardiac Care Unit at Methodist Hospital in Indianapolis, Indiana (Hendrich, et al. 2002; 2004). The unit was renovated from a centralized nurse station model with semi-private rooms to decentralized nurse stations with private rooms. This renovation was designed to increase the observation of patients and provide assistance in a timely manner. Their evaluation maintained that these changes in the design of the unit resulted in families being present more often thereby increasing their availability to assist or call for help. The post–occupancy evaluation was a comparison of data from 2 years prior and 3 years after the renovation. This comparison revealed that falls were decreased by two-thirds, from 6 falls per 1000 patients to 2 falls per 1000 patients (Hendrich, et al. 2002; 2004). Since this was a post-occupancy evaluation and not a true controlled study, the differences in the fall rates could be attributable to many elements in the built environment as well as other factors like fall prevention strategies etc. Therefore, it is impossible to conclude that the reason the fall rates went down is due to the availability of family in the private room. In fact, it is this investigators experience that families are often present in the room when a patient falls. Because of this, it is the practice at UMCP to instruct family members to ask for help rather than assist the patient alone.

The evidence that the built environment is able to prevent HAIs is more rigorous, but again, there are many variables to be considered and the private room is only one of
those. There are a large number of studies that have attempted to suggest that private rooms actually decrease HAIs; however, only two of those studies had the methodological rigor to be included in an integrative review of the research on the patient’s hospital room as it pertained to the promotion, maintenance, or restoration of healing and well-being for patients (Lorenz, 2007). The two highly reviewed studies in this respective literature review compared rates of infections caused by airborne pathogens in new construction in pediatric populations only (Anderson, Bonner, Schiefle, & Schneider, 1985; Ben Abraham et al 2002). Both studies compared older facilities with multi-occupancy rooms with new facilities with single occupancy rooms. Both studies found airborne HAIs to be reduced. Other post–occupancy evaluations reveal decreases in HAI, but fail to control for the many variables that may decrease infections, thereby limiting the applicability to the private room alone (Ulrich, 2008; Ulrich, 2009).

The evidence presented in this study, along with the many other data sources, make it clear that the disciplines of architecture and health design must continue in their efforts to establish a body of knowledge that begins pre-construction and control for all the variables that may impact the clinical outcome that is being measured. In a recent report found on the Center for Health Designs website, the authors state that although many of the studies that they reviewed were not well controlled, the power of the evidence is enhanced by the fact that reliable patterns of findings across several studies emerged with respect to outcome influences (Ulrich et al., 2008). Therefore, they believe that the application of the findings should be promoted despite the shortage of randomized experimental trials. They go on to say that, future research should be designed and controlled so that the independent function of the specific environmental
factors can be better understood (Ulrich). Unfortunately, none of these studies has been specifically applied to the older adult. In fact, although there have been studies which indicate that improved outcomes in the hospitalized older adult can be attained through environmental design changes in the hospital, including the use of multi-occupancy rooms, these studies have been conspicuously absent from the literature on hospital design. These studies should be multidisciplinary in approach and include not only architects and healthcare facility designers, but also healthcare providers, built environment specialists, and academicians. The Pebble Project through the Center for Health Design is one project that seeks to support on-going evaluation design interventions. The Pebble Project is a joint research effort between the Center for Health Design and self selected healthcare providers that are engaged in the construction of healthcare facilities. The purpose is to provide researched and documented examples of healthcare facilities whose design has made a difference in the quality of care and the financial performance of the institution (Health Design, 2009).

This research should focus on modifications to the design of the room that promote safety and well-being in all populations including the older adult. Design modifications include appropriate lighting, easy accessibility to the bathroom, (i.e. close to the head of the bed), support modifications such as hand rails and the use of surfaces that are resistant to bacteria, easily cleaned and limit distractions such as glare that can cause accidents. In addition, the research should be well thought out and described in the pre-construction phase. It is this investigators experience that a pre-occupancy evaluation should be completed in the present facility in order to control for as many variables as
possible when the post occupancy evaluation is completed, so that design interventions that have an impact on patient outcomes can be tested.

Recommendations for Future Research

Research on actual patient outcomes as they are attributed to the design of the patient room has been limited to those outcomes that enhance well-being and decrease stress, such as views and lighting. As this study reveals, there is inconclusive evidence to support the premise that the all-private room hospital necessarily equates to improved patient outcomes. While it appears the older adult may fall more in a private room, a larger multi-site retrospective study would be needed to confirm this. One suggestion for a larger study would include retrospectively examining only patients who fell and patients who acquired a HAI. By examining the actual documented circumstances surrounding an actual fall and or the development of a HAI, information that is more important may be derived to develop interventions to prevent both. A second suggestion would be to conduct a large multi-site concurrent study that would also likely yield more information about the circumstances surrounding the event. This type of study might also allow for a more sensitive tool to evaluate social isolation and whether or not room type plays a role in the effect of social isolation on the hospitalized older adult. In addition, future research should focus on the patient experience in the room as it relates to satisfaction with care, the feelings of safety, security, as well as social needs.

An important direction for future research is to expand the study of room type as it relates to the overall design of the patient care unit. Studies of all users of the space are needed, including all health care providers and family members. To date, few intervention studies regarding the patient unit or room have been done. Further research
should focus on specific design interventions that may or may not influence healing. Studies should test interventions that are designed to eliminate noise, provide optimal lighting and views, as well as promote nursing presence. Intervention studies should also include those features placed in patient rooms to promote safety, i.e. easily accessible hand washing stations, same handedness (identical room layouts with no mirror images or variation of room layout), easy bathroom accessibility, and increased family space. With this information, the impact of room type on the ability of the patient to heal and the caregiver to provide care could be greatly enhanced.

Study Summary

This study was designed to explore the relationship between room type and the occurrence of falls and HAI in the hospitalized older adult. In addition, the risk of social isolation on admission to the hospital was evaluated to determine if those patients presenting at risk would have an increased incidence of falls and HAI regardless of room type. Specifically the study examined fall data, HAI data, and social support risk data from the charts of 166 patients over the age of 65 admitted to UMCP, a 308-bed community teaching hospital in New Jersey. The analytical methods used in this study were used to analyze the data to gain a better understanding of the impact of room type on these variables.

The primary findings of this study are as follows: room type was not found to have a significant effect on the occurrence of HAI or falls, however, the relative risk of sustaining a fall increased by a factor of four when the patient was in a private room. The other variable in this study, risk of social isolation had no statistical significance on either
falls or HAI regardless of room type, although some 40% of hospitalized older adults were estimated to be at risk for social isolation.

The results of these research questions indicate that room type may be of some importance to patient outcomes in the hospital. The identification of risk of social isolation (at least as measured by the risk for social isolation rubric used in this study) on admission to the hospital has little predictive value in determining who will fall or develop an HAI. The majority of patients in this sample (60.3%) were not assessed to be at risk of social isolation on admission to the hospital.

The literature suggests that extrinsic risk factors, including the design of the patient room may, contribute to falls in the patient room (Tzeng & Chang, 2008). In addition, since the majority of falls occur in the patient room when the patient is alone attempting to get to the bathroom, the literature supports the finding in this study that risk may increase when the patient is in a private room (Hendrich et al. 1995; Krauss et al., 2007).

Contemporary literature reveals contrary findings regarding the implication of room type in the occurrence of HAIs. Although there are several elements that contribute to the rising rates of HAI, including hand washing rates, more immunocompromised patients, and increasing use of antibiotics (Joseph, 2006), there has been a significant push to provide all private patient rooms as a means of preventing these infections without an evidence base. There have been two studies that have found that private rooms prevent airborne infection (Joseph, 2006), but since most HAIs contracted in hospitals are acquired through contact pathways, the use of all private rooms may not necessarily decrease HAIs (Bauer et al., 1990; Page and Institute of Medicine, 2004). The findings in
this study, that there is no significant relationship between room type and HAI, are consistent with these previous studies.

Conclusions

The results of this study reveal that room type may play a role in the occurrence of falls in the hospitalized older adult and that room type, in and of itself, does not necessarily increase the chances of acquiring an infection while in the hospital. The results also indicate that risk of social isolation may not be predictive in terms of identifying those patients who may be at increased risk for either falling or acquiring an infection while in the hospital, although it is clear that better and more reliable and valid measures of social isolation for hospitalized older adults need to be identified.

Other variables may affect the occurrence of falls and HAI in the hospitalized older adults. Risk of falling was assessed on admission to the hospital but not reassessed and fall prevention practices were not evaluated. The tool used to assess the patients risk for falling has not been updated since 1990 and may be missing key risk factors. In addition, it was impossible to ascertain whether all of these infections were actually acquired in the hospital or if some were truly present on admission in the prodromal stage.

An identified weakness in the design of the study was the sample size estimation, which was based on falls in people over the age of 65 in the general population and not with hospitalized older adults. Part of the problem of accurately powering a fall study is the likely underreporting and inconsistencies in reporting of falls complicated by the lack of a standardized definition for falls, both in the literature and in hospital and nursing home incident reports. Although falls are the most frequently reported adverse events in
the inpatient setting rates range from 1.7 to 25 falls per 1000 patient days depending on
the setting (Hitcho, et al, 2004).

Given the knowledge gained from this study, hospitals that are designing new
facilities may want to carefully review the evidence concerning the type of patient room
that best meets the needs of the hospitalized older adult. This study suggests that a blend
of private and semi-private rooms may be the way to assure that the older adult patients
physiological and safety needs are met as well as giving patients a choice in the type of
room they would like to be cared for in. This study reveals that further research is
required to assure that the built environment in the acute care hospital is safe and patient
centered for all who are admitted.
References


Lewis, S. (2008). CMS wants to double list of conditions for which it will not pay a higher rate *ED Management*. 20 (7), 73-84.


Appendix A
Concerns:
(1) caring for infant
(2) caring for self
(3) depression
(4) disease/condition
(5) emotional stability
(6) financial concerns
(7) leaving hospital
(8) living alone
(9) living w/
(10) preparing meals
(11) returning to school
(12) returning to work

Select discharge concern option(s) or enter free text:

Mail

Enter discharge planning notes:

Mail
Appendix B

Data Collection Form

Chart # ____________

Diagnosis

Procedure

Room Type PS

Gender MF

Age

Risk of Social Isolation  1  2  3  4  5  6

Fall Risk YN

Falls YN

HAI YN

Notes
# SCHMID FALLS RISK ASSESSMENT TOOL

<table>
<thead>
<tr>
<th>MOBILITY</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Ambulates without gait disturbance</td>
<td></td>
</tr>
<tr>
<td>1 Ambulates or transfers with assist devices</td>
<td></td>
</tr>
<tr>
<td>or assistance/unsteady gait</td>
<td></td>
</tr>
<tr>
<td>1 Ambulates with unsteady gait and no assistance</td>
<td></td>
</tr>
<tr>
<td>0 Unable to ambulate or transfer</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MENTATION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Alert, oriented x3</td>
<td></td>
</tr>
<tr>
<td>1 Periodic confusion</td>
<td></td>
</tr>
<tr>
<td>1 Confusion at all times</td>
<td></td>
</tr>
<tr>
<td>0 Comatose/unresponsive</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MEDICATION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Anticonvulsants, tranquilizers, psychotropic, hypnotics</td>
<td></td>
</tr>
<tr>
<td>0 No anticonvulsants, tranquilizers, psychotropic, hypnotics</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELIMINATION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Independent in elimination</td>
<td></td>
</tr>
<tr>
<td>1 Independent with frequency or diarrhea</td>
<td></td>
</tr>
<tr>
<td>1 Needs assistance with toileting</td>
<td></td>
</tr>
<tr>
<td>1 Incontinent</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRIOR FALL HISTORY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 No prior history</td>
<td></td>
</tr>
<tr>
<td>1 Unknown</td>
<td></td>
</tr>
<tr>
<td>1 Yes, before admission (home or previous admission)</td>
<td></td>
</tr>
<tr>
<td>2 Yes, during this admission</td>
<td></td>
</tr>
</tbody>
</table>

| Total Score:                                  |       |
| Risk Level:                                   |       |
| Initials                                      |       |

A score of 3 or higher indicates High Risk