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# A COMPARISON OF NURSE SENSITIVE OUTCOMES OF AN ACUTE CARE FOR THE ELDERLY (ACE) UNIT AND A REGULAR INPATIENT MEDICAL UNIT

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Program in Research and Theory Development in Nursing Science

Submitted in partial fulfillment
Of the requirements for the degree of
Doctor of Philosophy in
The College of Nursing
New York University
2007

ACKNOWLEDGEMENTS

I dedicate this dissertation to my parents, Reva and Joseph Stahl, of blessed memory. My parents were a constant source of inspiration and motivation and were tremendously proud of all of my accomplishments.

I acknowledge the tremendous support and guidance of my dissertation committee. Dr. Elizabeth Capezuti, is a long time friend and mentor, who taught me how to be a scholar and researcher, and did so with incredible patience and kindness. She was the best chairperson anyone could have. Dr. Siegler and Dr. Fulmer provided valuable insight and support throughout the process of my study.

I acknowledge my husband, Howard Wexler, without whom I could not have completed this dissertation. He was a constant cheering section, offering incredible amounts of love, and computer tech support over the course of this long journey.

I acknowledge the nurse managers Barry Gallison and Mary Halston, and the staff of my two study units, the ACE unit and 5 Central, at New York Presbyterian Hospital Weill Cornell Medical Center. My fellow students in the PhD program, Catherine D'Amico and Noreen Brennan helped to keep me on track, and somewhat sane throughout this long journey. I also acknowledge Dr. Elizabeth Ayello, a professional colleague and friend for all of the ongoing support and guidance.

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# CHAPTER I

# THE RESEARCH OBJECTIVE

## Introduction

The rapidly growing population of older adults has directed society's attention toward the health implications of this aging imperative. At the end of the 20th century, there were an estimated 35 million persons age 65 or older, accounting for 13% of the population of the United States. By the year 2050, the older population, those individuals over age 65, is expected to grow to 86.7 million people, accounting for 20.6% of the population. Over the next 50 years, the population age 85 and older is expected to grow faster than any other age group (Federal Interagency Forum on Aging-Related Statistics, 2004). Older adults tend to have more chronic diseases, more functional disability, and utilize more health care and social service resources than younger adults. In hospitals, older adults constitute 48% of hospital admissions, and 46% of patients in critical care (DeFrances, Hall, & Podgornik, 2005) and account for 43.6 percent of the national hospital bill, nearly $329 billion annually (Russo & Elixhauser, 2006).

Functional status is an essential concept underlying an older adult's perception of quality of life. Normal aging is associated with functional changes such as a decline in muscle strength, reduced bone density, and

sensory changes (Covinsky et al., 2003). These changes often lead to decreased mobility, which further predisposes the individual to functional disability (Boyd, 2005; Covinsky et al., 2003; Creditor, 1993). Loss of functional status is associated with higher resource use (Chuang et al., 2003; Murray, Wells, & Callen, 2003).

Elderly hospitalized individuals are at increased risk for negative outcomes (Creditor, 1993; Wenger et al., 2003). The increased risk is related to many factors and includes normal age related changes and acute illness. Elements of hospitalization including the physical environment and some patient care practices may also contribute to poor outcomes (Covinsky et al., 1998; Creditor, 1993; Palmer, Counsell, & Landefeld, 1998). Wenger and colleagues (2003), in the Assessing Care for Vulnerable Elders (ACOVE) project found that care for older adults fell short of acceptable levels for a wide variety of common medical conditions. Care for geriatric conditions (i.e. falls and mobility, cognitive impairment, urinary incontinence, and end of life care) was less optimal than care for general medical conditions. One area is which older hospitalized patients are at high risk is functional decline.

Hospitalized elders may experience a decline in functional status from their preadmission baseline, over the course of a hospital stay, and often improve little by the time of discharge, regardless of the admitting diagnosis (Covinsky et al., 2003; Creditor, 1993). Research and clinical experience demonstrate that identification of risk factors for poor outcomes, combined with treatment

for the acute illness in a specially designed hospital environment can result in positive outcomes, or fewer negative outcomes for hospitalized elders ( Counsell et al., 2000; Covinsky et al., 1998; Kresevic et al., 1998; Landefeld, Palmer, Kresevic, Fortinsky, & Kowal, 1995; Palmer, Landefeld, Kresevic, & Kowal, 1994; Palmisano-Mills, 2007).

Models of care have been designed to prevent functional decline and to achieve better outcomes for hospitalized elders (Inouye, Baker, Fugal, & Bradley, 2006; Inouye, Bogardus, Baker, Leo-Summers, & Cooney, 2000; Mezey et al., 2004). One such model, the Acute Care for the Elderly Unit (ACE) model, integrates a physical environment designed to foster functional independence, in combination with changes in nursing and medical care delivery, specially trained staff, and an interprofessional team approach (Kresevic et al., 1998). The ACE model has demonstrated positive outcomes with this high risk population, such as improvement in performance of basic activities of daily living (Landefeld et al., 1995), reduction in frequency of discharge to long term care facilities (Landefeld et al., 1995), and improved patient and provider satisfaction (Counsell et al., 2000). Many of the outcomes measured, however, are not sensitive to the quality of nursing care.

The purpose of this study was to examine the effect of the ACE model on functional decline and associated nurse sensitive outcomes, compared to a regular medical unit. The primary study outcome was to determine differences in functional decline, defined as percentage change in functional status from

hospital admission to discharge, between participants on the ACE unit and those on the comparison unit.

Specific Aims

1. To determine if there is a difference in percentage change in functional status between participants on an ACE unit and those on a regular medical unit controlling for medical co-morbidities and cognition.
    A. Hypothesis 1: Participants on an ACE unit will have a significantly lower percentage of functional decline compared to a regular medical unit, controlling for medical co-morbidities and cognition.
2. To determine if participants on an ACE unit, compared to a regular medical unit, experience fewer nurse sensitive complications, controlling for medical co-morbidities and cognition.
    A. Hypothesis 2: Participants of ACE units will have fewer falls compared to a regular medical unit, controlling for medical co-morbidities and cognition.
    B. Hypothesis 3: Participants of ACE units will have fewer nosocomial pressure ulcers compared to a regular medical unit, controlling for medical co-morbidities and cognition.
    C. Hypothesis 4: Participants of ACE units will have fewer nosocomial urinary tract infections compared to a regular medical unit, controlling for medical co-morbidities and cognition.

3. To describe differences in nursing practice in relation to restraint use, indwelling urinary catheter use, psychoactive drug use, and mobility between ACE units and regular medical units.

Research Question 1: Are there fewer physical restraints used on the ACE unit compared to a regular medical unit?

Research Question 2: Are there fewer indwelling urinary catheters used on the ACE unit compared to a regular medical unit?

Research Question 3: Are there fewer psychoactive drugs used on the ACE unit compared to a regular medical unit?

Research Question 4: Are patients mobilized more frequently on the ACE unit compared to a regular medical unit?

Research Question 5: What is the relationship between nurse practices and patient complications on ACE units compared to a regular medical unit?

Definitions

Acute Care for the Elderly Unit (ACE) is a specialized unit for care of elderly patients in the hospital setting. Key elements of an ACE unit include environmental adaptations for the elderly (for example, flooring to decrease visual glare and noise, enhanced lighting, clocks and calendars in the patient rooms and a communal living room area to eat meals, socialize, and engage in therapeutic recreation), staff with special expertise in geriatrics and an

interprofessional team focused on preventing geriatric syndromes (Kresevic et al., 1998). For the purpose of this study, the ACE unit admission criteria were: Individuals age 65 and over, and admitted to the hospital for acute medical reasons. In addition, the ACE unit is defined as one that has employed the ACE model of care for at least one year prior to data collection for this study.

Regular medical unit is a patient unit in the hospital setting that provides care for adult patients admitted for acute medical reasons, but not meeting the ACE unit criteria. At least 60% of the patients are over the age of 65.

Elderly patients are defined as individuals age 65 and older hospitalized in an acute care setting.

Nurse sensitive outcomes are defined as outcomes that are sensitive to the input of nursing care and have a high specificity to nursing care, such as falls, fall related injuries, and nosocomial pressure ulcers and urinary tract infections (National Quality Forum, 2004; Gallagher & Rowell, 2003; Maas et al., 2002).

## Theoretical Rationale

Lawton and Nahemow (1973) define functional status as the result of the interaction between the person and the environment. The environment is defined broadly, as encompassing personal environment, group environment, as well as suprapersonal, social, and physical factors. This is based on Kurt Lewin's (1951) ecological theory that behavior is a function of the person and the environment. Ecological models of aging stress the importance of the

interactions between individuals and their environment such that the interaction influences functional outcomes (Hogue, 1984; Kayser-Jones, 1992; Lawton & Nahemow, 1973; Lawton & Simon, 1968; Moos, 1980). This model is further explicated in the middle range propositions of the Environmental Docility Hypothesis (Lawton and Simon, 1968); reductions in personal competence result in a higher proportion of behavior attributable to environmental factors.

Lawton (1971) describes the individual as having a set of competencies in the domains of biological health, sensorimotor functioning, cognitive skill and ego strength. Environments are classified on the basis of the demand that they place on the individual, which is called "environmental press". A person's outcome given a specific level of competence within an environment of a given press level is described on a continuum from positive to negative, and manifested on both behavioral and affective levels (Lawton & Nahemow, 1973) . Adaptive behavior and positive affect may result from a variety of combinations of environmental press and individual competence as illustrated in the following diagram:

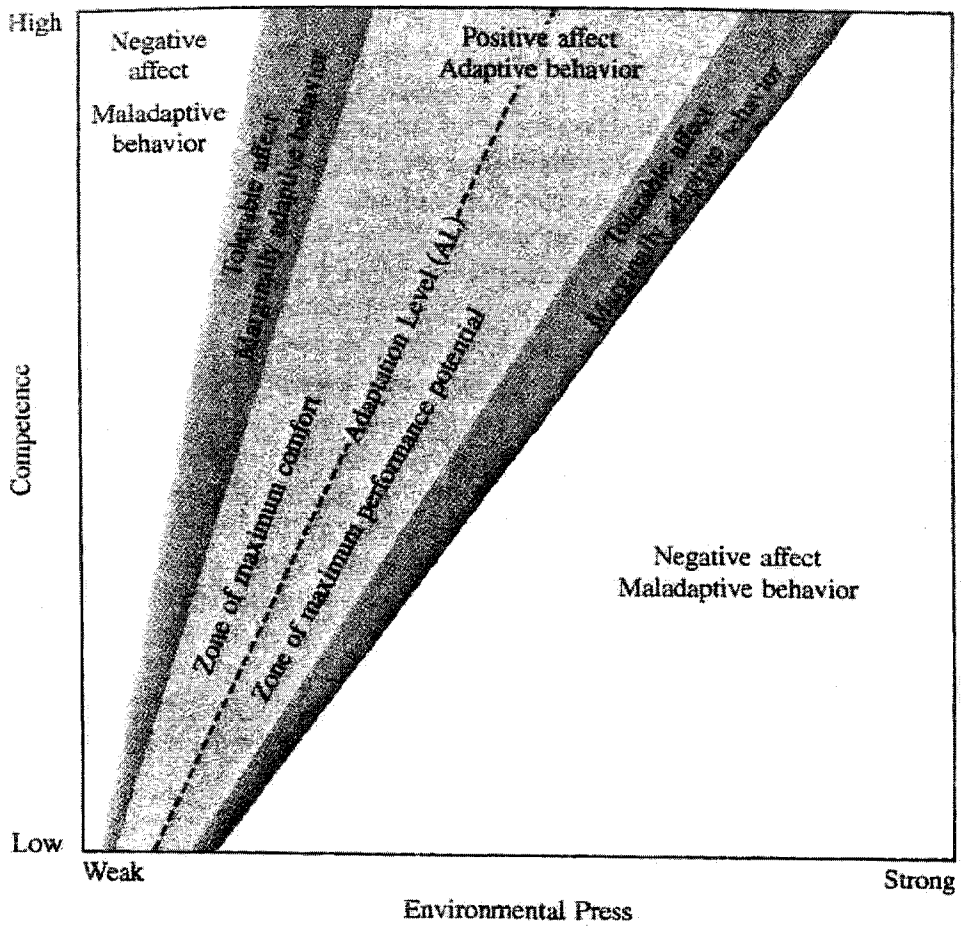


*Figure 1.* Lawton and Nahemow's Ecological Model (Lawton & Nahemow, 1973)

Lawton and Nahemow (1973) describe adaptation as the point when the individual is only minimally aware of the environment since the person is concentrating on other things; thus behavior and affect are normal. Awareness increases when the environmental press level increases above the adaptation level. Behavior remains adaptive and affect positive, with a moderate increase in environmental press. As the press level increases beyond a certain level, the

person's competence is surpassed, the behavior and affective outcomes are no longer positive, and the stress threshold is exceeded. Similarly, with a moderate decrease in press, the outcomes are usually positive. However, when there are even greater press decreases, the experience enters the realm of boredom, and there is the anxiety of true sensory deprivation and disorganized behavior.

Lawton and Nahemow (1973) explain the effect of press level changes on the individual. The "zone of maximum performance potential" results from slight increases in press level, which motivate the individual to uses one's competence to the fullest. The "zone of maximum comfort" results from mild decreases in press. It is a state of reduced motivation, mild dependence, and passive enjoyment. No matter how high a person's competence level is, there is a point of high press where behavior and affect deteriorate. The higher one's competence, the wider the range of press on is able to cope with in a positive manner. Individuals who have very low competence, however, are capable of positive affect and adaptive behavior, if in environments with appropriately low press levels.

Lawton and Nahemow (1973) assert that the older person is more subject to reductions in competence than the younger adult in any of the domains, which may be attributed to the aging process, illness, disability, or social circumstances. Lawton and Nahemow's (1973) approach focuses on the person's interaction with the environment. Competence is defined independent

of the way the person perceives himself/herself. The environment is defined in a broad manner encompassing personal environment, group environment, and suprapersonal, social, and physical factors, limiting the outcomes to behavioral aspects such as affect and reducing the applicability of the model to the possibility of other outcomes. Lawton and Nahemow's (1973) framework continues to guide research in related areas of geriatric practice (Calkins, 2004; Diaz Moore, 2005; Evans, Crogan, & Armstrong, 2004; Gitlin, Liebman, & Winter, 2003; Iwaarson, 2005; Kahana, Lovegreen, Kahana, & Kahana, 2003; Lichtenberg, MacNeill, & Mast, 2000; Sloane et al., 2002; Ziesel et al., 2003).

This study compared patient level, nurse sensitive outcomes of an ACE unit to those on a regular medical unit. Key aspects of the ACE model include: Environmental adaptations (a deinstitutionalized appearance, flooring to decrease visual glare and noise, enhanced lighting, and a communal living room area for meals, socialization, and therapeutic recreation), staff with specialized training in geriatrics, and an interprofessional team that meets regularly and focuses on preventing geriatric syndromes (Kresevic et al., 1998). These elements were the environmental press in the above model. In this study, competence was defined as functional status. Maladaptive behavior was manifested by the presence of the negative outcomes such as functional decline, falls, nosocomial pressure ulcers, and nosocomial urinary tract infections. The goal of the ACE unit is to create an environment that promotes an individual's maximum performance potential.

Significance

Models of geriatric care have been designed to prevent and/or reduce poor outcomes for hospitalized elders. The Acute Care for the Elderly unit is one model of geriatric care that has demonstrated success. One of the first publications about ACE units described implementation in a in a large teaching hospital setting, the University Hospitals of Cleveland (Palmer, Landefeld, Kresevic, & Kowal, 1994). The first published clinical investigation into this model was conducted by Landefeld and colleagues (1995), in a large randomized controlled trial with 651 patients, 70 years of age or older who were admitted for general medical care at a large teaching hospital. Patients were randomly assigned to receive usual care or to be cared for in a special unit, an ACE unit. Counsell and colleagues (2000) replicated this study in a community teaching hospital setting, in a randomized trial of 1531 community dwelling patients, age 70 or older, admitted for an acute medical illness. Positive outcomes were demonstrated in the areas of functional decline or maintenance of functional status, (Counsell et al., 2000; Landefeld et al., 1995), fewer patients discharged to nursing homes (Landefeld et al., 1995), less restraint use (Counsell et al., 2000), decreased number of days to discharge planning (Counsell et al., 2000), and improved patient and family satisfaction (Counsell et al., 2000). The outcomes, however, were not maintained for a long period of time after discharge, the reasons for which were not investigated. The outcomes measured in these studies

were not all considered to be nurse sensitive, or amenable to nursing intervention (Gallagher & Rowell, 2003).

Other models of geriatric care have demonstrated positive nurse sensitive outcomes with hospitalized older adults such as decreased functional decline (Inouye et al., 2006; Inouye et al., 2000) reduced falls (Swauger & Tomlin, 2002), lower rates of confusion(Lee & Fletcher, 2002; Swauger & Tomlin, 2002), and earlier identification of delirium (Inouye et al., 2000).

In summary, the ACE model is one model of care that has evidence that it is possible to prevent the hazards of hospitalization and promote positive outcomes by redesigning the hospital unit and care delivery. Despite the key role of nursing in this model, the studies that have been conducted have not all measured outcomes that were sensitive to the quality of nursing care. This study will investigate four nurse sensitive patient outcomes of ACE units including functional decline, falls, nosocomial pressure ulcers, and nosocomial urinary tract infections.

# CHAPTER II

# THE RELATED LITERATURE

The review of literature begins with a discussion of the negative consequences of hospitalization for the older adult and the nursing practices that contribute to these consequences. This section is followed by a discussion of patient outcomes that are sensitive to nursing care. The last section describes models of geriatric care that have been designed to combat the hazards of hospitalization and lead to positive patient outcomes.

## Hazards of hospitalization

It is well known that older hospitalized patients experience a decline in function from their pre-hospitalization status, by the second day of hospitalization, and improve little by time of discharge, regardless of admitting diagnosis (Covinsky et al., 2003; Creditor, 1993). In many cases, the decline cannot be attributed to the medical problem for which they were admitted. Even when the disease is cured, or the problem in corrected, the patient may never return to their premorbid functional status. Some of the decline can be attributed to complications of the disease itself, or its treatment. However, it is

clear that elders are at risk for a decline in function unrelated to a particular disease or its medical treatment (Creditor, 1993).

Hospitalized elders are at an increased risk for poor outcomes such as readmissions, increased hospital length of stay, functional decline and nursing home placement (Counsell et al., 2000). Factors that predict poor hospital outcomes and mortality after discharge include pressure ulcers (Cuddigan, Ayello, & Sussman, 2001), malnutrition (Covinsky, 2002; Gary & Fleury, 2002), acute confusion (Inouye, 2000), and an unsteady gait (Lindenberger et al., 2003). These negative outcomes may be as a result of hospitalization, and are associated with both personal (normal aging and medical conditions) and environmental (nursing practice) factors.

Boyd and colleagues (2005), in a large population based study of community dwelling older women, found that hospitalization for acute illness was an independent predictor of functional decline, controlling for established predictors of disability. In addition, repeated hospitalizations conferred cumulative risk.

Creditor (1993) discusses the "cascade to dependency", that results from the interactions between the effects of aging and hospitalization that lead to a loss of health and independence in the elder. Normal aging is associated with many changes that increase the elder's susceptibility to various stresses. Many of these changes, however, do not result in disability under normal circumstances. When stressed, the older adult may experience functional disability (Creditor,

1993). Stressful events associated with hospitalization include prolonged bed rest, the use of restraints, psychotropic medications, and bladder catheters (Inouye, 2000). Other deleterious nursing practices that may contribute to negative outcomes for the hospitalized elder include restrictive side rails , inattention to oral hygiene (Coleman, 2002) and dietary regimens that are very restrictive (Amella, 2004; Jensen, McGee, & Binkley, 2001). The impact of these practices on the hospitalized elder may be cumulative.

Bed rest is a frequent intervention in the hospital setting often without a medical order (Brown, Friedkin, & Inouye, 2004; Callen, Mahoney, Wells, Enloe, & Hughes, 2004). In elders, bed rest and mobility limitations may have deleterious effects, causing loss of muscle strength, falls and injuries, delirium, incontinence, pressure ulcers, malnutrition, dehydration and new institutionalization .

In the absence of any voluntary contraction, muscle strength decreases by 5% per day (McCusker, Kakuma, & Abramowitz, 2002). Inactivity due to bed rest contributes to muscle shortening and changes in joint structure, which cause limitations in motion and contractures. The most rapid changes take place in the lower extremities (McCusker, Kakuma, & Abramowitz, 2002). Immobility can lead to deconditioning and dependence in activities of daily living. In one large study of 498 hospitalized patients, aged 70 and older, a decline in at least one activity of daily living was noted in 29% of cohort;

bedrest was ordered at some during hospitalization in 33% of the patients (Brown, Friedkin, & Inouye, 2004) .

Despite the known hazards of bedrest and low mobility for hospitalized elders, there is little research that examines the frequency of ambulation and physical activity in this population or setting. Several early studies reported large proportions of patients documented to be on bedrest, to have no nursing documentation of ambulation and only a small percentage to have received physical therapy while hospitalized (Lazarus, Murphy, Coletta, McQuade, & Culpepper, 1991; Warshaw, 1982).

Callen and colleagues (2004), in a small observational study, observed and recorded frequency and minutes of hallway ambulation of a group of older hospitalized adults. Of 188 patients considered by nurses to be able to walk in the hallways, only 3.4% walked more than twice, and 72.9% did not walk at all during a three-hour period. Frequency of ambulation was as low for patients independent in walking, as it was for those dependent in walking. This study was limited in sample size, and that the information on ambulation was based on nursing judgment rather than on an objective assessment of a patient's mobility.

Another common practice in the acute hospital setting, which may contribute to mobility restriction, is the use of urinary catheters, which are placed routinely on admission, and frequently, left in place until time of discharge. Studies have demonstrated that initial insertion of urinary catheters is unjustified

in many patients, as is the continued use (Gokula, Hickner, & Smith, 2004; Maki & Tambyah, 2001; Munasinghe, Yadzani, Siddique, & Hafeez, 2001). Urinary incontinence was found to be the major reason for unjustified initial catheterization, as well as for the continued use of indwelling catheters in non critical care areas (Gokula et al., 2004). The use of urinary catheters results in an increased incidence of urinary tract infections that account for 40% of nosocomial hospital infections and which lead to bacteremia 2-4% of the time (MacLennon, 2003; Saint, 2000). Although the risks of indwelling urinary catheters are known, the risks and benefits of alternatives have not been adequately studied. Saint and colleagues (2006) in a small, randomized controlled trial of hospitalized men who required a urinary collection device found that the use of condom catheters was less likely to lead to bacteriuria, symptomatic urinary tract infections or death than indwelling catheters. This remains an area for further investigation.

In addition to the clinical and financial implications of catheter use is the significant discomfort experienced by patients (MacLennon, 2003). Urinary catheters can also act like physical restraints, restricting the patient's mobility and ability to function independently (Saint, Lipsky, & Goold, 2002).

Physical restraints may be utilized to prevent falls and treatment interference (Capezuti, 2000). A patient can be restrained with a vest or wrist restraint or by side rails that impede the patient's voluntary movement out of bed. Restraining the patient, regardless of the device, does not address the underlying problem and may in fact make it worse. Short-term complications

of physical restraints include new onset of bowel and bladder incontinence and pressure ulcers (Capezuti, 2004).

Similarly, restrictive siderail use is based on the belief that such devices prevent falls and injuries (Capezuti, 2000). Studies have demonstrated that siderails contribute to injury and do not prevent falls (Parker & Miles, 1997). Siderail use has other negative consequences including: increasing the distance one falls from the bed, obstructing vision, separating the patient from the caregiver, pulling and dislodging tubes during raising and lowering, causing trauma if the patient becomes entangled in them and creating a sense of being trapped (Capezuti, 2004; Capezuti & Braun, 2001) .

Many routine care practices in the hospital setting increase the elder's risk for malnutrition. Bed rest and patient attachments such as intravenous lines, oxygen lines and catheters limit freedom of movement and may make sitting uncomfortable. The upright position on electric beds may not be high enough to ensure safe swallowing in elders with dysphagia. Many diagnostic tests require the patient to be "NPO",i.e. take nothing by mouth from the night before even if the test is late in the day. Up to 25% of hospitalized patients have inadequate intakes due in a large part to NPO orders without other forms of repletion (DiMaria-Ghalili & Amella, 2005). Dehydration, in turn, may cause delayed wound healing, increased nosocomial infections, pressure ulcers, decreased functional status and poorer response to therapy for a primary condition (Akner & Cederholm, 2001; Amella, 2004).

Another aspect that impacts the nutritional status of the hospitalized elder is the ability to self-feed. Kayser-Jones (2002) found that for elders with impaired cognition, the time that the staff utilized to help the patient eat was a critical factor in determining nutritional status.

Neglect of oral hygiene in older adults is another deleterious nursing practice that contributes to malnutrition. Poor oral health is directly linked to malnutrition and dehydration in older adults and to many other serious conditions including valvular heart disease, brain abscesses, joint infections and pneumonia. Providing or encouraging oral hygiene in older adults is essential to ensure comfort, health and well-being. Despite its importance, oral care has not received the same priority as other nursing care practices (Coleman, 2002).

In summary, acute care hospitalization, which is intended to provide a healing environment, has many risks associated with it for the older adult. These hazards are not only related to the medical problem for which the individual was admitted, but also to the environment and many nursing care practices. Negative outcomes may result both during the hospital stay as well as post hospitalization.

## Patient Outcomes

Providing outcome oriented cost-effective care is of critical importance, as is identifying relevant outcomes that are sensitive to the input of nursing care and

have a high specificity to nursing care (Gallagher & Rowell, 2003; Maas et al., 2002). In 1995, the American Nurses Association developed The Nursing Care Report Card for Acute Care (American Nurses Association, 1995), which grew into the Quality Initiative in the Inpatient Setting (American Nurses Association, 2000). Outcomes of this study which are among the ANA nursing quality indicators are: Nosocomial urinary tract infections, falls and injuries, and pressure ulcers.

A similar initiative is The Nursing Outcomes Classification (NOC). The purpose of NOC is to identify standardized patient outcomes and measures that determine the effectiveness of nursing care. 330 patient outcomes have been identified and tested for content validity (University of Iowa College of Nursing, 2005:Maas et al., 2002). All of the patient outcomes that will be measured in this study are included in the NOC taxonomy.

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO), in its role in evaluating and accrediting health care organizations, sets standards for quality and safe patient care. JCAHO has recently shifted from a focus on individual outcome indicators to a focus on system wide patient safety (JCAHO, 2006). The National Patient Safety Goals highlight problematic areas in healthcare and describe evidence-based solutions to these problems.
The importance of assessing all patients for risk for falls, and the development of a fall prevention program is included in this initiative (JCAHO, 2006)

## Functional status

Functional status is defined as an interaction between the person and the environment (Lawton & Nahemow, 1973). The components of function are interrelated, a change in one area may affect the integrity of another area (Wang, 2004). Physical functioning may be defined as the ability to perform the basic activities of daily living (ADLs), and the instrumental activities of daily living (IADLs) (Katz, 1983). The ADLs include self care activities such as eating, toileting, transferring, bathing, and dressing (Katz, 1983; Katz, Ford, & Moskowitz, 1963). The IADLs include more complex tasks such as cooking, managing money, housekeeping, shopping, and the ability to use public transportation or drive a car (Lawton & Brody, 1969). There are many different tools available to measure functional status; some are population specific, others are setting specific (refer to Appendix A).

Between 25% and 60% of hospitalized elderly patients experience a loss of independent function while hospitalized for an acute illness (Palmer et al., 1998). In a study of more than 2,000 patients age 70 and older admitted to the general medical service, only 45% maintained premorbid level of function during the 2 weeks before hospitalization and through hospitalization, 20% declined in ADL function before admission and recovered baseline function during hospitalization. The remaining 35% were discharged with lower ADL function than 2 weeks prior to admission (Covinsky et al., 2003). Factors that have been identified as predicting functional recovery after discharge include:

age (Covinsky et al., 2003), cognitive status (Sands et al., 2003), visual impairment (McCusker, 2002), malnutrition (Covinsky, 2002), polypharmacy, and immobility (McCusker, 2002).

## Falls

Another common, yet serious problem for hospitalized elders is falls. A fall is defined as a sudden, unintentional event that causes a person to land on the floor or lower level, not as a result of a major intrinsic event or an overwhelming external hazard (Agostini, Baker, & Bogardus, 2001). Significant morbidity, mortality, reduced functioning, and nursing home admissions are due to falls in the elderly (Tinetti et al., 2006; American Geriatrics Society, British Geriatric Society, American Academy of Orthopaedic Surgeons, 2001).

Falls account for 10% of visits to emergency rooms and 6% of urgent hospitalizations for older adults. Approximately 5% of older people who fall require hospitalization (Rubenstein, Powers, & MacLean, 2001). Falls in the hospital setting are common, generally ranging from 2.3 to 7 falls per 1,000 patient days (Halfon, Eggli, Van Melle, & Vagnair, 2001). Complications of falls are the leading cause of accidental death from injury in older adults; 75% of death due to falls in the United States occur in 13% of the over age 65 population (National Center for Injury Prevention and Control, 2005).

It is estimated that fall related injuries account for 6% of all medical expenditures for persons age 65 and older in the United States (National Center

for Injury Prevention and Control, 2005). Falls in the hospital are often attributed to a combination of the individual's health status and the institutional environment. The unfamiliar hospital environment, physical obstacles, and equipment can also increase the elder's risk for falls (American Geriatrics Society et al., 2001; Rubenstein & Josephson, 2002; Lyons, 2005). In addition, hospital units staffed with less experienced nurses have been found to have higher rates of falls than units staffed by more experienced nurses (Blegen, Vaughn, & Goode, 2001).

Risk factors for the hospitalized elder include the acute illness for which the individual is hospitalized, which may cause weakness, deconditioning and immobility (American Geriatrics Society et al., 2001). Impaired mental status, delirium, confusion, and disorientation are also causes of falls for hospitalized elders (Agostini et al., 2001; American Geriatrics Society, 2001; Oliver, Daly, Martin, & McMurdo, 2004; Oliver, Hopper, & Seed, 2000). Patients with special toileting needs due to incontinence are at increased risk of falling in the hospital (Hitcho et al., 2004; Salgado, Lord, Ehrlich, Janji, & Rahman, 2004). Special toileting needs are often present in individuals with alterations in cognition and mobility, which also increase risk for falling.

The addition of new medications or alterations to medication regimen may also increase the elder's risk for falling (American Geriatrics Society et al., 2001; Rubenstein & Josephson, 2002). Benzodiazepines, diuretics, sedative/hypnotics, vasodilators, and antidepressants may increase the risk of

falling for older patients (Frels, Williams, Narayanan, & Gabriella, 2002; Leipzig, Cumming, & Tinetti, 1999a, 1999b).

History of falling during a previous hospitalization has been identified as a factor with an increased risk for future falls (Agostini et al., 2001; American Geriatrics Society et al., 2001). Between 16 and 52% of patients experience more than one fall during hospitalization (Oliver, 2000). Patients with a history of falling are more likely to be confused and have a longer length of stay in the hospital (Vasallo, Sharma, & Allen, 2002).

Patient injury rate is defined as the rate, per one thousand patient days, at which patients sustain physical injury from a fall, regardless of the severity of the injury (American Nurses Association, 2000). Up to 30% of hospital falls may result in injury including fractures, head trauma, and soft tissue trauma, which may lead to impaired recuperation and co-morbidities, and death (Agostini et al., 2001; Hitcho et al., 2004). In the hospital setting, 10% of older patients who fall die before discharge, and a clustering of falls in one patient results in increased mortality (Agostini et al., 2001). In addition to fall related injuries, complications of falls include increased functional dependence and fear of falling; fear of falling and fall related anxiety can result in loss of self confidence and self imposed functional limitations (Tinetti, Mendes de Leon, Doucette, & Baker, 1994)

Nosocomial pressure ulcers

A pressure ulcer is defined as any lesion caused by unrelieved pressure resulting in damage to the underlying skin (Agency for Health Care Policy and Research, 1992; Cuddigan, Ayello, & Sussman, 2001). Regulatory and accreditation agencies have identified pressure ulcers as a nurse sensitive indicator (JCAHO, 2006). In addition, pressure ulcer prevention has been identified as a quality outcome indicator by a number of national quality initiatives (American Nurses Association, 2000; Institute for Healthcare Improvement, 2007; Wenger et al., 2003). Pressure ulcer prevalence is defined as the number of patients with stage II, II or IV pressure ulcers divided by the total number of patients in the prevalence study (American Nurses Association, 2000). The primary location for the development of pressure ulcers is on the sacrum, followed by heels (Bates-Jensen, 2001; Cuddigan, Ayello, & Sussman, 2001).

Pressure ulcer incidence rates vary considerably by clinical setting, ranging from 0.4% to 38% in acute care (Lyder, 2003); the National Pressure Ulcer Advisory Panel estimates adult pressure ulcer prevalence in acute care setting to be about 15%; incidence is estimated to be 7% (Cuddigan, Ayello, & Sussman, 2001). An estimated one of ten hospitalized patients will develop a pressure ulcer (Whittington & Briones, 2004); many older hospitalized adults develop pressure ulcers soon after admission (Baumgarten et al., 2006). The development of pressure ulcers is a complex process involving factors related

to the patient's condition, as well as extrinsic factors. Pressure, moisture, shearing and friction are the primary external factors; external risk factors include age, mobility, food intake, and low serum albumin (Bergstrom, Braden, Kemp, & Ruby, 1998).

Many nursing and hospital practices such as enforced bedrest, restraints, improper bed positioning, and the resulting lack of physical and mental stimulation can lead to skin breakdown in a patient who did not previously have wounds, or worsen an existing wound .

Pressure ulcers can cause significant harm to patients, frequently causing pain and the development of serious infections such as cellulitis, sepsis, and osteomyelitis . Pressure ulcers have also been associated with longer lengths of stay and mortality. Approximately 60,000 hospitalized patients in the United States are estimated to die each year from complications of nosocomial pressure ulcers. The estimated cost of managing one full thickness pressure ulcer can be as high as $70,000; the total cost for treatment of pressure ulcers in the United States is estimated at $11 billion annually (Reddy, 2006; Mervaglia, Becker, Grobe, & King, 2002).

## Nosocomial urinary tract infections

Nosocomial infection rate is defined as the rate at which patients experience infections (all sites) originating in the hospital (American Nurses Association, 2000). The American Nurses Association chose urinary tract infections as the

indicator for nosocomial infection rate because the relationship between quality of nursing care provided and the development of urinary tract infections is more direct than in the case of other infections. There are also good reporting mechanisms in place for urinary tract infections (American Nurses Association, 2000).

Nosocomial urinary tract infection rate is defined as the rate per 1,000 acute care days at which patients admitted to the acute care setting develop urinary tract infections after the first 72 hours of their hospital stay, and for which there is no evidence to suggest that the infection was already present or incubating at the time of admission (American Nurses Association, 2000). The Centers for Disease Control (CDC) define a urinary tract infection as the presence of a positive urine culture with no more than two species of organisms, along with a fever of greater than 38 degrees centigrade and symptoms of urinary urgency, frequency, dysuria, or suprapubic tenderness. An alternate definition is the presence of all of the symptoms noted above, and a physician's diagnosis for which antimicrobial therapy is instituted (Horan & Gaynes, 2004).

Urinary tract infections produce substantial overall morbidity for patients and considerable costs for the healthcare system. Urinary tract infections account for approximately 40% of nosocomial infections, with up to 80% of nosocomial urinary tract infections associated with the use of indwelling urinary catheters (Doyle et al., 2001; Maki & Tambyah, 2001; Saint, 2000;

Tambyah & Maki, 2000). Nosocomial urinary tract infections are estimated to cause 1 death per 1000 episodes of catheterization and contribute to an additional 6500 deaths per year in the United States. Nosocomial urinary tract infections increase hospital length of stay on average by 1-4 days, and add approximately $675 to the cost of hospitalization. When bacteremia develops, this cost increases to approximately $2800 (Saint, 2000).

Catheter related bacteremia occurs infrequently; however, it has serious consequences. Urinary catheter related bacteremia is diagnosed when the same organism is isolated from both the urine and the blood cultures in the absence of other sources of infection (Saint, 2000). It is estimated that the risk of bacteremia in patients with a urinary tract infection is about 3.6%; bacteremia will develop in almost 1 of every 27 urinary tract infection (Saint, 2000). Catheter related urinary tract infections are also associated with an increased risk of death. There is controversy over whether the infection leads to mortality, or whether the patients in whom infection develops are fundamentally different and at higher risk of dying because of intrinsic factors (Saint, 2000).

## Delirium

Delirium is defined as an acute confusional state, characterized by a sudden onset, fluctuating course, inattention, altered level of consciousness, disorganized speech and thought, disorientation and often behavioral disturbances (American Psychological Association, 1994). It usually resolves

with elimination of underlying causes (Fick & Foreman, 2000). The etiology of delirium is multifactorial. A broad range of predisposing and precipitating characteristics have been identified, including increased age, cognitive and sensory impairments, dehydration, psychoactive drug use, concurrent medical illness, and sleep deprivation (Fick & Foreman, 2000; Foreman, Fletcher, Mion, & Trygstad, 2003; Inouye et al., 2000; Irving & Foreman, 2006)

The prevalence of delirium in older persons, on admission to the hospital, is estimated to be between 14-24%; it is the most frequent complication of hospitalization in this age group, developing in up to 56% of patients during the hospital stay (Inouye et al., 2000) Delirium often initiates a cascade of events that results in functional decline, caregiver burden, increased rates of nursing home placement, discharge delay, increased nursing time per patient and higher daily hospital costs and increased morbidity and mortality (Inouye et al., 2000; McCusker et al., 2003). These negative outcomes are not necessarily caused by the delirium itself, but may be a result of severity of illness, increased age, and overall frailty (Foreman, Wakefield, Culp, & Milisen, 2001).

Delirium can be identified using the Confusion Assessment Method (CAM) diagnostic algorithm. The CAM is a standardized diagnostic algorithm that allows clinicians without formal psychiatric training to accurately identify delirium (Rapp et al., 2000). The CAM is composed of two parts. Part one is an assessment instrument that screens for overall cognitive impairment. Part

two includes four features that were found to have the greatest ability to distinguish delirium from other types of cognitive impairment. These include: acute onset and fluctuating course, inattention, disorganized thinking or altered level of consciousness (Inouye et al., 1990).

## Malnutrition/Undernutrition

Malnutrition is defined as an inability to ingest, metabolize or acquire an adequate amount of protein or calories. (Jensen et al., 2001). The Nutrition Screening Initiative (2002), estimates that approximately 40%- 60% of older hospitalized patients are protein-energy malnourished on admission or develop serious nutritional deficits during hospitalization.

Poor nutritional status is also a marker for other negative outcomes in hospitalized elders. Patients with nutritional deficits are at an increased risk of development of a variety of complications including delayed wound healing, nosocomial infections, pressure ulcers, poor response to therapy for particular conditions (Amella, 2004; DiMaria-Ghalili & Amella, 2005).

Assessing nutritional status is an important role of the interprofessional team in the hospital setting. Calorie counts are one way to assess patient intake. The limitation of this measure is that it often is based upon patient or staff recall of amount consumed (DiMaria-Ghalili & Amella, 2005). Height and weight measurements are critical components of nutritional assessments. The Body Mass Index (BMI) is the preferred initial measurement for starting to assess physiologic

parameters for nutrition (Amella, 2004). BMI is calculated by dividing the weight in kilograms by height in meters squared. The BMI range for an older adult is 22-27, which is slightly higher than for younger adults (Nutritional Screening Initiative, 2002).

Another method to assess adequacy of nutritional intake is through serum measurements of visceral protein levels (DiMaria-Ghalili & Amella, 2005). The most frequently measured level is that of albumin. The serum albumin level, however, has a half-life of twenty-one days, and is not a good indicator of a patient's immediate nutritional status. The prealbumin level is a more useful indicator of nutritional status in the acute care setting because of its short half-life; prealbumin has a half-life of seventy-two hours. The normal range of prealbumin is 19.5 to 35.8 mg/dl (DiMaria-Ghalili & Amella, 2005).

## Length of stay

Length of stay is defined as the duration of the inpatient hospital component of a defined episode of illness (American Nurses Association, 2000). The amount of time patients spend in the hospital during an episode of illness is widely recognized as a measure of quality and cost effectiveness (American Nurses Association, 2000). Atypically long lengths of stay are associated with high resource utilization and poorer outcomes (American Nurses Association, 2000). As compared with patients aged 45-64, patients age 65 and older have longer

lengths of hospital stay, 5.8 days as compared to 5.0 days (DeFrances, Hall, & Podgornik, 2005).

Models of Geriatric Hospital Care

Models of geriatric hospital care have been designed to achieve better outcomes for this high-risk group. These include multidisciplinary geriatric consultation teams, geriatric evaluation and management units, the Hospital Elder Life Program, and Nurses Improving Care for Healthsystem Elders (NICHE). The ACE unit is one of the NICHE models.

Multidisciplinary geriatric consultation teams provide comprehensive assessment of the older adult's physical, emotional, psychological, and functional status and make recommendations about prevention and management. Teams usually include a geriatrician, nurse, social worker, and other health professionals. The goal is to maximize the comprehensive health status of the patient and prevent hospital related complications (Reuben, Borok et al., 1995). Multidisciplinary geriatric consultation teams are not unit based, so there is a greater opportunity to reach larger number of patients within the hospital (Cohen et al., 2002).

Studies of inpatient geriatric consultation have not reported positive outcomes. Several studies did not find that this approach to care improved the health or survival of hospitalized patients. In one of the earliest studies, Winograd and colleagues (1993) did not find any statistically significant

differences in outcomes between the group of patients receiving inpatient geriatric consultation and those receiving regular hospital care. The researchers attributed these results to the selection criteria for patients in their study. Criteria that predict adverse patient outcomes such as morbidity, mortality, and functional decline may not select those patients most likely to benefit from inpatient geriatric consultation. The patients may be on a course of deterioration that is not amenable to the interventions of inpatient geriatric consultation. Reuben and colleagues (1995) cited this issue, and that the patients in the control group were already receiving a high standard of geriatric care. Many of the services of these patients duplicated elements of treatment recommended by the geriatric consultation team. Another explanation was that the recommendations of the geriatric consultation team were not always fully implemented in the hospital setting.

Geriatric evaluation and management (GEM) units use the interdisciplinary team approach, on a designated inpatient unit. Standard protocols for geriatric assessment are utilized, with a focus on screening for geriatric syndromes such as functional and cognitive decline, falls, and nutritional disorders. Preventive and management services are coordinated to address the problems identified, with a focus on maintaining or regaining the patient's functional status (Cohen et al., 2002). Geriatric evaluation units usually do not accept patients admitted directly from home or the emergency room, but rather accept patients already hospitalized who experience selected geriatric syndromes, such as falls or functional decline.

Geriatric teams have direct control over implementation of interdisciplinary recommendations on GEM units.

Several early studies report positive outcomes including positive effects on quality of life, and ADL function (Kay, MacTavish, Moffatt, & Lau, 1992; Rubenstein, Stuck, Siu, & Wieland, 1991) and discharge to home setting (Applegate et al., 1990; Rubenstein et al., 1984). These studies demonstrate that geriatric evaluation units may be effective, but only for carefully targeted patients, and at a considerable cost, after patients already suffered functional decline.

More recent studies of GEM units have reported mixed results. Cohen and colleagues (2002), in a large, multisite randomized clinical trial within the Department of Veterans Affairs demonstrated little benefit of GEM units compared to customary care. 1388 hospitalized elders were randomly assigned to 1 of 4 groups across 11 Veterans Affairs Medical Centers with established geriatric programs. Patients were assigned to the inpatient GEM unit or to usual inpatient care with either usual outpatient follow-up or geriatric clinic follow-up. There were no differences in post-hospital survival rates between the two groups (approximately 78% survived). There was short-term functional improvement in the GEM unit patients compared to patients receiving usual medical care; there was mental health improvement for the patients receiving geriatric clinic follow-up.

One explanation for the results may be that the study design impacted care on the inpatient units. The health care teams did not know where the patients were

being referred for follow-up care until after discharge, which might have increased hospital length of stay (Rubenstein, 2004). This study was conducted at sites that had well established geriatrics programs for many years. The "usual care" may have been considerably better than at sites without such programs (Rubenstein, 2004). Another explanation offered was that customary care may have improved considerably since the early 1980's when the initial studies were conducted (Reuben, 2002).

In contrast, randomized controlled trials that investigated the GEM model for hospitalized older cancer patients reported this model to be an effective approach to the management of pain and psychological status in elderly hospitalized cancer patients, without extra costs nor greater length of hospitalization than usual care (Garmann, McConnell, & Cohen, 2004; Rao, Hsieh, Feussner, & Cohen, 2005). One recent study (Phibbs et al., 2006) reported a statistically significant reduction in nursing home admission for patients treated on a GEM unit compared to a regular medical unit.

The Elder Life Program developed by Inouye and colleagues (1993,1999, 2000, 2006) is an adaptation of Fulmer's (1991) Geriatric Resource Nurse model described below. The intervention, targeted to prevent delirium, uses an interdisciplinary team and trained volunteers to identify risk factors for delirium. A randomized controlled trial using matched units found that this model was successful in improving management of delirium, bladder/bowel problems, and

pressure ulcer prevention and treatment. This included a reduction of the incidence of delirium from 15% to 10% (Inouye et al., 1993).

In addition to interdisciplinary models, NICHE, Nurses Improving Care for Healthsystem Elders focuses on nursing practices as a way of improving care for hospitalized elders. The program consists of several approaches, each of which facilitates transfusion of evidence-based geriatric best practices into hospital care (Fulmer et al., 2002; Mezey et al., 2004). These include: the geriatric resource nurse model (GRN), syndrome specific model, comprehensive discharge planning, and Acute Care for Elders (ACE) nursing unit.

The GRN model is based on the premise that not all nurses have the requisite knowledge and skills to provide care for the growing number of elderly in hospitals (Fulmer, 1991; Fulmer et al., 2002). Primary nurses know most about the day to day patterns of their elderly patients; primary nurses who serve as geriatric resource nurses are more likely to integrate new behaviors into practice. A geriatric clinical nurse specialist works closely with the GRN to educate and exchange ideas (Fulmer et al., 2002). Inouye and colleagues (1993), in a controlled trial of 216 patients, found this model to be effective in decreasing functional decline without increasing per day hospital costs. The intervention group had significantly fewer declines in ADL and IADL function than control group patients, and was more likely to receive specific interventions to maximize function. Several descriptive studies demonstrated other benefits from the GRN model such as earlier interdisciplinary involvement in identifying needs of the

elder on admission, and recognizing geriatric syndromes, higher rates of patient and family satisfaction and successful outcomes in the care of older adults (Guthrie, Edinger, & Schumacher, 2002; Lopez et al., 2002; Pfaff, 2002; Swauger & Tomlin, 2002; Turner, Lee, Fletcher, Hudson, & Barton, 2001). .

A new model that is closely related to the GRN model is the nurse attending model. In this model, a senior faculty member from a university leads expert rounds on a clinical unit and is available for consultation. The goal of the model is to infuse current research into practice, and to keep experts at the bedside (Fulmer, 2000). This model has not been tested beyond the initial pilot.

The syndrome specific model, developed at the University of Chicago Hospitals, provides for consultation and education by a geriatric clinical nurse specialist to help nurses improve their accuracy and speed in identifying and managing common geriatric syndromes such as delirium, falls, urinary incontinence and sleep disturbances. This model uses a target condition to begin the comprehensive improvement of geriatric care (Milisen, 2001).

Unit based assessment and knowledge are key in reducing negative outcomes among hospitalized older adults. The initial focus of this model was on delirium (Foreman, Fletcher, Mion, & Simon, 1996). This model utilizes specially trained nursing staff to improve patient outcomes similar to the geriatric resource nurse model; however, it uses advanced practices nurses rather than staff nurses.

Another model that utilizes advanced practice nurses is the comprehensive discharge planning model for the elderly, which includes a specialized geriatric

discharge planning protocol for elders and geriatric clinical nurse specialists to coordinate and plan care in the critical period after discharge (Naylor, 2004; Naylor et al., 1999; Naylor, 2000). This model evolved into the transitional care model where services are provided by master's-degree prepared nurses with advanced training and clinical skills in the care of older adults. The advanced practice nurse is responsible for discharge planning while the patient is hospitalized, and then substitutes for the visiting nurse for a defined period after discharge. A key feature of this model is the ability of the advanced practice nurse in collaboration with the patient's physician to individualize patient care within the bounds of established protocols (Naylor, 2000). Naylor and colleagues (1994, 1999, 2004) found that this approach to care led to improved outcomes including fewer readmissions, fewer total days hospitalized, and lower charges for health care services after discharge as compared to patients who received traditional home care services. Although comprehensive discharge planning may lessen the risk of unplanned readmission, its effect on functional status has not been investigated.

The Acute Care for the Elderly Unit (ACE) is one of the four practice models developed as part of the NICHE initiative. This model is unique in that it is both a nursing practice model and an interdisciplinary model. Key elements of an ACE unit include environmental adaptations for the elderly (for example flooring to decrease visual glare and noise, enhanced lighting, clocks and calendars in the patient rooms and a communal living room area to eat

meals, socialize, and engage in therapeutic recreation), staff with special expertise in geriatrics and an interprofessional team focused on preventing geriatric syndromes (Kresevic et al., 1998).

Preventing geriatric syndromes is at the heart of the interprofessional team activity. Nurse initiated protocols, to improve continence, nutrition, self-care, mobility, cognition, skin care and mood are used to standardize care given by the team. Patient assessment includes not only the standard physical assessment that all hospitalized patients receive, but assessment of areas critically important to elders such as functional status, mood, and cognition. Standardized geriatric assessment tools are utilized. Another focus of the interprofessional team is on medical care review to avoid unnecessary medications and diagnostic testing (Kresevic et al., 1998). ACE units incorporate the GEM unit design with additional enhancements and admit patients with acute illnesses.

Palmer and colleagues (1994) designed one of the first ACE units at the University Hospitals of Cleveland. The first randomized controlled trial of Acute Care for Elders, conducted by Landefeld and colleagues (1995) included 651 patients hospitalized for general medical care at a teaching hospital. Subjects were randomly assigned to either regular care or a special unit designed to help older people achieve independence in self care activities (ACE). The main outcome investigated was the change from admission to discharge in the number of ADLs that the patient could perform independently.

Results demonstrated statistically significant improvement in several outcomes; including ADL function, IADL function, symptoms of depression, walking, and discharge to nursing home were noted. 34% of the patients receiving ACE care improved in ADL function versus 24% of patients receiving usual care, while 16% of ACE patients worsened in ADL function versus 21% of those receiving usual care. Fewer patients from the ACE group were discharged to nursing homes. These beneficial effects were achieved without increasing in-hospital or post-discharge costs. The differences in function, however, were not sustained 3 months after discharge. There were no significant differences in mortality, length of stay, readmission, or hospital costs between the two groups (Landefeld, Palmer, Kresevic, Fortinsky & Kowal, 1995). Although this study demonstrated short-term benefits of the ACE intervention, questions remain about appropriate targeting of patients as well as the ability to generalize to other settings.

In a randomized trial, Counsell and colleagues (2000) replicated Landefeld et al.'s (1995) study in a community hospital setting. Participants were randomly assigned to either ACE care or a regular care unit. Positive outcomes of the ACE intervention was demonstrated in several processes of care including a reduction in restraint use, days to discharge planning and use of high risk medications. Satisfaction improved in all areas; patient and family satisfaction improved 5%, physician satisfaction improved 20%, nurse satisfaction improved 30%. Improvements in ADL function and mobility and reductions in nursing home

placement were noted, but were not statistically significant, or as substantial as in the Landefeld et al. (1995) study. Only when ADL level and nursing home placement were combined as a composite measure was the ACE unit shown to achieve significantly better outcomes. There was no significant reduction in length of stay, hospital costs or mortality in the ACE unit subjects compared to the regular unit subjects.

Another study that found a significant impact of the ACE model on nursing home placement was conducted as a randomized trial in Sweden (Asplund et al., 2000). An acute geriatric unit, which met the criteria for an ACE unit, reduced the institutionalization rate for hospitalized elders. It is difficult, however, to draw conclusions due to the differences in the health care delivery systems between Sweden and the United States.

One recent descriptive study (LaReau & Raphelson, 2005) describes the impact of an ACE unit in a community hospital in Southwest Michigan. LaReau and colleagues (2005) report positive patient outcomes in the area of reduced fall and pressure ulcer rates, and decreased hospital length of stay. The ACE unit had the largest number of nurses certified in gerontology. This study is limited in that it was descriptive in nature, and that it compared the ACE unit to the rest of the hospital, not to a similar medical unit.

Although there are descriptions of ACE units in the literature, little is written about staffing characteristics. Siegler and colleagues (2002) conducted a survey of established ACE units, and found that although there were differences

in size and admission criteria, units all shared a common focus on functional improvement, interdisciplinary care; patient and staff satisfaction and length of stay reduction. There was variability in the staffing, especially among the paraprofessionals. Nurse to patient staffing ratios (when combining RN and LPN) averaged 1:5.6, 1:6.1, and 1:7 for days, evenings and nights respectively. Nursing assistant staffing ratios were much more variable, with an average of 1:9, 1:10, 1:12 for days, evenings, and nights respectively. Siegler's (2002) study was limited by a small sample size and relied on reported staffing patterns obtained by telephone interview.

In summary, the literature describes in detail the many negative consequences of hospitalization for older adults. Several models of hospital care for elders have been developed to prevent these consequences. One model that has demonstrated initial success is the ACE model, although the improvements were not sustained beyond the hospital setting.

The role of the nurse is one of the key factors in the ACE model. The nurse, with special education in care of elders, is a key member of the interprofessional team. Nurses initiate protocols to prevent the negative consequences of hospitalization based on data from specialized geriatric assessment instruments. Despite the critical role of the nurse, the initial studies of ACE units did not all emphasize outcomes designated as being nurse sensitive. Nurse staffing and nurse practices also were not investigated. Research is needed in the area of nurse

sensitive patient outcomes in order to fully evaluate the impact of this important model of geriatric care.

# CHAPTER III

# RESEARCH DESIGN AND METHODS

## Design

This study was a prospective observational trial that utilized a quasi-experimental, potentially non-equivalent, control group design to compare complications in patients that were admitted to two different hospital treatment groups (ACE unit and a regular medical unit). Although a matched control group design may have improved the equivalence of the comparison group, it was not feasible to conduct such a study without a data collector who was present daily on the nursing units. This was not economically possible for this dissertation study.

## Sites/Sample

Two units (one ACE and one regular medical unit) of a large urban academic hospital located in the Manhattan borough of New York City (hereafter referred to as the hospital) were recruited (see Appendix B for letters from hospital administrators indicating their interest in participation).

The hospital is a 798-bed urban, non- profit academic medical center, of which 547 beds are designated as medical-surgical beds. The occupancy rate for medical-surgical units is 86.8%, and the average length of stay is 6.5 days (*Health Care Annual 2005 Update*, 2005). The hospital is part of a large multi-hospital system consisting of two large academic medical centers, two medical schools

and a community hospital. The hospital has academic affiliations with two medical schools and serves as a training site for physicians and medical residents as well as fellows in geriatrics and various medical-surgical subspecialties. It also serves a clinical training site for many schools of nursing (Associate, Baccalaureate and Advanced Practice Nursing), as well as other disciplines (Physician Assistant, Social Work, Pharmacy, and Physical Therapy).

The ACE unit at the hospital was opened in 2003, as a seventeen bed unit (Siegler & Capello, 2005), unit bed capacity was increased to nineteen in the fourth quarter of 2006. Unit admission criteria include age over 75, and an acute medical diagnosis. Surgical patients are not admitted to this unit. The unit leadership consists of a Nurse Manager, who is a geriatric nurse practitioner, and a medical director/ geriatrician. The usual nurse staffing for the day shift is three registered nurses and two to three nursing attendants. The usual nurse staffing for the night shift is three registered nurses and one to two nursing attendants.

The nursing staff on the ACE unit received gerontological education prior to the opening of the unit in 2003; new staff receive the same education during their orientation. The initial gerontological education consisted of an eight-hour program for the registered nurses and nursing attendants. The topics covered normal aging, age related changes, common geriatric syndromes, and teamwork. Both the nurse educator and the medical director of the unit presented the education sessions. Continuing education on geriatric best practice topics is provided by nurses for all staff, every other month.

The interprofessional team consists of staff nurses, the nurse manager, a geriatric nurse practitioner, a physician's assistant, a medical house staff team (medical residents and students), a social worker, a case manager, a physical therapist, an occupational therapist, a dietician, and a chaplain. Interprofessional team rounds, held three times per week focus on preventing negative outcomes of hospitalization, especially functional decline (E. Siegler, personal communication, February 24, 2007). Each RN attends round and presents patient status, including functional status. Following an interdisciplinary discussion, a care plan is developed with input from all disciplines.

The ACE unit of the hospital has an environment specially prepared for older adults, which focuses on safety and functional status. There is a communal area at the front of the nursing unit, with a large table and chairs, a television set, and a DVD/CD player. Communal dining and group activities take place here. The corridors are maintained free of medical equipment, and the lighting is brighter than on other nursing units. The walls are decorated with age appropriate artwork. Bed exit and chair alarms are available for use with patients as needed. There is also a departure alert system in place on the unit; patients who exhibit wandering behavior or are at risk for elopement wear special bracelets, which sound an alarm when the patient approaches any of the exits. There are large clocks and calendars in all patient rooms. A marker board is in place at every bedside. Staff, on a daily basis writes the day and date and the names of staff caring for the

patient. Other messages about testing or procedures or reminders are written there as well.

The comparison (regular medical) hospital unit is a thirty-two general medical unit. Adult patient of all ages, with medical problems, are admitted to this unit. The unit leadership consists of a patient care director who is responsible for the day-to-day operation of the unit. The usual nurse staffing for this unit for the day shift is four to five registered nurses and three to four nursing attendants. The usual nurse staffing for the night shift is four registered nurses and two to three nursing attendants.

Social work, pharmacy, dietary, and chaplain services are available for patients; all patients are screened as part of the nursing admission assessment and referrals are generated based on patient criteria. Discharge planning rounds take place five times per week, and are attended by the nurse manager, medical house staff, care managers and social worker. The focus of the meeting is on medical plans, discharge needs, and anticipated discharge date. The registered nurse staff do not attend rounds; each nurse gives report on her patients to the nurse manager who attends rounds. The nursing staff of the comparison unit did not receive any specialized education in gerontological nursing, however, the general hospital orientation includes information on functional status, pressure ulcer and falls. There are no environmental enhancements on this unit. Appendix C compares the patient and staff characteristics of the ACE unit and the comparison unit.

Subjects: Inclusion Criteria

Eligible subjects included all patients, above age 65, admitted to the participating ACE and comparison units, who spent greater than fifty percent of their hospital stay on a study unit. Exclusion criteria included those individuals who were admitted in a comatose state, required mechanical ventilation, had a terminal condition with comfort care only, when death was imminent, exhibited combative or dangerous behaviors, had a severe psychotic disorder that prevented participation or understanding of interventions, severe dementia (unable to communicate, MMSE = 0), or who were discharged within forty-eight hours of admission. Additionally, patients who required a surgical intervention during their hospitalization, or who spent more than half of their hospital length of stay on a unit other than one of the study units were excluded from participation in this study. These criteria were similar to those used in other studies examining outcomes of geriatric care models (Counsell et al., 2000; Inouye et al., 2000; Landefeld et al., 1995).

Sample Size Estimation

The main outcome of this study was the comparison of percentage change in functional status between participants of the ACE unit and those of the comparison unit (see definitions on page 5). The sample size estimation for this study was based on a two-sample independent t-test. Parameters used in the calculation of sample size were the best estimations based on similar studies

(Counsell et al., 2000; Landefeld et al., 1995). Data on 50 patients in each observational treatment unit were required to detect a clinically important mean difference of 50% with an overall standard deviation of 30%, statistical power of 90%, and alpha level of 5%.

Study Procedures

The nurse manager of each of the study units screened all patient participants based on exclusion criteria, and entered eligible patient names onto the study log (Appendix D). After the patient participants had been on the nursing unit for twenty-four hours, the patient care director approached all eligible patients and provided them with the study information sheet (Appendix E). The patient participants, or proxies were guided in completing the bottom section of the information sheet if they were interested in participating in the study. The investigator visited all interested participants after the patient was on the study unit for forty-eight hours and implemented informed consent procedure. The investigator used a standard script when obtaining informed consent. Following informed written consent from the patient or proxy, a confidential study number was assigned.

Patient names and corresponding study numbers were maintained in a locked file drawer in the office of the patient care director. The investigator visited the study units to collect data on a prospective basis. The investigator interviewed staff, as needed, to supplement data obtained from the medical record in order to

reduce missing data. The investigator monitored the unit census on a daily basis, and documented the date of discharge or transfer for the study patients on the study log. A medical record review was completed after the patient was discharged in order to gather additional data and to obtain information about medical co-morbidities.

## Measurement

### Patient Characteristics

#### Demographic Data

When subjects were initially enrolled in the study, demographic information (age, gender, religion, race/ethnicity, residence prior to admission, former occupation, payment source, and reason for admission) was obtained from a medical record review (see Appendix F for demographic data collection form). These data were used primarily for descriptive purposes.

#### Medical Comorbidities

At the time of discharge, data on medical diagnoses were collected from the discharge summary. This information was used for descriptive purposes. Hospitalized older adults frequently have multiple chronic conditions; treatment of one condition may influence the outcome of others, and treatment for multiple conditions may interact in ways that are not well understood (Kaplan, Haan, & Wallace, 1999). The Charlson Comorbidity Index (Charlson, Ales, Pompei, &

MacKenzie, 1987) was utilized. The Charlson Index contains 19 categories of comorbidity, which are primarily defined using ICD-9-CM diagnoses codes. Each category has a specific weight, which is based on the adjusted risk of one-year mortality. The overall cormorbidity score reflects the cumulative increased likelihood of one year mortality; the higher the score, the more severe the burden of comorbidity (Charlson et al., 1987). A Charlson comorbidity score was calculated for each participant in the study (see Appendix G for medical diagnosis data collection form and comorbidity score).

### Level of Orientation

The participant's level of orientation was obtained from a medical record review. In the hospital, each patient's level of orientation is documented on the medical surgical assessment (refer to Appendix H), every shift. The nurse notes whether the patient is alert, and whether the patient is oriented to "person", "time", and "place", or whether the patient is "confused". The participant's level of orientation was tracked on a daily basis (refer to Appendix I for orientation status data collection tool).

## Patient Outcomes

### Functional Decline

Functional decline is defined as a decrement in physical functioning; a decrease in the number of ADLs that an individual can accomplish independently

(Inouye et al., 2000). Functional decline was measured using the Katz Index of Activities of Daily Living (ADL) (Katz, 1983; Katz & Akpom, 1976; Katz, Downs, & Cash, 1970; Katz et al., 1963). Functional decline was operationalized as a lower score on the Katz Index of ADL at discharge as compared to admission.

The Katz Index of Activities of Daily living (ADL) (Katz, 1983; Katz & Akpom, 1976; Katz et al., 1970; Katz et al., 1963) is one of the most common instruments used to measure functional status. It was developed by Katz and colleagues in 1963, for use in a chronic care hospital to observe recovery from stroke, hip fracture and rheumatoid arthritis. It is a six item, clinician administered tool that measures adequacy of performance in six functions: eating, dressing, toileting, transferring, bathing, and continence. Each function is measured on a dichotomous scale of "independent" or "dependent", with independent receiving one point, and dependent receiving zero points. The scores from each of the six domains are added together for a total score. A score of six indicates full function, a score of four indicates moderate impairment, and a score of zero indicates severe impairment. Functional decline or improvement can be measured by comparing these scores at two or more points in time (Reuben, Valle, Hays, & Siu, 1995). Test-retest reliability ranges from .95 to.98 (Reuben, Valle et al., 1995). Despite its widespread use for many years in many clinical settings (Counsell et al., 2000; Fitzpatrick, Eichorn, O'Connor, Salinas, & White, 2004; Milisen, 2001), there is little documented validity for this instrument

(Casiano, Paddon-Jones, Ostir, & Sheffield-Moore, 2002; Reuben, Valle et al., 1995). Doran (2003) cites the Katz Index of ADL as being sensitive to the quality of nursing care in that the activities of daily living reflect the foci of nursing care.

A limitation of the Katz ADL is that it is based on the perception of the nurse, and interview of the patient, rather than on actual performance (Doran, 2003). The Katz ADL is often completed at the time of admission to the health care setting, when the patient is ill. It may therefore, not provide a true reflection of the patient's abilities (Doran, 2003). In addition, the Katz Index of ADL is insensitive to low levels of disability; minor illness or disability often does not translate into the limitations in basic activities of daily living covered in this scale. It is more appropriate for severely sick individuals (Doran, 2003).

In the hospital, the six elements of the Katz tool are included in the nursing admission history and database (refer to Appendix J) and in the nursing discharge note, however a score is not assigned to any of the domains. The nurse notes whether the patient is "dependent" or "independent" in each domain. Scores were assigned to the data obtained from the nursing admission database and the nursing discharge summary based on the Katz criteria. The total Katz score at discharge was compared to that at admission and percentage change was calculated (refer to Appendix K).

Falls and Injuries

A fall is defined as a sudden, unintentional event that causes a person to land on the floor or lower level, not as a result of a major intrinsic event or an overwhelming external hazard (American Geriatrics Society, et al., 2001). Falls were measured by tracking whether an individual on either the experimental or comparison unit fell during their course of hospitalization. An injury is defined as any physical injury resulting from a fall, regardless of severity (American Nurses Association, 2000).

Fall and injury data were obtained from occurrence reports. In the hospital, all occurrence reporting is done electronically. The nurse managers of the ACE unit and the comparison unit provided copies of the occurrence report. The occurrence report describes the fall including date and time of day, location of fall, circumstances and outcome of the fall, as well as a description of any injury (refer to Appendix L for falls and injuries data collection tool).

Nosocomial Pressure Ulcers

A pressure ulcer is defined as a lesion caused by unrelieved pressure that results in damage to the underlying skin (Agency for Health Care Policy and Research, 1992; Cuddigan et al., 2001). All patients are assessed for the presence of pressure ulcers at the time of admission, and this information is documented on the nursing history and database (refer to Appendix J). Patients are reassessed at least on a weekly basis, as well as when transferred between units, upon return

from the operating room or an invasive procedure, upon change in medical condition, and at the time of discharge. The reassessment data is recorded on the medical surgical assessment (refer to Appendix H). A nosocomial pressure ulcer is defined as a pressure ulcer of any stage, which develops during the course of hospitalization. When a nosocomial pressure ulcer is identified, it is noted on the medical surgical assessment, and documented in a progress note written by the registered nurse. The progress note includes the stage of the pressure ulcer, measurements of the ulcer, and treatments provided (refer to Appendix M for pressure ulcer data collection tool).

Nosocomial Urinary Tract Infections

A nosocomial urinary tract infection is a urinary tract infection following the first seventy-two hours of their hospital stay, for which there is no evidence to suggest the infection was present or incubating at admission (American Nurses Association, 2000). The presence of a nosocomial urinary tract infection was operationalized as the presence of a positive urine culture, collected three or more days after hospital admission. Data for nosocomial urinary tract infection were obtained through a medical record review; including a review of the laboratory report and a review of patient progress notes (refer to appendix N for urinary tract infection data collection tool).

## Nursing Practices

### Physical Mobility

Physical mobility was defined as the highest level of mobility per twenty-four hour period. In the hospital, the actual activity of the patient is recorded on the daily medical surgical assessment (see Appendix H). For the purposes of this study, mobility was categorized into ambulation, bed mobility and transfer, as in Capezuti et al's (1996) study. Each category had multiple levels of mobility, ranging from independent to totally dependent, each with a numerical score. The three sub scores were summed to give a total mobility score. The total score ranged from 3 to 25, where 3 indicated total independence in mobility and 25 indicated total dependence. A mean mobility score was calculated for each day of the hospitalization, and a total mean was calculated (refer to Appendix O for the mobility evaluation instrument).

### Physical Restraints

A physical restraint is defined as any device that inhibits mobility and freedom of movement and cannot easily be removed by the person (Braun & Capezuti, 2000). For the purposes of this study, physical restraints included all restraints that are listed in the policy of Hospital A (refer to Appendix P). Physical restraint use was operationalized as whether or not the patient was restrained with any type of physical restraint for each shift. Thus, a summary score was calculated that was the proportion of shifts restrained divided by the total number

of shifts on the units. Data on physical restraint use was obtained through a medical record review (refer to Appendix Q for restraint data collection tool).

Psychoactive Drug Use

Psychoactive drugs are defined as those with the classifications as sedative/hypnotics, antidepressants, antianxiety drugs and antipsychotics (Leipzig, Cumming, & Tinetti, 1999a). Data on psychoactive drug use was collected for all study participants (refer to Appendix R for psychoactive drug data collection form). This data was dichotomized as "any" or "no" use for each category of psychoactive drug.

Urinary Catheter Use

Indwelling urinary catheters are defined as urethral catheters that remained in place (Munasinghe et al., 2001). Data on urinary catheter use was collected for all study participants (refer to Appendix S for urinary catheter data collection form). Information on the hospital location where the catheter was placed, the indications for urethral catheterization, as well as number of hours of catheter use was collected. The indications for urethral catheterization that were utilized was similar to that of other studies (Gokula et al., 2004; Warren, 2001).

Unit Census and Staffing

Unit census and staffing data including total nursing care hours provided per patient day were obtained from staffing reports for both units. Total nursing care hours provided per patient day was defined as the total number of productive hours worked per patient day by nursing staff with direct care responsibilities (American Nurses Association, 2000). In the study hospital, this information is calculated using retrospective data from the staffing and scheduling system. Registered nurses as well as nursing assistants are included in this calculation. The nurse manager of each study unit provided information on the unit census and the actual number or RN staff and NA staff on duty for both the day and evening shift for each day of the study on a weekly basis (refer to Appendix T for census and staffing data collection form).

Data Management

Data was entered into the Statistical Package for the Social Sciences software (SPSS, Inc., Chicago, IL). One hundred percent double data entry was used to ensure accuracy of the data.

Data Analysis

Data was analyzed using the Statistical Package for the Social Sciences software (SPSS, Inc., Chicago, IL). Statistical significance was defined as $p \leq 0.05$.

## Preliminary Analysis

The data were examined for skewness and outliers. Those continuous variables that did not exhibit an approximately normal distribution were transformed prior to analysis.

## Covariates

Chi-square and t tests were used to examine statistically significant differences in patient characteristics, nursing practices, and nurse staffing between the ACE unit and the comparison unit. When significant differences were found between groups, these variables were used as covariates in a linear regression model with the dependent variable, percentage change in functional status. If a potential covariate was not significantly related to a dependent variable, ($p>0.05$), then it was not included in the linear regression model.

## Statistical Analysis

A Wilcoxon rank sum test was used to assess if there was a significant difference between the mean percentage change in functional status between ACE unit participants compared to the comparison unit participants. A linear regression model was used to further understand the relationship between the dependent variable (percentage change in functional status) and the independent variable (hospital treatment unit), adjusting for any significant covariates.

## Secondary Analysis

T-tests, Wilcoxon rank sum tests or Poisson tests were used, as appropriate, to assess if there were statistically significant differences between the two hospital unit types with respect to: level of co-morbidity, nursing practices and nurse staffing.

## Human Subjects

Approval for the study was obtained from the Institutional Review Boards of New York University, and the participating hospital (refer to Appendix U for Institutional Review Board approval letters). Eligible subjects were all patients admitted to the ACE unit and the comparison unit who met the criteria for inclusion in the study. Each patient was approached by the patient care director of the study units and given a description of the study and invited to participate. It was made clear that participation was voluntary and that refusal to participate would in no way affect their care or treatment in the hospital.

Individual informed consent was obtained from all subjects on the ACE unit and the comparison unit who agreed to participate. Interested subjects were visited in person by the investigator. The investigator explained that the subject had been chosen because they were a patient on the ACE unit or the comparison unit. The investigator explained that the purpose of the study was to compare outcomes from a specialized geriatric unit (ACE) compared to a regular medical unit. The investigator described that the extent of the subject's involvement was a

review of their medical record, and that the investigator would speak to the nursing staff about the subject's course of hospitalization. The subjects were told that there was no risk from participation beyond that of everyday life. The investigator evaluated whether the patient understood the purpose of the study by asking the patient to describe the study in their own words and what the patient's involvement would entail.

Consistent with the state of the science concerning research of those with dementia, the investigator did not assume that a diagnosis of dementia or other mental illness meant that the resident was unable to consent to participate in the study (American Geriatrics Society, 1998). According to the Alzheimer's Association, "decision-making capacity is task specific." Therefore, some cognitively impaired individuals retain the ability to make informed decisions for themselves about participating in research (Ethical Issues in Dementia Research statement adopted by the Alzheimer's Association National Board of Directors, May 1997). The same standard that is applied to any adult in which informed consent is administered was used. There is general agreement that subjects should exhibit at least the ability to understand the significant information relevant to the choice about research participation. To be informed, a subject must be cognitively capable of understanding the relevant facts about the decision at hand. To determine whether a subject has the requisite cognitive capacity, the examiner must disclose the facts and then ascertain the subject's level of comprehension (Dresser, 1996). If the patient demonstrated understanding, he/she

was asked to give consent for a review of his/her hospital record and collection of information on physical function, mobility, activity, falls, pressure ulcers, restraints, catheter use, and medication use. If the patient was unable to demonstrate understanding (i.e. is unable to describe the purpose of the study and what the patient's involvement will entail), the investigator contacted the responsible party and provided the same explanation given to the patient.

At the time of consent, codes were assigned to all participants. The data was kept confidential by using codes to track individuals rather than names. The list of participant names and codes assigned was maintained in a locked file drawer on the study units. The patient care directors, the investigator and the faculty sponsor were the only individuals with access to these codes.

# CHAPTER IV

# RESULTS

The main purpose of this study was to examine the effect of the Acute Care for the Elderly model of care on functional decline and associated nurse sensitive outcomes compared to a regular inpatient medical unit (comparison unit). The percentage change in functional status between study participants on the ACE unit compared to that of study participants on the comparison unit was the primary study outcome. The secondary aim was to determine if study participants on the ACE unit experienced fewer nurse sensitive complications (falls, nosocomial pressure ulcers and nosocomial urinary tract infections) compared to a regular inpatient medical unit. These research questions were explored controlling for medical comorbidities and level of orientation. Another aim of this study was to describe differences in nursing practice related to restraint use, urinary catheter use and mobility between the ACE unit and the regular medical unit. The final aim was to describe the relationship between nursing practices (restraint use, catheter use and psychoactive drug use) and functional decline.

## Study Participants

One hundred study participants, fifty on the ACE unit and fifty on the comparison unit, were enrolled in the study. The managers of the two units

identified 124 patients as eligible candidates for the study and interested in participation, 62 in the ACE unit and 62 in comparison unit. Nineteen potential subjects did not consent to the study. Of these nineteen potential subjects, five (two from the ACE unit and three from the comparison unit) responded that they were interested in participating in the study, but declined participation during the meeting with the investigator. The two main reasons for refusal were that either the person did not feel well or was too tired. Eight patients required a proxy to provide informed consent and the investigator was unable to make contact with the proxy. The remaining 6 patients were transferred off the study units before enrollment, making them ineligible for the study. Thus, a total of 106 study participants, or their proxy, provided written consent for study participation. One patient withdrew from the study for unknown reasons. Five study participants (2 on the ACE unit, and 3 on the comparison unit) expired during the course of their hospitalization, after consenting to participate in the study, and were eliminated from the final analysis. The final sample consisted of 100 participants, 50 from the ACE unit and 50 from the comparison unit. Data was collected over a three-month period of time.

## Participant Demographics

Demographic characteristics of the sample are presented in Table 1. The mean age of the ACE unit participants in the study was slightly older than the comparison unit (82.3, SD 8.7 v. 78.3, SD 8.4, respectively). The median age

ACE unit participants was 82 (range 69-102), and for the comparison unit 76.5 (range 66-100). For both groups, most subjects were white, non-Hispanic, non-immigrant, English speaking females, professionals, with greater than 12 years of education. There were more Jewish participants and less Catholic participants on the ACE unit compared to the comparison unit (38% v. 22%; 24% v. 38%). Medicare was the primary payment source for 98% of the sample. No statistically significant differences were found between the two groups in any of the demographic characteristics.

Table 1

*Participant Demographics Characteristics (n=100)*

| Characteristic | Total sample (n=100) | ACE unit (n=50) | Comparison unit (n=50) | p value |
|---|---|---|---|---|
| Age* | 80.3 (8.7) | 82.3 (8.6) | 78.3 (8.4) | 0.9193 |
| Female | 77% | 78% | 76% | 0.8122 |
| Race | | | | 0.3036 |
| White | 88% | 84% | 92% | |
| Black | 10% | 12% | 8% | |
| Asian | 2% | 4% | 0 | |
| Non-Hispanic | 87% | 92% | 82% | 0.1371 |
| Primary language English | 85% | 90% | 80% | 0.0661 |
| Marital status | | | | 0.0736 |
| Widowed | 44% | 34% | 54% | |

| | | | | |
|---|---|---|---|---|
| Married | 21% | 12% | 30% | |
| Divorced / Separated | 9% | 14% | 4% | |
| Religion | | | | 0.3879 |
| Catholic | 31% | 24% | 38% | |
| Jewish | 30% | 38% | 22% | |
| Protestant | 5% | 6% | 4% | |
| Other | 14% | 10% | 18% | |
| No religion documented | 20% | 22% | 18% | |
| Occupation | | | | 0.1611 |
| Professional | 44% | 53% | 37% | |
| Unskilled Laborer | 6% | 8% | 4% | |
| Skilled Laborer | 21% | 11% | 20% | |
| Homemaker | 27% | 9% | 37% | |
| Education | | | | 0.8638 |
| <8 years | 34% | 32% | 36% | |
| 8-12 years | 19% | 18% | 20% | |
| >12 years | 47% | 25% | 25% | |
| Immigrant | 21% | 24% | 18% | 0.1318 |
| Medicare | 98% | 49% | 49% | 1.000 |

* Mean (SD)

Tables 2 and 3 present the residence prior to admission and the discharge locations for the participants in both groups. For both the ACE unit and the comparison unit groups, most participants lived at home prior to hospital admission, and were discharged back to home. A higher percentage of participants on the ACE unit were discharged to subacute rehabilitation units than on the comparison unit. No statistically significant differences were found between the two groups for either pre-admission residence (chi-square =6.22, p=0.3869) or discharge location (chi-square=9.32, p=0.1771).

Eleven participants on the ACE unit were discharged to subacute rehabilitation units, and 2 were discharged to acute rehabilitation units. Of these 13 participants, one was admitted from a subacute rehabilitation unit, the remainder was admitted from home. On the comparison unit, 5 participants were discharged to subacute rehabilitation units, and one was discharge to an acute rehabilitation unit. Of these six participants, one was admitted from subacute rehabilitation, the others were from home. On the ACE unit, five participants were discharged to a skilled nursing facility; four of these participants were admitted from a skilled nursing facility. On the comparison unit, two participants were discharged to a skilled nursing facility; both of these participants were admitted from the skilled nursing facility.

Table 2

*Residence Prior to Admission (n=100)*

| Residence Prior to Admission | Total Sample (n=100) | ACE Unit (n=50) | Comparison Unit (n=50) |
|---|---|---|---|
| Home | 87% (87) | 80% (40) | 94% (47) |
| Nursing Home | 6% (6) | 8% (4) | 4% (2) |
| Assisted Living | 1% (1) | 2% (1) | 0 |
| Subacute Rehab | 2% (2) | 2% (1) | 2% (1) |
| Other | 2% (4) | 8% (4) | 0 |

Table 3

*Discharge Destinations Post-Hospitalization (n=100)*

| Discharge location | Total sample (n=100) | ACE unit (n=50) | Comparison unit (n=50) |
|---|---|---|---|
| Home | 64% (64) | 52% (26) | 76% (38) |
| Nursing Home | 7% (7) | 10% (5) | 4% (2) |
| Assisted Living | 1% (1) | 2% (1) | 0 |
| Subacute Rehab | 16% (16) | 22% (11) | 10% (5) |
| Acute Rehab | 3% (3) | 4% (2) | 2% (1) |
| Other | 9% (9) | 10% (5) | 8% (4) |

## Participant Diagnoses

Table 4 presents the most frequent discharge diagnoses among study participants. Of a total of 9 diagnoses, pneumonia was the most frequent diagnosis, followed by falls, or fall related issues. The diagnoses of the remaining 20 participants not presented in Table 4 were of a wide variety. There were no significant differences between the two groups in relation to discharge diagnosis.

Table 4

*Discharge Diagnoses of Study Sample (n=100)*

| Diagnosis | Total Sample | ACE Unit | Comparison Unit | p value |
|---|---|---|---|---|
| Pneumonia | 24% (24) | 20% (10) | 28% (14) | 0.235 |
| Fall/fall related problem | 11% (11) | 14% (7) | 8% (4) | 0.505 |
| UTI/urosepsis | 7% (7) | 10% (5) | 4% (2) | 0.140 |
| MI/cardiac problem | 9% (9) | 10% (5) | 8% (4) | 0.727 |
| CHF | 8% (8) | 6% (3) | 10% (5) | 0.461 |
| Cellulitis | 7% (7) | 4% (2) | 10% (5) | 0.240 |
| Cancer | 8% (8) | 6% (3) | 10% (5) | 0.558 |
| Failure to thrive | 6% (6) | 8% (4) | 4% (2) | 0.361 |

Table 5 presents the most common medical comorbidities in the study sample. Many participants had more than one medical comorbidity. Hypertension was the most common comorbidity, followed by diabetes mellitus. There were no significant differences in the types of comorbidities between the two groups. The mean Charlson comorbidty score of participants on the ACE unit (2.6,SD 2.0) did not significantly differ from the mean Charlson comorbidity score of participants on the comparison unit (2.0, SD 2.0; Wilcoxon Z = 1.52, p=0.1284). There was also no statistically significant difference in level of orientation between the groups (chi-square=2.128, p=0.546).

Table 5

*Medical Comorbidities of Sample (n=100)*

| Comorbidity | Total Sample | ACE Unit | Comparison Unit | p value |
|---|---|---|---|---|
| Hypertension | 45% (45) | 44% (22) | 46% (23) | 0.841 |
| Diabetes | 21% (21) | 16% (8) | 25% (13) | 0.220 |
| Cancer | 21% (21) | 24% (12) | 18% (9) | 0.461 |
| Congestive heart failure | 19% (19) | 24% (12) | 14% (7) | 0.202 |
| Dementia | 17% (17) | 22% (11) | 12% (6) | 0.183 |
| Chronic lung disease | 15% (15) | 10% (5) | 20% (10) | 0.161 |
| Myocardial infarction | 13% (13) | 8% (4) | 18% (9) | 0.137 |
| Renal failure | 10% (10) | 6% (3) | 14% (7) | 0.182 |
| Cerebrovascular accident | 6% (6) | 4% (2) | 8% (4) | 0.400 |
| Peripheral vascular disease | 5% (5) | 6% (3) | 4% (2) | 0.646 |

The mean length of stay for participants on the ACE unit was 7.4 days (SD 5.0), the median was 6.0 days with a range from 2 to 29 days while the mean length of stay for participants on the comparison unit was 6.0 days (SD 2.9), and the median was 5.0 days with a range from 2 to 18 days. There was no

statistically significant difference in length of stay between the two units (Wilcoxon Z= 0.96, p=0.3394).

Unit staffing Characteristics

Table 6 presents unit census and staffing characteristics for the two units. The comparison unit is significantly larger than the ACE unit (32 beds vs. 19 beds) and thus, the census was significantly higher for both the day and night shifts (Wilcoxon Z=-10.53, p=0.0001). Table 6 presents staffing characteristics for the ACE unit and the comparison unit. There was a statistically significant higher median RN to patient ratio in the comparison unit for the day (Wilcoxon Z =4.34, p<0.0001) and night shift (Wilcoxon Z=-6.14, p<0.0001). There was no significant difference between the units for the NA: patient ratio for either the day (Wilcoxon Z=-1.69, p=0.0901) or night shift (Wilcoxon Z=-0.79, p=0.4304). There was no significant difference between actual nursing care hours per day (HPPD), which includes both RN and NA hours, between units (5.7 vs. 5.6).

Table 6

*Unit Census and Staffing*

| Variable | ACE Unit | Comparison Unit | p value |
|---|---|---|---|
| 7AM-7PM Census* | 17.6 (1.2) | 30.9 (1.5) | <0.0001 |
| 7PM-7AM Census* | 16.9 (1.5) | 28.5 (2.3) | <0.0001 |
| 7AM-7PM RN:Patient Ratio* | 1:6.0 (0.7) | 1:6.4 (1.0) | <0.0001 |
| 7AM-7PM NA:Patient Ratio* | 1:6.3 (3.3) | 1:8.0 (2.5) | 0.0901 |
| 7PM-7AM RN:Patient Ratio* | 1:60 (1.2) | 1:7.0 (1.2) | <0.0001 |
| 7PM-7AM NA:Patient Ratio* | 1:7.5 (3.3) | 1:7.3 (2.4) | 0.434 |

* Median (SD)

Functional Status

Katz ADL score on admission were significantly lower on the ACE unit than the comparison unit (chi-square = 20.772, $p<0.05$), the median Katz ADL score on admission on the ACE unit was 3.0 and on the comparison unit 5.0. There was no significant difference between Katz ADL scores on discharge between the two units (chi-square = 6.583, $p=0.361$), the median Katz ADL score on discharge on the ACE unit was 5.0 and on the comparison unit 4.0.

The Katz ADL score on discharge for those participants who were discharged to home was significantly higher than those who were discharged to rehabilitation units (subacute and acute) (Wilcoxon $Z= -3.83$, $p<0.0001$). The median Katz score on discharge for those participants discharged to home was 6.0 compared to 3.5 for those who were discharged to rehabilitation units.

Specific Aims, Hypotheses and Research Questions

Specific Aim 1:

To determine if there is a difference in percentage change in functional status between participants on an ACE unit and those on a regular medical unit controlling for medical co-morbidities and cognition.

The main finding of this study is that there was a difference in percentage change in functional status between the two groups, i.e., participants on the ACE unit improved in their ability to perform basic activities of daily living as compared to participants on the comparison unit, controlling for medical comorobidities and level of orientation ($F=18$, $p<0.0001$; Table 7). On average, the participants on the ACE unit improved their functional status, while those on the comparison unit demonstrated, on average functional decline. Participants on the ACE unit improved their ability to perform basic activities of daily living, as measured by Katz ADL scores, on average 49%, while those on the comparison unit declined, on average 7% (Table 8).

Table 7

*Comparison of units in functional decline*

| Effect | Num DF | Den DF | F Value | p Value |
|---|---|---|---|---|
| Unit | 1 | 78 | 18.00 | <0.0001 |
| Level of orientation | 1 | 78 | 0.61 | 0.4375 |
| Comorbidities | 1 | 78 | 1.07 | 0.3046 |

Table 8

*Tukey Adjusted Estimates and Standard Error for Functional Status for Each Unit*

| Unit | Estimate | Standard Error |
|---|---|---|
| ACE | 48.7628 | 11.186 |
| Comparison | -7.1428 | 11.0727 |

Specific Aim 2:

To determine if participants on an ACE unit, compared to a regular medical unit, experience fewer nurse sensitive complications, controlling for medical co-morbidities and cognition.

There were too few falls (5), nosocomial pressure ulcers (3), and nosocomial urinary tract infections (4) reported in the sample to allow for statistical modeling (Table 9). There was a marginally significant higher number of reported fall

events among ACE unit participants (chi-square = 5.2632, p = 0.0563). There was no statistically significant difference in the number of reported nosocomial pressure ulcers (chi-square = 0.5577, p = 0.999) or nosocomial urinary tract infections (chi-square = 0.3998, p = 0.57) between the two units.

Table 9

*Comparison of Units on Nurse Sensitive Outcomes*

| Outcome | ACE Unit | Comparison Unit | p Value |
|---|---|---|---|
| Falls* | 10% (5) | 0 | 0.0563 |
| Nosocomial pressure ulcers | 4% (2) | 2% (1) | 0.9999 |
| Nosocomial urinary tract infections | 11.76% (2) | 25% (2) | 0.57 |

* Represents actual # of falls, not # of patients who fell

Specific Aim 3:

To describe differences in nursing practice in relation to restraint use, indwelling urinary catheter use, psychoactive drug use, and mobility between ACE units and regular medical units.

The comparison between units in nursing practices is presented in Table 10. There were only two events of restraint use among the study participants, one ACE unit and one comparison unit participant. Both events of restraint use took place when the participants were on non-study units during their hospital stay; one event of restraint use took place in the Emergency Department while the other occurred in an intensive care unit. Also, both events of restraint use were of short duration, one was for eight hours and one for twelve hours. There were no statistically significant differences in restraint use between the two units (chi-square = 1.000, p = 0.9999). There were no statistically significant differences between the ACE unit and the comparison unit in urinary catheter use (chi-square = 0.2945, p=0.4019) or psychoactive drug (chi-square=0.3172, p=0.4328) use. The degree of participant mobility also did not differ between the groups (Wilcoxon Z=0.323, p=0.7631)

Table 10

*Comparison of Nursing Practices*

| Nursing Practice | ACE Unit | Comparison Unit | Statistical Value | p Value |
|---|---|---|---|---|
| Restraints | 2% (1)* | 2% (1)* | 1.000** | 0.9999 |
| Urinary catheters | 40% (20)* | 30% (15)* | 0.2945** | 0.4019 |
| Mobility*** | 8.0 (5.4)**** | 8.0 (5.6)**** | 0.3023*** | 0.7631 |
| Psychoactive drugs | 54% (27)* | 44% (22)* | 0.3172** | 0.4328 |

* percentage (frequency)
**chi-square value
*** Wilcoxon test normal approximation Z statistic
**** The total score ranged from 3 to 25, where 3 indicated total independence in mobility and 25 indicated total dependence. A mean mobility score was calculated for each day of the hospitalization, and a total mean was calculated.
*****Mean (SD)

.

Urinary catheter use was further examined to evaluate aspects of catheter use considered relevant to clinical practice such as the location where the catheter was inserted, the reason for catheter insertion and the mean dwell time for the catheter (Munasinghe, Yadzani et al. 2001; Goolsarran & Katz, 2002; Gokula, Hickner et al. 2004). Table 11 presents the data on location where the catheters were inserted. There was no statistically significant difference between the ACE unit and the comparison unit in the location where the catheters were inserted (chi-square = 0.3554, p=0.6214), most were initiated in the Emergency Department.

Table 11

*Location of Urinary Catheter Insertion*

| Place inserted | ACE unit (n=20) | Comparison unit (n=15) |
|---|---|---|
| Emergency Department | 75% (15)* | 93% (14)* |
| Study unit | 10% (2)* | 0 |
| In place on admission | 10% (2)* | 0 |
| OR/testing area | 5% (1)* | 7% (1) |

Percent (frequency)
* %= #catheters inserted/total # catheters

Table 12 presents the reasons for urinary catheter insertion. The most frequent reason for urinary catheter insertion, on both units was urinary retention, followed by fluid balance management. There was no statistically significant difference in reasons for reasons for urinary catheter insertion between the ACE unit and the comparison unit (chi-square=0.2961, p=0.3099).

Table 13 presents the catheter dwell time, measured in hours for both units. There was a marginally statistically significant higher mean dwell time in the comparison unit versus the ACE unit (p=0.0504). The mean dwell time on the ACE unit was 81.6 hours with a range from 11-695 hours while the mean dwell time on the comparison unit was 92.7 hours with a range from 24-432 hours.

Table 12

*Reasons for Catheter Insertion*

| Reason | ACE unit (n=20) | Comparison unit (n=15) |
|---|---|---|
| Urinary retention | 35% (7) | 40% (6) |
| Fluid balance management | 35% (7) | 26.67 % (4) |
| Procedure/testing | 5% (1) | 6.67% (1) |
| Urologic testing | 15% (3) | 0 |
| Other | 5% (1) | 0 |
| No reason documented | 5% (1) | 26.67% (4) |

Percent (frequency)
* %= #catheters inserted/total # catheters

Table 13
*Urinary Catheter Dwell Time*

| Unit | Mean(SD)* | Median* | Minimum* | Maximum* |
|---|---|---|---|---|
| ACE | 81.6 (151.3) | 35 | 11 | 695 |
| Comparison | 92.7 (99.7) | 72 | 24 | 432 |

* Measured in hours

On the ACE unit, there were two nosocomial urinary tract infections and both of these participants had urinary catheters. On the comparison unit, two participants had nosocomial UTIs, neither of these participants had urinary

catheters. Of the two participants with nosocomial UTIs and urinary catheters, one was in place on admission to the hospital, for a neurogenic bladder. The other catheter was inserted in the Emergency Department for urinary retention.

Psychoactive drug use was furthered examined to determine if there was a difference between units in whether the drugs were ordered on a "prn" (as needed) basis or on a standing basis. On the ACE unit, 32% of the psychoactive drugs were ordered as "prn" while on the comparison unit 22% of the psychoactive drugs were ordered as "prn". There was no statistically significant difference between the units (chi-square=.2601, p=0.3678). Table 15 presents the different classification of psychoactive drugs and their usage on the two units. There were no statistically significant differences in the use of antianxiety drugs (chi-square =1.000, p=1.000), antidepressants (chi-square=0.3912, p=0.5205), or sedatives (chi-square=0.5854, p=0.7858) between the two groups. Eighteen percent of the ACE unit participants were administered antipsychotics, whereas only 2% of the comparison unit participants were.

Table 14

*Psychoactive Drug Use*

| Drug Category | ACE Unit | Comparison Unit | p value |
|---|---|---|---|
| Antianxiety | 8% (4) | 8% (4) | 1.000 |
| Antidepressant | 36% (18) | 28% (14) | 0.5205 |
| Sedative | 14% (7) | 18% (9) | 0.7858 |
| Antipsychotic | 18% (9) | 2% (1) | 0.0157 |

The relationships between nursing practices (restraints, urinary catheters, mobility and psychoactive drugs) and participant outcomes were explored. Since only two participants were restrained in the study it was not possible to meaningfully analyze that relationship.

Urinary catheter usage was not associated with functional decline among participants on the ACE unit (Wilcoxon Z=164.0, p=0.0904). Among participants on the comparison unit, urinary catheter usage was significantly associated with functional decline (Wilcoxon Z=104.5, p=0.0003).

There was no significant correlation between functional status change and catheter dwell time on either the ACE unit (r=0.00461, sig.= 0.9893) or the comparison unit (r=-0.33466, sig.=0.3144).

There were differences in the relationship between functional status change and psychoactive drug use between participants on the ACE and the comparison units. For ACE participants, psychoactive drug use was associated

with improved functional status (Wilcoxon Z=219.0, p<0.0001) as compared to those ACE participants without psychoactive drug use (Wilcoxon Z=219.5, p<0.0001). Psychoactive drug use among comparison unit participants, however, did not demonstrate differences in functional status change (Wilcoxon Z=486.5, p=.2047).

There was no significant association between functional status change and mobility on either the ACE unit (r=-0.20181, sig.=0.2244) or the comparison unit (r=-0.04956, sig.=0.7912).

Due to the very low restraint use, I was unable to assess the relationship between falls and restraints. Similarly, the low number of falls (n=4) and nosocomial pressure ulcers (n=3) makes it impossible to meaningfully assess the relationship between nursing practices and these outcomes.

# Chapter V

# DISCUSSION

## Introduction

This chapter describes the study findings and provides a detailed explanation of the implications of these findings for both clinical practice and future research directions. The main finding of this study is that there was a difference in percentage change in functional status between the two groups, i.e., participants on the ACE unit improved in their ability to perform basic activities of daily living as compared to participants on the comparison unit, controlling for medical comorbidities and level of orientation. These findings, however, cannot be explained by other patient outcomes or staff practices measured in this study. The limitations of this study underscore the importance of conducting randomized clinical trials to evaluate the effectiveness of ACE units on patient outcomes, controlling for staff practices and patient characteristics that are collected prospectively using observational methods instead of medical record review.

## Sample Characteristics

### Unit Characteristics

The ACE unit in this study was a nineteen bed medical unit in a large academic medical center. This setting is similar in both unit size and facility characteristics of the original 15 bed ACE unit at the University Hospitals of Cleveland (Landefeld, Palmer, Kresevic, Fortinsky, & Kowal, 1995; Palmer, Landefeld, Kresevic, & Kowal, 1994). The Counsell study (1995) replicated the ACE model of care in a larger unit (34 beds) and in a community medical center. The comparison unit in this study was a thirty-two bed general medical unit in the same academic medical center. The comparison unit in the two previous studies (Counsell et al., 2000; Landefeld et al., 1995) was described as a general medical unit, however the size of the comparison unit was not described. Others (Siegler et al., 2002; LaReu & Raphelson, 2005; Flaherty et al., 2003) have described ACE unit size ranging from 6-34 beds. There is no suggested ideal number of beds for an ACE unit.

There were statistically significant differences in RN staffing between the ACE unit and the comparison unit in this study. The median RN: patient ratio on the day and night shift of the ACE unit was less than the comparison unit ($Z=4.34$, $p<0.0001$). There were no significant differences in nurse aide staffing between the units. There was no significant difference between total nursing care hours (HPPD) between the ACE and comparison units.

There is little written about ideal or recommended staffing in ACE units. In both of the original ACE unit studies (Counsell et al., 2000; Landefeld et al., 1995), the staffing on both the ACE and the comparison unit was described as being the same as on general medical units. Landefeld and colleagues (1995) further describe the staffing to be "one RN for each of two beds". This ratio is very different than in the present study, but it also must be noted that the study was conducted more than 15 years ago (1990-1992).

Siegler et al.'s (2002) study surveying ACE units found great variability in nurse staffing, with an average of 1:5.6, 1:6.1, and 1:7 for days, evenings, and nights respectively. Nurse aide staffing ratios were even more variable, with an average of 1:9, 1:10, and 1:12 for days, evenings, and nights respectively. Siegler's study was limited by a small sample size and relied on information obtained via telephone interview. This study was conducted 6 years ago, limiting applicability to the current study. For example, the hospital in this study employs two 12-hour shifts, which is typical in many hospitals compared to 2001 when Siegler's study was conducted.

There has been much attention in the literature concerning nurse staffing and patient care outcomes. In one study, in medical patients, a higher proportion of nursing care hours per day and a greater absolute number of hours of care per day provided by RNs were associated with shorter length of stay, lower rates of urinary tract infections and upper GI bleed, pneumonia, shock, cardiac arrest or deep vein thrombosis (Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky,

2002; Needleman, Buerhaus, Stewart, Zelevinsky, & Mattke, 2006). In Needleman et al.'s study (2006), the mean number of hours of nursing care per patient day was 11.4, of which 7.8 hours were provided by registered nurses, 1.2 by licensed practical nurses and 2.4 by nurses' aides. In the current study, the actual nursing care hours per day, which included both RN and nurse aide hours (the hospital does not employ licensed practical nurses) was 5.7 HPPD (hours per patient day) for the ACE unit and 5.6 HPPD for the comparison unit. There are no specific staffing recommendations for acute hospital units in which all patients are older adults.

## Patient Characteristics

The demographics of the sample in this study are similar to other studies examining models of geriatric care. The mean age was 82.3 (SD 8.7), primarily female, and with 12 years or more of education which is similar to the sample in the other studies of ACE units (Counsell et al., 2000; Landefeld et al., 1995), and other models of geriatric care (Fitzpatrick, Eichorn, O'Connor, Salinas, & White, 2004; Lopez et al., 2002; Turner, Lee, Fletcher, Hudson, & Barton, 2001).

The majority of the patients were admitted from home while 6% of the total sample (8% of the ACE participants and 4% of the comparison unit participants) was admitted from nursing homes. This is similar to the Landefeld et al. (1995) study where 7% of the participants were from nursing home; nursing home residence was an exclusion criterion in the Counsell et al. (2000) study.

The most frequent diagnosis of the participants in this study was pneumonia, followed by fall related issues, and urinary tract infection. Other common diagnoses were myocardial infarction, congestive heart failure, cancer and failure to thrive. This is similar to the other ACE studies (Counsell et al., 2000; Landefeld et al., 1995) where the most common diagnoses were pneumonia, congestive heart failure, and failure to thrive. Nationally, heart and respiratory conditions such as congestive heart failure and pneumonia are the most common reasons for hospitalization among older adults; other conditions that account for the majority of hospital admissions included coronary artherosclerosis, cardiac dysrhythmias, acute myocardial infarction, osteoarthritis, stroke, and chronic obstructive pulmonary disease (Nagamine, Jiang, & Merrill, 2006).

Many hospital stays for older adults are complicated by chronic coexisting conditions such as diabetes and hypertension; on average hospitalization for an older adult contains two comorbidities (Nagamine et al., 2006). The majority of the participants in this study had at least one cormorbid condition; the most common were hypertension and diabetes. There were no significant differences in the Charlson comorbidity score between ACE and comparison unit participants in this study. The mean Charlson score for ACE participants was 2.6 (SD 2.0) which was similar to the other ACE studies (Counsell et al., 2000; Landefeld et al., 1995).

There was also no statistically significant difference in length of stay between ACE and comparison unit participants in this study (Wilcoxon Z= 0.96,

p=0.3394). The median length of stay on the ACE unit was 6.0 days (SD 5.0), compared to 5.0 (SD 2.9) on the comparison unit.

Functional Decline

The ACE model of care was designed to prevent functional decline and achieve better outcomes for hospitalized elders. This study examined the impact of the ACE model of care on functional decline and associated nurse sensitive outcomes compared to a medical unit. In this study, ACE participants did not demonstrate, on average, functional decline while those on the comparison unit did decline in functional status between hospital admission and discharge. The main finding of this study is that there was a difference in percentage change in functional status between the two groups, i.e., participants on the ACE unit improved in their ability to perform basic activities of daily living as compared to participants on the comparison unit, controlling for medical comorbidities and level of orientation ($F=18$, $p<0.0001$). On average, the participants improved their functional status while those on the comparison unit demonstrated, on average, functional decline. Participants on the ACE unit improved in the ability to perform basic activities of daily living, on average of 49%, while those on the comparison unit declined, on average 7%. This finding is similar to that of previous studies examining the impact of the ACE model on functional decline (Counsell et al., 2000; Landefeld et al., 1995). Both of these prior studies examined the change in the number of basic activities of daily living that the

patient could perform independently, which is the same methodology used in the current study. In Landefeld et al.'s (1995) study, at the time of hospital discharge, 34% of the patients on the ACE unit were classified as improved in the number of independent ADLs, 50% were unchanged, and 16% declined. Patients on the comparison unit did not do as well, 24% improved in ADL function, 54% were unchanged and 22% declined. Landefeld and colleagues (1995) also compared change functional status from two weeks prior to admission to functional status at time of discharge and found similar results.

Counsell and colleagues (2000) defined their baseline for ADL function as two weeks prior to hospital admission and found that ADL decline was less frequent in the ACE group (34%) compared to the usual care group (40%), and during the year following hospitalization. Although it would have added to the current study, it was not feasible to collect information on function prior to hospital admission or to follow patients for a year after hospital discharge. The information on functional status both in the Counsell (2000) and Landefeld (1995) studies was obtained via self report, or report of the proxy. The functional status information in the current study was obtained by the nurse via an assessment at the time of admission to the hospital and again at the time of discharge. Previous research has demonstrated that although self report scales are frequently easier to administer, respondents tend to rate their own function higher than family or nursing staff (Owens et al., 2002; Reuben, Valle, Hays, & Siu, 1995; Sager et al., 1992). Measurement of physical capabilities by direct observation has the advantage of

providing an objective measure of the patient's performance (Guralnick, Simonsick, & Ferucci, 1994; Reuben et al., 1995; Siu, Reuben, & Hays, 1990).

Participants on the ACE unit had median Katz ADL scores of 3.0, which is similar to that reported in previous ACE unit studies (Counsell et al., 2000; Landefeld et al., 1995). This was significantly lower than participants on the comparison unit who had median scores of 5.0. The previous ACE unit studies did not report significant differences between the ACE unit and the comparison unit participants in ADL scores at admission (Counsell et al., 2000; Landefeld et al., 1995). This difference in findings may be influenced by the different study designs. The previous studies (Counsell et al., 2000; Landefeld et al., 1995) were randomized control trials in which functional status did not determine admission to the ACE unit. In the current study, participants who were less functional may have been more likely to be admitted to the ACE unit due to the goals of the unit. There was no significant difference between Katz ADL scores on discharge between the two units (chi-square = 6.583, p=0.361), the median Katz ADL score on discharge on the ACE unit was 5.0 and on the comparison unit 4.0.

Medical comorbidities was used as a covariate due to strong a priori evidence in the literature (Fried, Brandeen-Roche, Kasper, & Guralnick, 1999; Orsitto et al., 2005; Pedone et al., 2005; Rantanen et al., 2001). It was not, however, found to be significantly associated with change in ADL performance. Further, Charlson comorbidity scores were not significantly different between the two

groups (ACE: M=2.56, SD=2.00, Comparison M=2.20, SD=2.18, F=1.07, p=0.3046).

Cognition has also been cited in the research literature as an important covariate to include when considering changes in functional status (Knight, 2000; Orsitto et al., 2005; Pedone et al., 2005; Sager, Rudberg, & Jalaluddin, 1996; Sands, Yaffe, Covinsky, Chren, Counsell, Palmer et al., 2003). In this study, however, cognition was not obtainable from the medical records since it is not routinely measured or documented in the study hospital. Thus, I was limited to the participants level of orientation, which is considered only one aspect of cognition (Foreman, Fletcher, Mion, & Trygstad, 2003). In the study hospital, the nurse noted whether or not the patient was alert and their level of orientation (oriented to person only, person and time, or person, time and place). The scores were not significantly different between the two groups (ACE: M=2.58, SD=.76, Comparison unit M=2.74, SD=.60, F=0.61, p=0.4375). Since most studies that report cognitive levels of older hospitalized patients use standardized valid and reliable measures, such as the Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975), the Mini-Cog (Borson, Scanlan, Brush, Vitaliano, & Dokmak, 2000), the Short Portable Mental Status Questionnaire (Pfeiffer, 1975), or the Confusion Assessment Method (CAM) (Inouye et al., 1990), it is not possible to compare these study findings with others.

Compared to participants on the medical unit, ACE unit participants experienced less decline in ADL function and their median Katz ADL score on

discharge was higher (5.0 v. 4.0). Despite these findings more participants from the ACE unit were discharged to rehabilitation compared to the medical unit. This difference can perhaps be attributed to the focus of the interprofessional team on preventing functional decline, one of the key features of an ACE unit (Kresevic et al., 1998), and the role of the interprofessional team in more effectively evaluating discharge options for older adults (Bull & Roberts, 2001). Further, other factors known to correlate with discharge to rehabilitation settings such as cognition (Luxenberg & Feigenbaum, 1986; Yu, Evans, & Sullivan-Marx, 2005) and social support (Wee & Hopman, 2005) were not examined in this study.

Other Nurse Sensitive Outcomes

This study examined selected nurse sensitive outcomes (falls, nosocomial pressure ulcers, and nosocomial urinary tract infections) of participants on the ACE unit compared to participants on the regular medical unit. Although previous research of ACE units did not look at these outcomes, one of the key elements of the ACE model of care is an interdisciplinary team focused on preventing the hazards of hospitalization (Kresevic et al., 1998). These outcomes are all considered hazards of hospitalization (American Geriatrics Society, 2001; Rubinstein & Josephson, 2002; Lyons, 2005; Whittington & Briones, 2004; Doyle et al., 2001; Maki & Tambyah, 2001).

There were too few reported events of falls for statistical modeling. In the entire sample, there were a total of five falls, three patients fell once, and one patient fell twice. All of these falls occurred on the ACE unit. Approximately 4% of the ACE unit sample experienced a fall. There was a marginally significant difference between the ACE unit and the comparison unit (chi square= 5.2632, p=0.0563). There were no serious injuries in the patients who fell; one patient sustained a laceration, which did not require sutures. All of the falls occurred when the patients were ambulating, three of the five falls occurred when the patients were on the way to the bathroom, which is consistent with the literature on hospital falls (American Geriatrics Society, 2001). It is known that patients who are more mobile are more likely to fall (Thapa, Brockman, Gideon, Fought, & Ray, 1996). Mobility scores did not differ between the groups; however, participants on the ACE unit were significantly less likely to experience functional decline than those on the comparison unit. Thus, it seems likely that participants on the ACE unit were more mobile and thus more likely to fall.

LaReu and colleagues (2005) reported significantly less falls on their ACE unit, however they were comparing the ACE unit to all other medical units within the hospital. In the current study, data on falls in the remainder of the hospital was not available, so a similar comparison could not be conducted.

Similarly, there were not a sufficient number of reported nosocomial pressure ulcers to allow for statistical analysis. There were a total of three nosocomial pressure ulcers in the sample, two on the ACE unit one on the comparison unit.

There was no statistically significant difference between the groups (chi-square = .5577, p=0.999). Studies examining pressure ulcer prevalence need to have very large samples, as it is estimated that only one out of every ten hospitalized patients develops a pressure ulcer (Whittington & Briones, 2004); the sample size in this study was not large enough to be able to detect significant differences in nosocomial pressure ulcer rates.

There were a total of 25 urinary tract infections in the sample, 17 on the ACE unit and 8 on the comparison unit. Of the total number of urinary tract infections, only four were nosocomial, two on the ACE unit and two on the comparison unit.

Nurse Practices

This study examined specific nurse practices on the ACE unit compared to a medical unit. The nurse practices selected were restraint use, urinary catheter use, psychoactive drug use, and mobility. These practices were selected as they all may contribute to negative outcomes in hospitalized elders (Callen, Mahoney, Grieves, Wells, & Enloe, 2004; Capezuti, 2004; Gokula, Hickner, & Smith, 2004; Holroyd-Leduc et al., 2007; King, 2006). There were only two incidents of restraints use in the sample, one patient on the ACE unit and one patient on the comparison unit. In both cases, the restraints were used in areas other than the study unit (emergency department and intensive care unit). There was no significant difference between the units (chi-square =1.00, p=0.999). Although previous ACE unit studies did not specifically look at

restraint use, other models of geriatric care, such as the Geriatric Resource Nurse Model have included this as a nursing practice outcome. Several studies demonstrated significant reductions in restraint use on units where the model had been implemented (Fitzpatrick et al., 2004; Lopez et al., 2002; Pfaff, 2002). Restraints are also known to be associated with immobility (Capezuti, 2004), however many other hospital practices also contribute to immobility such as orders for bedrest (Brown, Friedkin, & Inouye, 2004; Covinsky et al., 2003) and urinary catheter use (Saint, Lipsky, & Goold, 2002).

The use of urinary catheters was examined on both units. Forty percent of the participants had urinary catheters on the ACE unit versus 30% on the comparison unit. There was no significant difference in the number of urinary catheters placed between the units (chi-square=0.2945, p=0.4019). This is similar to the findings of Counsell and colleagues (2000). Dwell time, measured in hours, was compared for the two units. The median dwell time for the ACE unit was 35.0 hours, compared to 72.0 hours for the comparison unit. There was marginal statistical significance (Wilcoxon Z=1.9564, p=0.0594). This is a shorter dwell time than found by Counsell (2000), who found a mean of 14.1 (SD 15.8) of shifts with catheters. The length of the shift was not clearly described; however, it is longer than was found in this study. One possible explanation for the shorter dwell time on the ACE unit is that urinary catheter use is discussed in interprofessional team rounds. Consistent with geriatric best practice guidelines, urinary catheters are used only for specific indications, and a concerted effort to discontinue catheters

is made (Dowling-Castronovo & Bradway, 2003; Gokula et al., 2004; LaReau & Raphelson, 2005). Urinary catheter use was one of the topics covered in ongoing gerontologic education on the ACE unit, previous research demonstrates that a concerted educational program improved care of patients with indwelling urinary catheters and subsequently decreased the number of urinary tract infections (Ribby, 2006).

In order to further examine this issue, the location, and reason for placement was evaluated (Gokula et al., 2004; Goolsarran & Katz, 2002; Munasinghe, Yazdani, Siddique, & Hafeez, 2001), although it was not a variable measured in previous ACE studies or other studies of geriatric care models. There were no significant differences in the location of catheter placement (chi-square=0.3554, p=0.6214), or reason for placement (chi-square=0.2961, p=0.3099). Urinary catheters can also limit mobility since they can act as "one point restraints" (Saint et al., 2002). Urinary catheter use is also associated with an increased length of stay (Holroyd-Leduc et al., 2007; Saint, 2000; Tambyah, Knasinski, & Maki, 2002), based on the increased incidence of nosocomial urinary tract infections, however, there was no significant difference in length of stay between the two units in this study.

There was no significant difference in participant mobility between the two units, despite fewer urinary catheters and shorter dwell time on the ACE unit. Mobility was measured on a scale consisting of three subscales: ambulation, bed mobility, and transfer mobility that was derived from medical record review and

not nurse or patient interview. The median mobility for both units was 8.0 (Wilcoxon Z=0.3023, p=0.7631). In the Landefeld et al. (1995) study, mobility was measured, via patient interview, as a change in the ability to walk from admission to discharge; participants were classified as "better, unchanged or worse". Patients on the ACE unit had greater improvement in their ability to walk. Counsell and colleagues (2000) measured mobility in a number of different ways, as the percentage of patients with bedrest orders and the days to a new activity order. Physical therapy consults were measured as well as days to consult. At the time of admission, mobility was assessed through self-report. At discharge mobility was assessed using the Physical Performance and Mobility Examination (Winogard, Lemsky, & Nevitt, 1994), a reliable and valid performance based instrument that assesses bed mobility, transfer, multiple stands, sitting balance, climbing one step, and a timed walk. There was a trend toward improvement in self reported mobility from admission to discharge between the groups, however there was no statistically significant difference. The ACE unit patients had significantly higher scores of the PPME at time of discharge (Counsell et al., 2000).

Previous studies demonstrate that mobility for hospitalized older adults is markedly inadequate, as is documentation of mobility (Bogardus, Towle, Williams, Desai, & Inouye, 2001; Brown et al., 2004; Callen, Mahoney, Grieves et al., 2004; Callen, Mahoney, Wells, Enloe, & Hughes, 2004; Lazarus, Murphy, Coletta, McQuade, & Culpepper, 1991). There were many issues related to

documentation of mobility in the study hospital. The daily medical surgical assessment flow sheet (Appendix G) does not include a separate field for documentation of mobility. Mobility was addressed in several sections of the flow sheet, under a variety of different categories ranging from fall risk to safety to miscellaneous comments. The investigator had to look in many different areas in the medical record, including nursing progress notes and physical therapy notes in order to obtain the information on mobility instead of relying on nurse interview which is how this tool has been used in other studies ( Capezuti, Strumpf, Evans, & Maislin, 1996). There was also no standard objective manner used to describe different levels of mobility in the documentation system of the hospital. One previous study examining outcomes of a geriatric model of care measured mobility by using the presence of contractures as a measure of immobility , and the use of mechanical devices for ambulating as a proxy for mobility (Turner et al., 2001).

There are no studies that have demonstrated the validity or reliability of the tool utilized in this study to measure mobility. The tool has only been used in nursing home studies (Capezuti et al., 1996). A better way to measure mobility would have been to administer some type of performance measure, or use a tool that required direct observation, such as the "Get up and Go Test" (Mathias, Nayak, & Isaacs, 1996) , the Physical Performance Test (Reuben & Siu, 1990) or the Tinetti Gait and Balance Measure (Tinetti, 1989). It was not economically feasible for this dissertation study.

The use of psychoactive drugs was examined in the sample. Fifty-four percent of the participants on the ACE unit received psychoactive drugs, while 44% of participants on the comparison unit. The number of psychoactive drugs ranged from one to six. There was no significant difference between units in psychoactive drug use (chi-square= 0.3172, p=0.4238). Further analysis was conducted to examine if there were differences in the administration of the different categories of psychotropic drugs on the ACE unit and the comparison unit. There were no statistically significant differences for sedatives (chi-square=.5854, p=.7858), antianxiety drugs (chi-square=1.000, p=1.000), or antidepressants (chi-square=0.3912, p=0.5205). There was a statistically significant difference in the antipsychotic drug group, patients on the ACE unit received significantly more antipsychotic drugs than patients on the comparison unit (chi-square=0.0077, p=0.0157). This is an unexpected finding that requires additional investigation.

There was no significant difference in level of orientation between the ACE and the comparison unit; however, there are limitations in using level of orientation as a proxy for cognitive status. Data was not collected on behavioral symptoms such as treatment interference, which are associated with antipsychotic use (Desai, 2003). It was also not known whether the antipsychotic drugs that were prescribed were new medications or were a continuation of previous prescriptions. It was also not known whether the patients who received

psychoactive drugs had a psychiatric diagnosis or whether they received a psychiatry consult.

Although there is evidence in the literature that supports that community dwelling older adults use a considerable amount of psychoactive drugs (Aparasu, Mort, & Brandt, 2003; Desai, 2003), there is little research on the use in hospitalized older adults. Previous ACE unit studies (Counsell et al., 2000; Landefeld et al., 1995) did not specifically look at psychoactive drug use. One recent study (Saltvedt et al., 2005) examined differences in drug profiles of patients in a Geriatric Evaluation and Management (GEM) unit compared to those on a regular medical unit. There was no significant difference in the number of patients on either the GEM unit or the regular medical unit receiving psychotropic drugs at admission or discharge. There were statistically significantly more antipsychotic drugs withdrawn on the GEM unit, and more antidepressants ordered. The authors explain these findings by the intensive screening for psychiatric disorders, particularly depression that is part of the GEM unit care. This study was conducted in Norway, limiting its applicability. In the current study, data on the participants' medication schedule prior to admission was not collected; therefore it is not known whether psychotropic medications were withdrawn or added.

Nursing Practices and Functional Decline

The relationship between nursing practices that are known to immobilize patients (restraints, urinary catheter use, mobility and psychoactive drug use) and functional decline were examined for each unit. There were no significant differences between the units for any of these nursing practices; although, there was a significant difference in functional decline between the ACE and the comparison unit.

A possible explanation for the main finding is the role of the interprofessional team, a major component of the ACE model (Kresevic et al., 1998). Preventing geriatric syndromes, especially functional decline, is a key element of the interprofessional team activity (Kresevic et al., 1998).

The ACE unit in this study has a strong interprofessional team co-led by a nurse manager and medical director. The members of the interprofessional team are part of the unit staff, and interact on a regular basis with the nursing staff and patients on the unit. Interprofessional team rounds, held three times per week on the ACE unit focus on preventing negative outcomes of hospitalization, especially functional decline (E. Siegler, personal communication, February 24, 2007). The interprofessional team includes registered nurses, the patient care director, a geriatric nurse practitioner, the geriatrician medical director, a physician's assistant, a medical house staff team (medical residents and students), a social worker, a case manager, a physical therapist, an occupational therapist, a dietician, and a chaplain. Each registered nurse attends rounds and presents

patient status, including functional status. Following an interdisciplinary discussion, a care plan is developed with input from all disciplines.

The registered nursing staff on the comparison unit has access to all the same disciplines as the ACE unit, however, only the nurse manager, the case manager, and social worker round on the patient daily. Rounds on the comparison unit are focused on discharge planning. The nurse manager attends rounds and provides information on the patient obtained from the patient's nurse. Following rounds she reports back to the nurse. The different focus and composition of the team rounds for each unit is a likely explanation for the differences in functional change demonstrated by the participants of the two study units. A qualitative study examining the content and process of rounds on each unit, including the care plan documentation, may provide more insight into differences in unit care practices that can affect functional decline.

Another possible explanation is the difference in hospital-based education of the nursing staff. All nurses in the hospital receive a general hospital orientation, which includes information on function, pressure ulcers, and falls. In addition, the nursing staff on the ACE unit receive an eight hour class on best practices in care of older adults as well as ongoing monthly education on gerontologic nursing topics. The nursing staff on the comparison unit did not receive any of this additional education. Staff with specialized education in the care of older adults is positively associated with improved patient outcomes (Fitzpatrick et al., 2004; Fulmer & Mezey, 1994; Fulmer et al., 2002; Guthrie, Edinger, & Schumacher,

2002; King, 2006; Lee, Fletcher, Westley, & Frankhauser, 2004; Lopez et al., 2002; Mezey et al., 2004; Pfaff, 2002; Turner et al., 2001).

Study Limitations

A limitation to this study is sample size, which was not large enough to appropriately statistically evaluate differences in nurse sensitive outcomes (reported falls, nosocomial pressure ulcers, and nosocomial urinary tract infections) for each unit. Since there were too few events of restraints, it was not possible to explain differences in functional decline based on this nursing practice. Reproducing this study's design with a significantly larger sample size would be necessary to explore the differences in the nurse sensitive outcomes and the nursing practices between the ACE unit and the comparison unit.

Another limitation of this study is that all outcomes were obtained by medical record review. As this study was a dissertation study, it was not economically feasible for the investigator to be on the unit every day and to prospectively observe care directly or to interview patients and nurses each shift.

Although there is no "gold standard" for measuring function, direct observation of physical function has the advantage of being more objective in measuring functional capabilities (Reuben & Siu, 1990; Reuben et al., 1995). Performance based measures of function may more accurately assess functional status (Owens et al., 2002; Reuben et al., 1995). It may be useful to use one of the many tools that utilize direct observation of physical function to measure

functional status. Guralnick and colleagues (1994) developed a comprehensive scale of lower extremity performance that assessed balance, gait, and strength endurance. They found that performance measures contributed information beyond that obtained from self-report. Both performance measures and self report are independent predictors of mortality and nursing home admission (Guralnick et al., 1994).

There is much research that reinforces the importance of functional status as a marker for outcomes in hospitalized elders. There are many different functional status assessment tools; however, there is no one tool recommended specifically for the acute hospital setting. Additional studies to determine the one that is most useful in detecting changes but can also be easily incorporated into the daily routine of bedside nurses is needed in order to set a standard of practice.

A limitation to this study is that it did not follow the participants post discharge to evaluate functional status and whether or not improvements were maintained, or whether or not participants were admitted to long term care facilities, which was examined in other ACE unit studies (Counsell et al., 2000; Landefeld et al., 1995). In addition, baseline, i.e., pre-hospitalization functional status for the patients in this study was not evaluated as in other studies (Counsell et al., 2000; Landefeld et al., 1995). Assessing functional status at the time of hospital admission may not be an accurate measure since functional status at the time of hospital admission may already be below the patient's baseline, due to the presence of an acute illness, pain and fatigue (Kresevic & Mezey, 2003).

Knowledge of baseline functional status would give a more accurate goal for discharge.

The hospital documentation system is another limitation of this study. The hospital utilized an electronic medical record with numerous electronic "flow sheets". The documentation system is used throughout all of the adult medical surgical areas. There is no customization for care of the older adult as in other systems (Agostini, Zhang, & Inouye, 2007). Caring for older hospitalized adults necessitates using specific assessment criteria, however, the current documentation system does not allow for this.

The documentation system in the hospital uses many electronic "flow sheets", where there is charting by exception i.e., the nurse only documents when there are abnormal findings (Murphy, 2003). This method of charting makes it difficult to collect complete data as only specific items are addressed in detail, and other things are checked off as "being within normal limits." Older adults, due to age related changes often do not fall into the same definitions of "within normal limits" as compared to younger or middle-aged adults (Turner & Lee, 2001).

Documentation of mobility is another limitation of this study. The investigator did a complete medical record review, reviewing all of the flow sheets and narrative notes of all disciplines. There is no standard scale, electronic flow sheet, or form to document mobility in the study hospital's electronic medical record. Although I was not present on the nursing units every day during data collection for this dissertation study, it was my perception that patients on the ACE unit

were more likely to be mobilized and were more often in communal areas instead of their patient rooms. The highest level of activity that was documented in the chart was used as the mobility score, however, this does not capture the frequency or duration of that mobility activity.

The use of the level of orientation as a proxy for cognition is a major limitation. Cognition has been found to be a key dimension in functional status (Knight, 2000), and predictor variable of functional decline (Orsitto et al., 2005; Pedone et al., 2005; Sager, Rudberg et al., 1996; Sands, Yaffe, Covinsky, Chren, Counsell, & Palmer, 2003). Level of orientation is one element of cognitive status (Foreman et al., 2003) which is composed of perception, memory, and the recognition, registration, storage and use of information (Foreman & Vermeersch, 2004). A more accurate method would have been for the investigator to administer a valid and reliable mental status tool to all of the study participants, such as the Mini Mental State Examination (MMSE) (Folstein et al., 1975), the Mini-Cog (Borson et al., 2000), the Short Portable Mental Status Questionnaire (Pfeiffer, 1975), or the Confusion Assesment Method (CAM) ( Inouye et al., 1990).

Another limitation of this study is that data on whether the psychoactive drugs were new prescriptions or continuation of prescriptions was not collected. Data on psychiatric comorbidities was not available in many of the medical records, so it is not known whether the patients receiving these medications had psychiatric

diagnoses. In addition, information on behavioral symptoms, a major reason for administration of psychoactive drugs (Desai, 2003), was not collected

The lack of diversity of the patient sample is another limitation to this study. The sample was very homogenous (i.e. primarily white, educated, English speaking females), on both the ACE and the comparison unit. This study was conducted in one hospital, a large university teaching hospital in a large city. This limits the generalizability of the study's findings.

The methods used to screen potential participants for this study is another limitation. The nurse managers of the respective units screened the potential subjects. Although specific criteria were utilized, subjects more likely to demonstrate functional improvement may have been preferentially screened. In addition, when the investigator was reviewing the medical records of the participants, the unit location was not blinded, adding another potential source of bias.

Another limitation to this study was that data was not collected on whether or not participants lived alone or with family. Family caregivers are important not only in their roles in providing assistance after hospital discharge (Bull & Roberts, 2001), but during the hospital stay as well. The ability of the family to provide support has been reported to improve outcomes in hospitalized patients (Bull, Hansen, & Gross, 2000; Li et al., 2003).

## Implications of Results

### Implications for Clinical Practice

Models of care have been designed to achieve better outcomes for hospitalized elders. The ACE model is one of these models. Previous studies have demonstrated positive outcomes of ACE units (Counsell et al., 2000; Landefeld et al., 1995; LaReau & Raphelson, 2005). This study supports prior findings that ACE units successfully prevent functional decline in hospitalized elders. Others have used self report or report of the proxy to document changes in function while this is the first study to uses nurses' documentation of participant status.

Despite the increasing population of elders in hospitals, and the known hazards of hospitalization for the older age group, there is also the competing imperative to decrease hospital costs and focus on decreasing length of stay. It is widely agreed that interventions such as the ACE model, which reduce functional decline, produces desirable clinical outcomes. The incremental costs to set up an ACE unit, which include staff education, equipment costs and environmental modifications, may be a deterrent to the development of an ACE unit. Covinsky and colleagues (1997) measured the costs of caring for patients on the original ACE unit, reported in the Landefeld (1995) study. They found that caring for patients on an ACE unit was no more expensive to the hospital than caring for patients on a usual care unit, even though the ACE unit required a commitment of hospital resources. This main finding of this study, the significant difference in functional change status between participants on the ACE unit compared to a

regular medical unit may provide justification for the expenditure of additional monies.

Functional status has been demonstrated to be a strong marker for well being in older adults, and is of major importance to the quality of life in older adults. Since hospitalized older adults are at an increased risk of functional decline both during hospital and post discharge (Covinsky et al., 2003; Sager, Franke et al., 1996; Sager, Rudberg et al., 1996), identification of those at highest risk for functional decline must take place at the time of admission to the hospital (Winograd et al., 1997). These individuals require targeted interventions, especially facilitation of mobility and removal of devices that restrict mobility. An ACE unit, with a strong emphasis on interdisciplinary communication that focuses on prevention of hospital complications, is an ideal environment to reduce functional decline. Clinical judgments about care of elders must take into account consideration of functional status, and assessment of function must be incorporated into the planning and delivery of care.

A major implication of this study is in the need to design documentation systems that meet the needs of the hospitalized older adult. Specific modifications of current systems are needed to customize documentation to include assessment and documentation parameters that are specific to the older adult. Evidence based best practice protocols for the care of the older adult need to become part of the standard documentation (Counsell et al., 2000; Francis & Bottrell, 2003; Inouye et al., 1993). This will reduce variation in practice,

improve patient outcomes and lead to a more effective and efficient use of resources.

In view of the significant difference in change in functional status between the ACE unit and the comparison unit, elements of the ACE model with its focus on functional status, needs to be incorporated into the routine hospital care for all older adults. Other models of care that are not dependent on a specific unit, but rather that can reach a wider percentage of the large number of hospitalized elders, such as the Geriatric Resource Nurse Model, another practice model of the Nurses Improving Care for Healthsystem Elders (NICHE) project, need to be considered.

## Implications for Future Research

Although there were significant differences in functional status changes from hospital admission and discharge between the ACE and comparison unit participants, neither nursing practices nor other patient complications can explain these differences. Replication of this study with a larger sample size may help answer this question. Alternatively, employing a prospective, observation design that captures physical performance and nurse practice with valid and reliable tools would also better inform the relationship between function and nurse practices. Further, a clinical trial in which participants are randomized to study units would provide the best method of examining changes in functional status, including its antecedents and confounders.

The ACE model of care has three key elements: A specially designed physical environment, an interprofessional team focused on preventing hospital complications (including functional decline), and staff with geriatric expertise (Kresevic et al., 1998). Further qualitative studies to examine the contribution of each of these elements to the ACE model are warranted.

Cognitive status has been shown to be a predictor of functional decline (Orsitto et al., 2005; Pedone et al., 2005; Sager, Rudberg et al., 1996; Sands, Yaffe, Covinsky, Chren, Counsell, Palmer et al., 2003) . This study was limited in its definition of cognitive status. The role of cognitive status and functional status on ACE units needs to be investigated in depth.

This study examined the impact of the ACE model of care on only a few of the nursing practices and patient outcomes important in the care of the hospitalized older adult. Further studies to explore medication practices including appropriate doses of medications and adverse drug reactions is warranted, as this has been explored in GEM (geriatric evaluation and management) units, but not in `ACE units (Schmader et al., 2004). Improving the quality of medication prescribing is a key component of safety in older adults (Agostini et al., 2007, Higashi et al., 2004). Other outcomes that were not explored in this study, but have been proven to be impacted by other models of geriatric care include urinary incontinence (Dowling-Castronovo & Bradway, 2003), nutrition (DiMaria-Ghalili & Amella, 2005), delirium ( Inouye, 2000) and pain management (Horgas, 2003; Horgas & Elliott, 2004; Horgas & McLennon, 2003).

## Conclusion

Acute care hospitalization, which is intended to provide a healing environment, has many risks associated with it for the older adult, which include readmissions, increased hospital length of stay, functional decline and nursing home placement (Counsell et al., 2000). These hazards are not only related to the medical problem for which the individual was admitted, but also to the environment and many nursing care practices. Negative outcomes may result both during the hospital stay as well as post hospitalization.

Models of care have been designed to improve outcomes for hospitalized older adults. The ACE unit is one model of care that has strong evidence that it is possible to prevent the hazards of hospitalization and promote positive outcomes by redesigning the hospital unit and care delivery. The findings of this study support the ACE model of care and its role in improving outcomes for hospitalized older adults.

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# APPENDIX A

## INSTRUMENTS COMMONLY USED TO MEASURE FUNCTION IN OLDER ADULTS

Adapted from (Richmond, Tang, Tulman, Fawcett, & McCorkle, 2004, p.89-99)

| Name | Dimensions Measured | Target Population | Administration | Number of Items | Reliability | Validity |
|---|---|---|---|---|---|---|
| Barthel Index of ADL Scale | Physical disability,ADL, mobility. Seven Subscales: Feeding, grooming, bathing, toileting, walking or climbing stairs, propelling a wheelchair, bowel and bladder control | Patients with chronic disease | Health care staff familiar with patient; takes 2 minutes | 16 | Internal consistency: alpha 0.943-0.965, Interrater: r=.99 | Predictive: score<60 inversely related to subsequent mortality Concurrent: Established |
| Functional Independence Measure (FIM) | Self-care, sphincter control, mobility, locomotion, communication, social adjustment/cooperation, cognition/problem solving | Patients with CVA and spinal cord injury | Clinician, takes 10 minutes | 18 | Interclass correlations: 0.88 Interrater: 0.86-0.87 | Predictive: Help needed by patients with MS Concurrent: Established |
| OARS Multidimensional Functional Assessment Questionnaire | Part A: Personal functioning Part B: Service utilization | Community based population | Trained interviewer, takes 45-75 minutes | 101 | Part A Interclass correlations: 0.66-0.87 Interrater: social (0.823), economic (0.783), mental health (0.803), physical health (0.622) | Part A Construct: Spearman's rank order correlations: economic (r = 0.68), health ( r = 0.67), self care (r = 0.89) Discriminant: excellent vs. totally impaired functioning |

APPENDIX A
Page 2

INSTRUMENTS COMMONLY USED TO MEASURE FUNCTION IN OLDER ADULTS (CONT.)
Adapted from (Richmond, Tang, Tulman, Fawcett, & McCorkle, 2004, p.89-99)

| | | | | | | |
|---|---|---|---|---|---|---|
| Sickness Impact Profile | Physical and psychosocial | Acute and chronic illness | Self or structured interview, takes 20-30 minutes | 136 | Test-retest: r = 0.88 (24 hours) Internal consistency: Cronbach's alpha 0.93-0.97 | Discriminant: Higher correlation between Sickness Impact Profile and levels of dysfunction and different groups of patients |
| Katz Index of Activities of Daily Living | Bathing, dressing, toileting, continence, transfer, feeding | Patients with hip fracture, chronic illness, and elderly | Rates who has health care experience and has knowledge of subject, takes a few minutes | 6 | Test-retest: 0.95-0.98 | Predictive: Discharge status, function |

# APPENDIX B

## LETTER OF SUPPORT FROM HOSPITAL ADMINISTRATOR
Page 1

NewYork-Presbyterian
The University Hospitals of Columbia and Cornell

New York Weill Cornell Medical Center
525 East 68th Street
New York, NY 10021
Tel 212 746-5454

November 18, 2005

To Whom It May Concern:

I am writing this letter to indicate my support, as nurse manager of 10 North, of the research project: A Comparison of Nurse Sensitive Outcomes of Acute Care for the Elderly Units and Regular Inpatient Medical Units, with Sharon Wexler, MA, RN, doctoral candidate at New York University College of Nursing as the principal investigator. I understand that my unit, 10 North, will be used as one of the study units.

I look forward to participating in this project.

Thank you

Rita Kraut
Nurse Manager- 10 North
212 746-5714

# APPENDIX B

## LETTER OF SUPPORT FROM HOSPITAL ADMINISTRATOR
Page 2

NewYork-Presbyterian
The University Hospitals of Columbia and Cornell

New York Weill Cornell Medical Center
525 East 68th Street
New York, NY 10021
Tel 212 746-5454

November 18, 2005

To Whom It May Concern:

I am writing this letter to indicate my support, as nurse manager of 5C, of the research project: A Comparison of Nurse Sensitive Outcomes of Acute Care for the Elderly Units and Regular Inpatient Medical Units, with Sharon Wexler, MA, RN, doctoral candidate at New York University College of Nursing as the principal investigator. I understand that my unit, 5C, will be used as one of the study units.

I look forward to participating in this project.

Thank you

Mary E. Halston
Nurse Manger, 5C
212-746-5932

# APPENDIX C

## COMPARISON OF STUDY UNITS

| | ACE unit | Comparison unit |
|---|---|---|
| Bed size | 19 | 32 |
| Mean length of stay | 7 days | 6 days |
| Mean patient age | 85 | 75 |
| Patient gender | 70% female, 30% male | 65% female, 35% male |
| Most common medical diagnoses | Urinary tract infection, dementia, falls, failure to thrive, change in mental status, congestive heart failure | Congestive heart failure, pneumonia, gastrointestinal bleeding |
| Unit staffing<br><br>Nurse patient ratio (day shift)<br>Nurse patient ratio (night shift)<br>Nurse aide patient ratio (day shift)<br>Nurse aide patient ratio (night shift)<br>Budgeted skill mix | <br><br>6-7:1<br>6-7:1<br>8-9:1<br><br>8-9:1<br><br>55/45 | <br><br>6-8:1<br>8-11:1<br>11-16:1<br><br>11-16:1<br><br>56/55 |
| Educational preparation of RN staff | 91% BSN, 9% Associate Degree | 84% BSN, 16% Associate Degree |
| Presence of geriatric education program | Hospital orientation content on falls, pressure ulcers, functional decline<br>Monthly geriatric education classes | Hospital orientation content on falls, pressure ulcers, functional decline |

# APPENDIX D

## STUDY LOG

Unit: ____

| Patient Name | Medical Record # | Date of Hospital Admission | Date of Study Unit Admission | Date of Consent | Study ID# | Discharge Date |
|---|---|---|---|---|---|---|
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# APPENDIX E

## STUDY INFORMATION SHEET

A Comparison of Nurse Sensitive Outcomes of an Acute Care for the Elderly Unit and a Regular Medical Unit

My name is Sharon Stahl Wexler, MA, RN, and I am a doctoral student at New York University College of Nursing. My dissertation study is looking at outcomes of older patients in the hospital. The study will involve my reviewing your medical record. I will be looking for information concerning your ability to take care of yourself (i.e. wash, dress), to walk and any indication of a fall, bedsore, or infection.

The study will be done completely by looking at your medical record. I will not have any contact with you, other than to have you sign the consent. If you do not want to participate, it will not reflect your care here at New York Presbyterian Hospital Weill Cornell Medical Center or your relations with the Medical Center, your physicians, or other personnel.

Please complete the bottom portion of this form and place in the envelope provided, seal it, and put it in the box at the nurses' station, or ask any staff member to place it in the box for you. If you are interested in participating in the study, I will come to visit you and explain more about the study. If you wish to contact me at any time, you may call me at 914-310-0212.

Thank you for your time.

---

Name:_____ Room #_____

☐I am interested in participating in this study.

☐I am interested in learning more about this study.

☐I am not interested in participating in this study.

# APPENDIX F

## SUBJECT DEMOGRAPHICS FORM

Subject ID # Date collected:

| | | |
|---|---|---|
| Date of birth | | mm/dd/yy |
| Religion | | 0=none/not religious, 1=Protestant, 2=Catholic, 3=Jewish, 4=Muslim, 5=other |
| Education | | # of years |
| Marital Status | | 0=never married, 1=married, 2=widowed, 3=divorced/separated |
| Main occupation | | 1=professional, 2=skilled labor, 3=unskilled labor, 4=homemaker, 5=other |
| Sex | | 1=female, 2=male |
| Ethnicity | | 1=Hispanic, Latino, or Spanish origin, 2=other |
| Race | | 1=white, 2=black/African American, 3=Asian, 4=American Indian/Alaskan 5=Hawaiian/Pacific Islander |
| Year of immigration | | 9999=not applicable |
| Primary language | | 1=English, 2=Spanish, 3=Chinese, 4=Korean, 5=Russian, 6=other |
| Payor | | 1=MC, 2=MA, 3=other |
| Residence prior to admission | | 1=home, 2=nursing home, 3=assisted living, 4=other |

# APPENDIX G

## Page 1

## PAT I: MEDICAL DIAGNOSES AT DISCHARGE

Subject ID #:

| DIAGNOSES | ICD-9=CM CODES |
|---|---|
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| DIAGNOSES | ICD-9=CM CODES |
|---|---|
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Diag:

* Angina 1
'413 '-'4140','4148'-'4149',
'4292'
* Angina 2
'4111'-'4118'
* Arrhythmia 1
'42612'-'4269','427 '-'4270',
'4272'-'42732','4278'-'42789'
* Arrhythmia 2
'4274'-'4275','4260','4271',
'V450'
* Vascular Heart Disease 1
'394 '-'39490', '424 '-'42400',
'395 '-'39590', '4241'-'42410',
'396 '-'39690', '397 '-'39710',
'4242'-'42430', '3979'-'39790',
'4249'-'42490', '421 '-'42299'
* Vasuclar Heart Disease 2
'V433'

Myocoardial inforaction (acute)
'410 '-'41099'

Myocardial Infarction (old)
'412 '

CHF
'428 '-'4289', '4293',
'40201', '40211', '40291',
'425 '-'4259'

* Hypertension 1
'401 '-'4019','405 ',
'4051'-'40599'
* Hypertension 2
'402 '-'40291'| '403 '-'40390',
'404 '-'40490','4050'-'40509'

Peripheral vascular disease
'441 '-'4419',
'442 '-'4429',
'4431'-'4439', '4471',
'440 '-'4409',
'7854'

Cerbrovascular disease
'7843','438 ',
'9970', '36234',
'7814',
'430 '-'436 ','437 '-'4371',
'4379'

COPD 1
'491 '-'4949 '|'496 '

COPD 2
'4150','4168'-'4169'

* Neuro_OT - Parkensonism, etc
'332 '-'3321','3334',
'340 ', '3335',
'345 '-'3459',
'334 '-'3349','335 '-'3359',
'3411'-'3419','3481', '3319 ',
'3483'

Dementia
'290 '-'2909','331 '-'3312'

Paralysis
'342 '-'3429','3440'-'3449'

* Endo other
'243 '-'2449',
'2532' , '2537'-'2539',
'2554'-'2555', '242 '-'2429',
'2450'-'2459', '252 '-'2521',
'2553',DX{K} = '2556','255 '-'2551'

Diabetes
'250 '-'2501'

DKA, etc.
'2501'-'2503'

Diabetes with sequelae
'2504'-'25099'

Chronic Renal Failure 1
'585 '-'586 '

Chronic Renal Failure 2
'V451','V420',
'V56 '-'V569'

Various crrhodites
'5712','5715'-'5716'|
'5718'-'5719'

Moderate-severe liver disea
'5722'-'5724',
'4560'-'45629'

Ulcers
'531 '-'53499'

* Inflammatory Bowel Disc
'555 '-'5556'

Various Cancers
('140 '-'14090') LIPCA
('141 '-'14990') ORAL(

APPENDIX G

Page 2

PART II: CHARLSON COMORBIDITY INDEX
(Charlson et al., 1987)

Subject ID# _____ Date_____

| Assigned weight for disease | Conditions | Individual Subject Score |
|---|---|---|
| 1 | Myocardial infarct<br>Congestive heart failure<br>Peripheral vascular disease<br>Dementia<br>Chronic pulmonary disease<br>Ulcer disease<br>Mild liver disease<br>Diabetes | |
| 2 | Hemiplegia<br>Moderate or severe renal disease<br>Diabetes with end organ damage<br>Any tumor<br>Leukemia<br>Lymphoma | |
| 3 | Moderate or severe liver disease | |
| 6 | Metastatic solid tumor<br>AIDS | |

TOTAL SUBJECT SCORE:_____

# APPENDIX H

## SAMPLE MEDICAL/SURGICAL FLOW SHEET OF STUDY HOSPITAL

(unable to print example from electronic medical record)

| | 08:00 Shift | 20:00 Shift |
|---|---|---|
| Braden Scale (copyright)<br>Sensory perception<br>Moisture<br>Activity<br>Mobility<br>Nutrition<br>Friction and shear<br>If total score < = 18 Implement pressure ulcer protocol | | |
| Fall Risk-Complete all Items<br>Assessment type<br>Meds: Taking 1 or more sedative<br>Fall(s) in past 7 days<br>Impaired mobility w/ no assistive device<br>Impaired mobility<br>Gender=male<br>Impaired Cognition<br>Total fall risk score | | |
| Injury risk-complete all items<br>Potential for bleeding: If yes, implement bleeding precautions protocol<br>Potential for fracture<br>Injury risk level<br>Fall-injury risk level<br>(Nursing to implement safety measures per risk level) | | |
| Plan of Care/Standards of Care | | |

| | | |
|---|---|---|
| Education<br>Topics discussed<br>Learning response | | |
| Neuro/musculoskeletal | | |
| Respiratory | | |
| Cardiovascular | | |
| Gastrointestinal | | |
| Urinary/Reproductive | | |
| Skin integrity<br>Skin impairment<br>Type<br>Site | | |
| Psychosocial | | |

# APPENDIX I

## INDIVIDUAL SUBJECT LEVEL OF ORIENTATION

Subject #_____

| DATE | TIME | ALERT 1=yes, 2=no | ORIENTED TO PERSON 1=yes, 2=no | ORIENTED TO TIME 1=yes, 2=no | ORIENTED TO PLACE 1=yes, 2=no |
|---|---|---|---|---|---|
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# APPENDIX J

## NURSING HISTORY ADMISSION DATA BASE

| ***Self Care History*** | | | |
|---|---|---|---|
| Vision: | Teeth/Dentures: | Bowel Pattern: | Sleeping Pattern: |
| Hearing: | Indwelling Treatment Device: | | Bladder Function: |

| ***Functional Screen*** | |
|---|---|
| Dressing/ Grooming | Feeding |
| Toileting/Bathing | Bed Mobility |
| Transfer From Bed to Chair | Ambulation |
| Stair Climbing | Wheelchair Mobility |
| Upright Balance/Safety | Prosthetic or Orthotic Devices Used |
| Speech/Language Difficulties | Swallowing |

| ***Nutrition Screen*** | |
|---|---|
| Usual Diet: | Current Diet Restrictions: |
| Appetite: | |
| Weight Loss: | |
| Skin: | |
| **Females Between 9-55 years old only** | |
| Pregnant | Currently Breast Feeding: |

| ***Social History*** | |
|---|---|
| Occupation: | Lives With: |
| Dwelling Type: | Agency / Homecare: |
| Primary Language: | Other Languages: |
| Info Obtained From: | |

| ***Belongings*** | |
|---|---|
| Disposition of Belongings: | Disposition of Valuables: |

| ***Educational History*** |
|---|
| Motivation |
| Barriers to Learning |
| Patient/Family Prefer to Learn by: |
| Understanding of Hospitalization: |
| Understanding of Meds |
| Family (including significant Other): |

| ***Advance Directives*** |
|---|
| Advance Directive Info |
| If patient has Advance Directive, Is it in the chart? |
| If no, Please provide Agent(s) name(s): |
| Additional Info |
| Phone #'s |

| ***Religion/Culture*** |
|---|
| Religion Considerations: |
| Do you want your baby baptized in the event of an emergency/surgery/procedure? |
| Are there any religious beliefs/practices we should be aware of? |
| Cultural Considerations: |

*Nursing Admission Data Base*

# APPENDIX K

## BASIC ACTIVITIES OF DAILY LIVING
(Katz, Ford, & Moskowitz, 1963)

Subject ID #_____ Date _____

| **ACTIVITIES ADMISSION** | **ACTIVITIES DISCHARGE** | **INDEPENDENCE (1 POINT) NO supervision, direction, or personal assistance** | **DEPENDENCE (O POINTS) WITH supervision, direction, personal assistance or total care** |
|---|---|---|---|
| BATHING POINTS ___ | BATHING POINTS ___ | (1 POINT) Bathes self completely or needs help in bathing a single part of the body such as the back, genital area or a disabled extremity. | (0 POINTS) Needs help with bathing more than one part of the body, getting in or out of the tub or shower. Requires total bathing. |
| DRESSING POINTS ___ | DRESSING POINTS ___ | (1 POINT) Gets clothes from closets and drawers and puts on clothes and outer garments complete with fasteners. May have help tying shoes. | (0 POINTS) Needs help with dressing self or needs to be completely dressed. |
| TOILETING POINTS ___ | TOILETING POINTS ___ | (1 POINT) Goes to toilet, gets on and off, arranges clothes, cleans genital area without help. | (0 POINTS) Needs help transferring to the toilet, cleaning self or uses a bedpan or commode. |
| TRANSFERRING POINTS ___ | TRANSFERRING POINTS ___ | (1 POINT) Moves in and out of bed or chair unassisted. Mechanical transferring aides are acceptable. | (0 POINTS) Needs help in moving from bed to chair or requires a complete transfer. |
| CONTINENCE POINTS ___ | CONTINENCE POINTS ___ | (1 POINT) Exercises complete self-control over urination and defecation. | (0 POINTS) Is partially or totally incontinent of bowel or bladder. |
| FEEDING POINTS___ | FEEDING POINTS___ | (1 POINT) Gets food from plate into mouth without help. Preparation of food may be done by another person. | (0 POINTS) Needs partial of total help with feeding or requires parenteral feeding. |
| **TOTAL POINTS ADMISSION** ___ | **TOTAL POINTS DISCHARGE** ___ | | |

# APPENDIX L

## FALLS AND INJURIES DATA COLLECTION FORM

**Subject ID #:** _____

Complete one form for each fall/incident, number each fall/incident (FALLNUM) sequentially from date of admission

| | | | | |
|---|---|---|---|---|
| **FALNUM** | | Incident # | | |
| **FALDATE** | | Date of fall/incident; use 4 digit year | | |
| **FALTIM** | | Time of day using military time; 25=unknown | | |
| **FALDES** | | Description of fall/incident | 1=fall, 2=found on floor, 3=accident,not staff related, 4=accident w/staff, 5=violence, 6=other | |
| **FALOUT** | | Outcome of fall/incident | 1=no injury, 2=minor injury, 3=serious injury | |
| **FALPOS** | | Position of subject | 1=transfer OOB, 2=transfer fm chair/w/c,3=tranfer fm toilet, 4=standing/walking, 7=other | |
| **FALLOC** | | *Location of subject* | 1=bedroom, 2=bathroom, 3=hall, 4=lounge, 5=DR, 6=other, 7=not documented | |
| **FALSR** | | SR-related incident | 0=no, 1=yes | |
| **FALPR** | | PR-related incident | 0=no, 1=yes | |

# APPENDIX M

## INDIVIDUAL SUBJECT PRESSURE ULCER FORM

**Subject ID #:** Date

Complete one form for each pressure ulcer, each week, and when new ulcer identified
Number each pressure ulcer (PREUL sequentially from date of admission

| | | | |
|---|---|---|---|
| **PREUL** | | Pressure Ulcer # | |
| **PREULDATE** | | Date pressure ulcer first; use 4 digit year | |
| **PREULORIG** | | Location where pressure ulcer originated | 0=present on admission to hospital<br>1=developed on study unit, 2=developed on another unit in hospital |
| **PREULST** | | Stage of pressure ulcer | 1=stage I, 2= stage II, 3= stage III, 4=stage IV, 5=unstageable |
| **DCSTAGE** | | Stage of pressure ulcer at time of discharge | 1=stage I, 2= stage II, 3= stage III, 4=stage IV, 5=unstageable |

# APPENDIX N

## NOSOCOMIAL URINARY TRACT INFECTION DATA COLLECTION FORM

Subject ID #

| | | |
|---|---|---|
| UTI as diagnosis on admission | | O=No<br>1=Yes |
| UTI as diagnosis on discharge | | O=No<br>1=Yes |
| Positive Urine Culture | | 0=No<br>1=Yes |
| Date of positive urine culture | | Mm/dd/yy |
| Organism on culture | | |
| Symptoms | | 0=no symptoms, 1=fever alone, 2=pain on urination, 3=fever and pain, 4=other |
| Antibiotic therapy | | 0=no antibiotics, 1=antibiotic therapy |
| List name of antibiotic and duration of course of therapy | | |

# APPENDIX O

## MOBILITY EVALUATION SCALE
(Capezuti et al., 1996)

Subject ID #:
Date:

Collect daily - indicate highest level of mobility during day and evening shifts

| Subject Score (0=no, 1=yes) | Ambulation - Mobility |
|---|---|
| | Ambulates without assistance in hallway (1 point) |
| | Ambulates without assistance in room (2 points) |
| | Ambulates with an assistive device in hallways (3 points) |
| | Ambulates with an assistive device in room (4 points) |
| | Ambulates with a person assist in hallway (5 points) |
| | Ambulates with 2 persons assist in hallways (6 points) |
| | Ambulates with a person assist in room (7 points) |
| | Ambulates with 2 persons assist in room (8 points) |
| | Self-propels wheelchair in hallways (9 points) |
| | Self-propels wheelchair in room (10 points) |
| | Chair/wheelchair-fast, requires a person to assist (11 points) |
| | Chair/wheelchair-fast with restraint (12 points) |
| | Bedbound (13 points) |
| | Bedbound with restrictive siderails (14 points) |
| | Bedbound with restrictive siderails and physical restraint (15 points) |
| | **TOTAL AMBULATION MOBILITY SUBSCORE** |
| | |
| | **Bed Mobility Scale** |
| | Independently moves in bed (1 point) |
| | Requires an assistive device to move in bed (2 points) |
| | Requires on person to move in bed (3 points) |
| | Requires 2 person to move in bed (4 points) |
| | **TOTAL BED MOBILITY SUBSCORE** |
| | |
| | **Transfer Scale** |
| | Independently tranfers out of bed (1 point) |
| | Requires a bed height adjusted to patient's height to transfer oob (2 points) |
| | Requires an assistive device to transfer oob (3 points) |
| | Requires one person to transfer oob (4 points) |
| | Requires 2 persons to transfer oob (5 points) |
| | Requires hoyer lift (or equivalent) to tranfer oob (6 points) |
| | **TOTAL TRANSFER SUBSCORE** |

**TOTAL MOBILITY SCORE :_____**

# APPENDIX P

## STUDY HOSPITAL RESTRAINT POLICY

### Page 1

**NewYork Presbyterian Hospital**
**Site: All Centers**
**Hospital Policy and Procedure Manual**
**Number: R135**
**Page 1 of 18**

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**TITLE: RESTRAINT**

**Table of Contents:**



**This policy applies to all units where patients might need restraints. [For Psychiatric Units licensed by New York State Office of Mental Health see also the policy on Behavioral Health Restraints and Seclusion.]**

**DEFINITION**

A restraint is any method or device attached or adjacent to the patient that he/she cannot easily remove that restricts movement or normal access to one's body.

Types of restraints include:

- Mittens, helmets, tabletops that patients cannot remove easily
  - may be used to protect patient from injury, remind patient not to dislodge tubing, etc.
- Geriatric chairs that patients cannot get out of independently
  - may be used to maintain body alignment, protect patient from falls, maximize patient's freedom and independence
- Full/four siderails
  - may be used to prevent patient from falling out of bed
- Vest restraints
  - may be used to prevent the patient from climbing or falling out of a chair or bed, to provide proper body position and balance, or to facilitate treatment if the patient's behavior/condition (e.g., confusion, physical weakness or debilitation, etc.) so warrants.
- Two-point extremity restraints
  - usually refers to the application of restraints to the wrists/upper extremities; however other extremity restraints may be used as ordered
  - may be used to prevent patient from pulling at or dislodging tubes or catheters or to prevent self-injury
- Four-point extremity restraints
  - refers to restraints to both wrists and both ankles, or when fewer than four extremities are restrained but the patient's own condition renders the remaining extremities unmovable (e.g., a hemiplegic patient whose unaffected limbs are restrained is considered to be in 4-point restraints since s/he is unable to move any extremity). Patients in four-point restraints require close observation.

# APPENDIX P

## STUDY HOSPITAL RESTRAINT POLICY

### Page 2



- usually used for behavioral health management

NOTE: The standards governing the use of restraints are determined by the situation in which the restraint is used, not the location or setting. Restraints are generally used in two types of situations: Behavioral Health Management and Medical, Surgical or Dental Care Management.

- Behavioral Health Management: primarily directed to the protection of the patient against injury to self or others because of an emotional or behavioral disorder. **Example:** A patient with Alzheimer's Disease has a catastrophic reaction, becomes agitated and aggressive, physically attacking a staff member. The patient cannot be calmed by other mechanisms and the behavior presents a danger to self, staff or others. The use of restraints in this situation is for behavioral health reasons, regardless of the location of the patient.
- Medical, Surgical or Dental Care Management: primarily directed to support medical healing associated with acute medical, surgical or dental care. **Example:** A patient becomes confused or disoriented and unable to follow instructions, and attempts to pull out tubes or catheters, interfering with needed care. The use of less restrictive alternatives has been considered or was unsuccessful. The use of restraints in this situation is considered a restraint for the provision of medical-surgical care, regardless of the location of the patient.

Certain protective devices do not require implementation of the restraint standards or orders. These may include:

a. Devices customarily used in conjunction with medical, diagnostic, surgical procedures/treatments or movement/transfer of patients that are considered a regular or usual part of such treatment or procedure, e.g., an armboard applied to one arm to prevent an IV from being dislodged, body restraint during surgery, immobilization of a postoperative patient during the immediate recovery phase (not to exceed 12 hours)

b. Commonly used devices, such as geriatric chairs that patients **are able to easily remove without assistance.** If such devices cannot be easily removed by the patient, and they are deemed necessary, the restraint protocol must be implemented.

c. Safety restraints for children in cribs, highchairs, playpens or strollers. Siderails when utilized as a developmentally appropriate measure to reduce risk of injury for infants or children. See the Pediatric Safety Protocols.

d. Medically indicated devices that are intended to stabilize a body part, e.g., back brace or splint.

# APPENDIX P

## STUDY HOSPITAL RESTRAINT POLICY

### Page 3

**NewYork Presbyterian Hospital**
**Site: All Centers**
**Hospital Policy and Procedure Manual**
**Number: R135**
**Page 3 of 18**

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**APPLICABILITY:**

All Physicians, Nursing Staff and appropriately trained staff

**PURPOSE:**

To provide protection from self-injury, injury to others and from interruption of care and treatment.

**POLICY:**

1. The use of restraints is a patients' rights issue and the benefits are weighed against the patient's inherent right to be free from restraint. Maintaining the patient's rights, dignity and well-being are a primary consideration when restraints are used. Whenever possible early identification of risks factors and prevention of patient behavior requiring restraint is encouraged.

2. Less restrictive alternatives are attempted or considered prior to any use of restraints. Restraints are only used when less restrictive devices or alternative interventions are not sufficient. See Appendix: Suggested Alternatives to Restraints.

3. The use of restraints is based on individual patient assessment and limited to clinically justified situations.

4. Special consideration is given to use of restraints with vulnerable populations such as the elderly, the physically and cognitively impaired, and the pediatric and emergency patient. These patients may require additional monitoring or intervention, according to their assessed needs.

5. The reason(s) for using the restraint is explained to the patient or to an appropriate person acting on behalf of the patient to the extent feasible depending upon the emergency nature of the use of the restraint, including the conditions/ situation required for removal of the restraint.

6. Restraints are initiated by a MD/NP/RN and applied by competent individuals who has received appropriate training. Staff receives ongoing education related to the use of restraints, including annual assessment of competency.

7. Use of restraints is monitored through the hospital's performance improvement process.

8. Restraints require the written order of a physician/appropriately credentialed professional who has conducted a personal examination of the patient.

# APPENDIX P

## Page 4

## STUDY HOSPITAL RESTRAINT POLICY



a) For **Medical/Surgical/Dental Management**: An MD/appropriately credentialed professional must write an order based on their examination of the patient within 24 hours.

b) For **Behavioral Health Care Management**: An MD/appropriately credentialed professional must write an order based on their examination of the patient within 1 hour after initiation of restraints.

c) Restraint orders must be time-limited and specific to the patient's assessed status.

d) Restraint orders must include the following components:
- the DATE the order is written
- the TIME the order is written
- the TYPE of restraint to be used
- the AMOUNT OF TIME THE PATIENT IS TO BE RESTRAINED, not to exceed 4 hours for 4-point restraints; not to exceed 24 hours for all other restraints. For Behavioral Health Management, not to exceed 4 hours for adults, 2 hours for ages 9-17 and 1 hour for under age 9.
- the patient's BEHAVIOR or CONDITION requiring the use of restraints
- the specific REASON the restraint is being ordered for the patient
- the physician/appropriately credentialed professional's signature and code#.

9. The required components of restraint orders have been incorporated into the computerized order entry program. For paper orders, a preprinted sticker that includes the required components is used for writing restraint orders. The sticker is affixed to the Doctor's Order Sheet and completed by the physician/appropriately-credentialed professional. Handwritten orders without the sticker cannot be implemented. In Behavioral Health the order for behavioral management is written on the Restraint/Seclusion Flowsheet. Orders for medical surgical management in behavioral health are written on the restraint order sticker.

# APPENDIX P

## STUDY HOSPITAL RESTRAINT POLICY

### Page 5

**NewYork Presbyterian Hospital**
**Site: All Centers**
**Hospital Policy and Procedure Manual**
**Number: R135**
**Page 5 of 18**

---

| **RESTRAINT ORDER** | |
|---|---|
| **1. DATE:** _____ | **2. TIME:** _____**AM** _____**PM** |
| **3. Behavior/condition requiring restraint (Choose A or B):** | |
| **A. Medical Surgical Dental Management:**<br>❑ Agitation/restlessness/confusion<br>❑ Attempts to interfere with treatment/medical devices<br>❑ Other (specify) _____<br>**Type and Duration:**<br>(Record time limit if less hours desired)<br>❑ Full/four siderails for 24 hours (or)_____ hours *(not to exceed 24 hours)*<br>❑ Vest restraint for 24 hours (or)_____ hours *(not to exceed 24 hours)*<br>❑ 2-point wrist for 24 hours (or)_____ hours *(not to exceed 24 hours)*<br>❑ 4-point *(not to exceed 4 hours)*<br>❑ Other: _____ for 24 hours (or)_____ hours *(not to exceed 24 hours)* | **B. Behavioral Health Management:**<br>❑ Physically assaultive/combative<br>❑ Attempts to injure self or others<br>❑ Other (specify) _____<br>**Type and duration of restraint**<br>**Type:**<br>❑ Full/four siderails<br>❑ Vest restraint<br>❑ 2-point wrist<br>❑ 4-point<br>❑ Other: _____<br>**Duration:**<br>❑ Not to exceed 4 hours (18 yrs and older)<br>❑ Not to exceed 2 hours (9-17 yrs)<br>❑ Not to exceed 1 hour (< 9years old) |

10. If a patient requires the use of restraints beyond the time limit of an order, the physician/appropriately-credentialed professional must reassess the patient and enter/place a complete new order, including all of the required components listed above.

11. Restraints may be applied by or under the supervision and direction of a registered professional nurse when the nurse believes that a patient or others may be in imminent danger of injury.
    a. In the event of such emergency application of restraints, the responsible physician/appropriately credentialed professional must be summoned immediately to perform an assessment of the patient and write the order for restraint if needed.
    b. Pending the arrival of a physician/appropriately credentialed professional the patient will be kept under continuous supervision as warranted by his/her condition **and type of restraint applied**, i.e., sufficient supervision to protect the patient from harm due to the application of the particular type of restraint, as defined in the restraint protocol in this document. Constant direct observation is not required unless the patient's condition warrants this level of intervention.

12. When used, restraints are removed at the earliest possible time.
    a. A registered professional nurse may release a patient from restraints prior to the order's expiration time if the patient's condition so warrants, i.e., when the patient no longer exhibits the behaviors for which s/he was placed in restraints or the reason for the restraints no longer exists.

# APPENDIX P

## STUDY HOSPITAL RESTRAINT POLICY

### Page 6



b. When a restraint is removed prior to the order's expiration time, that episode of restraint is finished; if it later becomes necessary to reapply the restraint, **a complete new order is required**.

13. While in restraints, the patient is observed and assessed as stated in the restraint protocol and his/her physical needs, privacy, comfort and safety are attended to.
    - For Medical/Surgical/Dental management, documentation of observation of the patient's condition including any significant changes in health status is done at least every 15 minutes for 4-point restraints, at least every 30 minutes for 2-point or vest restraints and at least every 2 hours for all other types of restraints. More frequent observation is done according to nursing judgment or as per physician/appropriately credentialed professional's order.
    - All patients in restraints who are in isolation rooms must be observed every 30 minutes or more frequently if indicated.
    - Patients in 4-point restraints require continuous observation.
    - All patients in restraints for Behavioral Health management require observations documented every 15 minutes, and are maintained on continuous observation.
    - The documented observation need not be conducted by a registered professional nurse. A licensed practical nurse, patient care technician or nurses' aide/attendant with appropriate training can perform this function under the general supervision of an RN.

**PROCEDURE:**

A. VEST RESTRAINT (Criss-Cross Vest)

- Vest restraints may not be applied over a chest or abdominal drainage tube.
- Careful application of the vest restraint and subsequent observation of the patient must be done to ensure that placement of the vest restraint does not constrict the neck, axilla or waist.
- Patients are not to be restrained in the prone position.
- The HOB should be elevated at least 30° unless contraindicated.
- Two (upper) siderails should be up when patient is in vest restraint.

A1. Select vest restraint of appropriate size for comfort and safety.

A2. Have patient slip arms through arm holes of vest. Criss-Cross type vest should always criss-cross in the front.

A3. Adjust waist straps for snug but comfortable fit.

A4. Tie free ends to each side of frame of bed. Be sure that ends have been placed between mattress and siderails prior to tying and that ties cannot be easily untied by patient. Do not anchor restraints to siderails. If patient is in a chair,

# APPENDIX Q

## INDIVIDUAL SUBJECT RESTRICTIVE DEVICE FORM

Subject ID #:

| Hospital Day # | Date | Location | Position | Source | Restrained? | Type | Restricitive Siderails? | |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |

| KEY | | | | | |
|---|---|---|---|---|---|
| Hospital Day # | | | | | |
| Date | MM/DD/YYYY | | | | |
| Location | 1= study unit | 2=ICU | 3=other | | |
| Position | 1=bed | 2=chair | 3=other | | |
| Source | 1=medical record | 2=observations | 3=interview | 4=combination | |
| Restrained? | 0=No | 1=Yes | | | |
| Type (if no = .) | 1=wrist | 2=belt | 3=vest | 4=ankle | 5=combination |
| Restricitive Siderails? | 0=No | 1=Yes | | | |

IF GREATER THAN 10 DAYS LOS - USE SECOND SHEET AND CORRECT HOSPITAL DAY #

# APPENDIX R

## INDIVIDUAL SUBJECT PSYCHOACTIVE DRUG USE

**Subject ID #:**

| Psychoactive Drug Name/Order | Category | Dates Given | PRN | ADD | MDD | #DO | #DA |
|---|---|---|---|---|---|---|---|
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| KEY | | | | | |
|---|---|---|---|---|---|
| **Category** | 1=sedative-hypnotic; 2=antipsychotics, 3=antianxiety; 4=anti-depressant; 5=pain relieving drug | | | | |
| **PRN** | 0=no; 1=yes | | | | |
| **ADD** | average daily dose for days administered | | | | |
| **MDD** | maximum daily dose for days administered | | | | |
| **#DO** | # days ordered | | | | |
| **#DA** | # days administered | | | | |

APPENDIX S

INDWELLING URINARY CATHETER DATA COLLECTION FORM
ID #_____ Date Collected _____

| | | |
|---|---|---|
| Indwelling Urinary Catheter | | 0 = no 1 = yes |
| Place inserted | | 1 = ED 2 = study unit 3 = other unit 4 = diagnostic testing area 5 = in place on admission 6 = OR |
| Dwell time | | # hours |
| Reason for catheter | | 1 = urinary retention 2 = fluid balance management 3 = neurogenic bladder 4 = diagnostic testing/procedure 5 = bladder irrigation 6 = urologic diagnosis 7 = other 8 = no reason documented |
| Was catheter reinserted | | 0 = no 1 = yes |
| Place reinserted | | 1 = ED 2 = study unit 3 = other unit 4 = diagnostic testing area 5 = in place on admission 6 = OR |
| Dwell time | | # hours |
| Reason for reinsertion | | 1 = urinary retention 2 = fluid balance management 3 = neurogenic bladder 4 = diagnostic testing/procedure 5 = bladder irrigation 6 = urologic diagnosis 7 = other 8 = no reason documented |

# APPENDIX T

## DAILY UNIT CENSUS AND STAFFING

| Date | Unit | Patient Census | #RN 7a-7p | #NA 7a-7p | #RN 7p-7a | #NA 7p-7a |
|---|---|---|---|---|---|---|
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# APPENDIX U

## APPROVAL LETTERS FROM INSTITUTIONAL REVIEW BOARDS

**New York University**
*A private university in the public service*

University Committee on Activities Involving Human Subjects

15 Washington Place, Apt. 1-A
New York, NY 10003-6657
Telephone: (212) 998-4808
Fax: (212) 995-4304
E-mail: human.subjects@nyu.edu
Internet: www.nyu.edu/ucaihs

**MEMORANDUM**

**TO:** Sharon Stahl Wexler

**FROM:** Jan Blustein, M.D., Ph.D., Chair
University Committee on Activities Involving Human Subjects

**DATE:** 7/5/2006

**RE:** HS #5451, "A Comparison of Nurse Sensitive Outcomes in Acute Care for the Elderly (ACE) Units and Regular Inpatient Medical Units" (DENTAL/College of Nursing, no agency; diss., *approved* 06/30/2006)

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The above-referenced protocol has been approved by the University Committee on Activities Involving Human Subjects for the project year:

06/30/2006 to 04/18/2007

Please note the following:

- Please submit a copy of your New York Presbyterian approval letter once you receive it.
- **If your study uses written consent, the approved, stamped versions are attached. You are required to use these forms for all recruitment.**
- Where consent forms are used, subjects must sign and must be given a copy (without signature) of the UCAIHS current stamped consent form before the subjects' participation.
- All data, as well as the investigator's copies of the signed consent forms, must be retained by the principal investigator for a period of at least three years following the termination of the project.
- If additional sites will be incorporated, **letters of approval from cooperating institution IRBs or other approvals for sites without an IRB must be submitted.**
- Should you wish to **make changes to the Committee-approved procedures**, the following materials must be submitted for Committee review and be approved by the Committee prior to being instituted:
  - **a description of proposed revisions**;
  - any **new or revised material**, such as recruitment fliers, letters or statements to subjects, or consent forms; and
  - copies of **approval letters from cooperating institutional IRBs,** *if applicable*.
- Should you wish to **conduct research for this study beyond 04/18/2007,** the following materials must be submitted for Committee review:
  - **"Continuing Review Progress Report"** (available from the UCAIHS website at www.nyu.edu/ucaihs);
  - **current stamped consent form(s) and an unstamped original consent form(s);**
  - *if applicable*, **updated letters of approval from cooperating institutions;** and
  - *if applicable*, any **new or revised material**, such as revised procedures, recruitment methods, statements to subjects, or consent forms.

If you have any questions regarding the Committee's requirements, please contact the UCAIHS office at 212-998-4808 or human.subjects@nyu.edu.

cc: Dr. Elizabeth Capezuti—Faculty Sponsor

CORNELL
UNIVERSITY

Joan and Sanford I. Weill
Medical College

Institutional Review Board
Mail: 1300 York Avenue, Box 5
New York, NY 10021
Office: 425 East 61st Street, DV-301
New York, NY 10021

Phone: 212 821-0577, 0518
Fax: 212 821-0580, 0660
E-mail: irb@med.cornell.edu

September 18, 2006

**Eugenia Siegler, MD**
Professor of Medicine
Geriatrics and Gerontology

**Re: Protocol #0606008616**

Dear Dr. Siegler:

As Chairman of The Committee on Human Rights in Research IRB II, I have reviewed your response to the non-substantive issues raised by the Committee for the protocol entitled **"A Comparison of Nurse Sensitive Outcomes of Acute Care for the Elderly Units and Regular Inpatient Medical Units,** Study Information Sheet, Telephone Scripts, Data Collection Forms." The protocol and consent form stand approved for the following period: **FROM:** September 14, 2006 **TO:** August 13, 2007.

IRB approval is required in order to conduct research involving human subjects or their tissues. However, IRB approval to conduct a study does not supercede hospital policy which must be adhered to. If your protocol involves the use of tissue specimens, please familiarize yourself with Section 4.4 of the hospital By-Laws which states: "Section 4.4 Specimens Removed During Resective Surgery". All specimens removed during resective surgical and diagnostic procedures shall be sent to Pathology Service. The Pathology service shall make such examinations as it may consider necessary to arrive at a pathological diagnosis. The pathologist making the diagnosis shall describe his or her findings in a report which shall be authenticated by an attending pathologist. A copy of the pathology report shall be filed with the patient's medical record.

**Investigators must notify the NYPH/WMC IRB in writing within 5 working days of the occurrence of all SERIOUS and/or UNEXPECTED adverse events (AEs) in NYPH-WMC research subjects and research subjects at other sites (if this is a multi-site study), whether or not the events are considered study related.** In addition there may be reporting requirements of the study sponsor and/or regulatory agencies. The reporting requirements of the different bodies may differ both with regard to what events must be reported and the required timing of reports. You must acquaint yourself and abide by all reporting requirements applicable to this study. Provide the IRB with copies of all adverse event reports, which you submit, to the sponsor or to a regulatory agency.

Forms for continuing review of this protocol will be sent to you in advance of the expiration date. The continuing review forms must be filed with the IRB sufficiently early to permit timely review and approval if the project is to continue beyond the period for which it has been approved.

If your investigation undergoes change in design or if unanticipated hazardous conditions emerge affecting the rights or welfare of the human subjects involved, you must re-submit your protocol to the IRB (and to the Scientific Advisory Committee, if the Clinical Research Center is used). It is your responsibility to request such review prior to initiation of any change in the study design of your project. Potential HHS and legal penalties for not doing so are severe. In addition, a new consent must be obtained from the subject after he or she is made aware of the changed conditions. Any changes in the physicians or staff participating in the study must be reported to the IRB prior to initiation.

**Keep signed consent forms (IRB approved stamped form(s) must be used) permanently in the subject's hospital chart as a matter of record that the required disclosure was made.** If the subject has no New York Presbyterian Hospital chart, you are responsible for retaining such signed forms in your personal research files.

Thank you for your cooperation, and best wishes for a productive and rewarding research project.

Sincerely,

David A. Behrman, D.M.D.
Chairman

The International Committee of Medical Journal Editors (ICMJE) has established a requirement that all clinical trials be entered in a public registry before the onset of patient enrollment as a condition of consideration for publication. Additional information may be found at http://clinicaltrials.gov/ and at http://www.icmje.org/clin_trialup.htm

Please contact the Protocol Registration System ("PRS") administrator by e-mail at ICR@med.cornell.edu to set up a PRS user account to register new and ongoing clinical trials. The e-mail should contain the PIs full name, department, phone number and e-mail address.

IRB # 060608616