Spring 3-16-2017

The Health Status of Older Adults Discharged Home from an Acute Care Hospital: a Descriptive Study

Colleen Chancler
colleen.chancler@student.shu.edu

THE HEALTH STATUS OF OLDER ADULTS DISCHARGED HOME FROM AN ACUTE CARE HOSPITAL: A DESCRIPTIVE STUDY

By

Colleen Chancler

Dissertation committee:

Dr. Genevieve Pinto-Zipp, Chair

Dr. Terrence Cahill

Dr. Laurita Hack

Graduate Program in Health Sciences

Seton Hall University

2017

Submitted in partial fulfillment of the requirements for the degree

Doctor of Philosophy in Health Sciences

Seton Hall University

2017

Seton Hall University

School of Health and Medical Sciences

Department of Interprofessional Health Sciences and Health Administration

Approval of Successful Defense

Doctoral Candidate, Colleen Chancler, has successfully defended and made the required modifications to the text of the doctoral dissertation for Ph.D. during the **Spring Semester 2017**

Dissertation Committee:

Dr. Genevieve Pinto-Zipp, Chair

Dr. Terrence Cahill

Dr. Laurita Hack

Approved by the Dissertation Committee

Dr. Genevieve Pinto-Zipp Genevieve Pinto-Zipp Date: March 16, 2017

Dr. Terrence Cahill Terrence Cahill Date: March 16, 2017

Dr. Laurita Hack Laurita M. Hack Date: March 16, 2017

ACKNOWLEDGEMENTS

It is a humbling experience to be trusted to care for another person. In acute care hospitals, our patients are sick, sometimes scared and depend on the health care providers to heal their bodies and care for their well-being. The patients who could consent to this study did so sometimes to help me, sometimes to help another patient they would never know and sometimes to make sure they had some follow up after the hospital. I will always be grateful for their generosity while they were trying to recover to full health. And I will continue to work in my career to find better solutions for return to health and well-being for older adults who have been in the hospital.

I have said my title of this dissertation should have been "it takes a village" because it sure took a village to help me achieve this accomplishment. A special thanks to my family who have been so supportive, caring, understanding and seemed to know just when to nudge or have that cup of tea with me. Thanks to so many dear friends who encouraged me to hang in/talked me off the ledge, to help me believe I could get this done, and helped me balance all what of life is so that I could progress and improve myself. While my parents may not have been able to witness this occasion, I have felt them with me throughout the journey and heard many times in my heart how proud they were of me.

Special thanks to my dissertation committee members and mentors. To Dr. Zipp who helped me enhance my clinical thinking and become a research clinician. She helped me learn the balance of knowing what can be done and how to accomplish research agendas in a clinical setting. To Dr. Cahill who helped broaden my experience with his vision of interdisciplinary

education and research models. Having a broad representation of disciplines at SHU has widened my thinking and me be a better PT. And to Dr. Hack, who always helped me understand my potential and the importance of what I was doing. She guided me through many years of study, led me refine my thoughts with lots of discussion, questions and large iced tea, and reminds me now, this is not the end but the beginning of a new chapter of my PT career. And I look forward to what those chapters will read.

The Health Status of Older Adults Discharged Home from an Acute Care Hospital: a Descriptive Study

Colleen Chancler

Seton Hall University

Dr. Genevieve Pinto-Zipp

Abstract

Background. Hospitalized older adults are susceptible to adverse events reporting decreased activity, falls and dependence in activities of daily living after hospitalization. Falls incidence is higher among those in the hospital compared to community dwelling older adults. Research has demonstrated the rate of readmission to the hospital for older adults is essentially unchanged at approximately 20% over the last 20 years despite attempts to provide meaningful interventions while patients are in the hospital or once they return home.

Objective. The study objectives were to describe the health status of older adults discharged home from a hospital, to explore the impact of health status of older adults discharged home from a hospital and to examine potential factors that influence readmission back to the hospital within 30 days of discharge.

Design. This study was an exploratory, descriptive design.

Methods. Demographic and medical characteristics were obtained from the electronic medical record for 73 participants. Participants completed the WHO QOL BREF and the 4 MWT. After discharge, each participant was contacted weekly by phone for a total of 4 weeks or until readmission to a hospital or death to answer structured questions.

Results. The mean age for the total sample was 74.6 ± 7.2 years old. Sixty-seven percent of the sample was male and 88% of the sample was white. Fourteen participants (19.2%) were

readmitted to the hospital within 30 days and of those, 21.4% were 85+ years old and had a medical diagnosis for admission 71.4% of the time. Readmitted participants walked 20% slower (0.49 m/s) compared to those not readmitted (0.59m/s). The WHO QOL BREF scores comparing time of discharge to 30 days after discharge for those not readmitted hospital differed significantly only for domain 4/environment ($W= 416$, $z= 2.651$, $p= 0.009$). Using multiple regression analysis, 93% of the readmission variance could be explained by combining domain 3/social, domain 4/environment and the 4 MWT score.

Limitations. The participants were recruited from a single hospital. The sample size was underpowered and did not present diversity regarding ethnicity or sex. The participants all had a completed physical therapy evaluation prior to enrollment and this may have biased the results. None of the participants once discharged had measured outcomes other than by self-report with follow up phone calls.

Conclusions. The study indicates traditional medical and demographic characteristics do not sufficiently describe the health status of older adults discharged home from a hospital and that inclusion of biopsychological factors is meaningful. Those readmitted to the hospital were more likely to have an admission diagnosis related to a medical condition and age did seem to be a factor.

Key words: gait speed, WHO QOL BREF, readmission, older adult, hospital.

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Chapter I

BACKGROUND OF THE PROBLEM

Older adults admitted to hospitals are at risk of complications related to the medical course of care as well as secondary adverse effects associated with the actual hospitalization. Preventable adverse events such as infection, falls and medication errors have been documented in the literature with special attention being paid to Medicare beneficiaries (Jencks, Williams & Coleman, 2009; Kandilov, Coomer & Dalton, 2014). Studies in older adults have noted an increased risk of falls during and after the hospitalization (Cummings, Nevitt & Kidd, 1988; Hitcho, et al., 2004), increased risk of re-admission for the same or similar medical concerns (Courtney, et al., 2011; Fox, et al., 2013; Herrin, et al., 2014), added costs to the healthcare system and patient/consumer and at times death during and after acute hospitalizations (Jencks, et al., 2009; Krumholtz, 2013; Kandilov, et al., 2014; Gorina, Pratt, Kramarow & Elgaddal, 2015). Interventions for known complications during the hospital stay and after hospital discharge have been implemented with anticipation of improving the hospital course and the post-acute care hospital discharge, however, to date, few interventions have had any lasting effect in decreasing or changing the incidence of adverse events, such as falls, in the actual hospital stay or once a patient is discharged home (Pardessus, et al., 2002; Coleman, Mahoney & Parry, 2005; Spetz, Jacobs & Hatler, 2007; Barker, et al., 2016) or the readmission rate (Jencks et al., 2009; Gorina, et al., 2015).

Falls can result in a decline in one's ability to walk and remain independent with self-care tasks (Gaebler, 1993; Hitcho, et al., 2004). Additionally, falls in older adults can negatively impact confidence related to functional abilities and increase fear of future falls (Roudsari, Ebel, Corso, Molinari, Koepsell, 2005; Mahoney, et al., 2000). Mahoney et al. (2000) followed

patients who were considered high-risk patients and were discharged to home from a hospital in Wisconsin for a period of 13 weeks post discharge. High risk patients were defined as patients that would need home care services upon discharge (Mahoney et al., 2000). The purpose of this study was to see if fall risk declines over time in the community setting as one continues to recover from the acute medical illness (Mahoney et al., 2000). In this study, injuries related to falls accounted for 15% of readmission reasons to the hospital within the first month, 2.4 % of readmission reasons in the second month and 4.5% of readmission reasons in the third month (Mahoney et al., 2000). Identifying factors present prior to and after hospital admission in patients at high risk for falls and functional decline may aide in preventing future falls with the provision of proper interventions (Mahoney et al., 2000).

Falls risk in community living elders has been studied for many years. In 1988, Tinetti examined risk factors related to falling for those ≥ 75 years of age. Results of risk analysis demonstrated that in these older adults, 32% fell at least once per year and of those who fell, 24% had a serious injury (Tinetti, Speechley & Ginter, 1988). From this study, the greatest risk factors associated with falling included: use of sedatives, changes in cognitive status, disabilities of the lower extremity and abnormal gait and balance. If and older adult had one of the risk factors, then there was an 8% greater chance of falling, but, when there were four or more risk factors present, the likelihood of falling increased to 78% (Tinetti et al., 1988). Tinetti and colleagues (1988) described that most falls occur within the home setting and that there was an increased risk of falling with increased age. In a clinical review presented in the New England Journal of Medicine, Tinetti (2003) summarized the available data on falls risk and interventions for older persons living in the community. The summary showed no single cause of falls, but pointed to an interaction effect amongst impairments of the older person including: depression,

cognitive changes, balance and vision changes, gait and strength problems of the lower extremity and the use of four or more medications (Tinetti, 2003).

While research studies continue to support the link between risk factors and falls, the impact of intervention strategies in reducing falls and fall related injuries is less clear (Tinetti, 2003). A systematic review completed by Coussement, et al. (2008) examined randomized controlled trials as well as controlled trials investigating fall prevention programs. The publication included 8 studies examining falls prevention in acute care and chronic care hospitals. Pooled data did not support that hospital fall prevention programs had the ability to significantly reduce the number of falls or the number of fallers in acute care hospitals but did appear to delay the time to the first fall (Coussement, et al., 2008).

In the case of older persons living at home, studies have investigated the benefit of various interventions in reducing falls. Feder, Cryer, Donovan and Carter (2000) using the best available evidence made recommendations for prevention of falls in persons over 65 years old. The guidelines indicated: a multifaceted approach provides the best result for reduction in fall rates, home assessment was not recommended for all persons over the age of 65 and that modification of risk factors was best introduced after a person had already experienced a fall (Feder, et al., 2000). Feder et al. (2000) further indicated that exercise is a modality commonly included to reduce falls whether a single or multiple modality approach is used.

While, some literature exists providing descriptive statistics of older adults who have been discharged home from a hospital, few studies provide a detailed description of the functional status at the time of discharge or the ability of those in the hospital to recover from a physical and or psychosocial perspective (Covinsky et al., 2003; Kortebein, 2009). Many patients admitted to the hospital do sufficiently recovery from the medical crisis which caused

the hospitalization and can be discharged back to the community, however, the acute medical management while in the hospital does not present the full picture of the recovery process given the complicated and often prolonged recovery period post hospital discharge. Full recovery may not be immediately realized at the time of discharge or at all and may be one of the contributing factors to readmission rates, falls at home, and low self-reported health status (Krumholtz, 2013; Gorina, et al., 2015). Krumholtz (2013) describes this condition of suboptimal recovery as post hospital syndrome which accounts for the acute illness recovery as well as the period immediately post discharge to either home or another level of care. Post hospital syndrome includes a new period of increased risk of additional adverse events not caused by the initial medical condition which warrants medical treatment provided in an acute care hospital (Krumholtz, 2013). Post hospital syndrome is defined as an acquired, transient period of vulnerability, which is influenced by what happened in the hospital and is related to the acute illness (Krumholtz, 2013). At the time of discharge, many patients experience physiologic changes that decrease their overall capacity to respond to new threats to their health and wellness (Krumholtz, 2013). In addition, the acute hospital stay may contribute to a level of physical and mental stress as well as physical deconditioning that imposes new challenges on the patient as they seek to fully recover from the issues surrounding their initial admission (Krumholtz, 2013). An emerging theme in research has sought to explore the effect of the actual hospitalization on the functional status of the patient. Hospital associated deconditioning is now an accepted term to define the loss of function related to declines in ambulation and activities of daily living (ADLs) while in the hospital (Kortebein, 2009). Older adults are more commonly affected by hospital acquired deconditioning (HAD) with reports of up to 1/3 of all older adults experiencing a decline in ambulation and ADL status at the time of discharge from the hospital (Kortebein,

2009). One aspect that can be used to promote quality of life for older adults and thus healthcare effectiveness is to assess and mitigate the effects of HAD for older adults.

In recent years, the Centers for Medicare and Medicaid Services (CMS) have monitored hospital readmissions regarding the cause, timing and subsequent cost to the patient and health system (Jencks, et al., 2009). In a study by Jencks and colleagues (2009), the authors examined readmission to the hospital within 30 days, looking for patterns, relationships and characteristics amongst readmitted patients and/or the hospital they were readmitted to. Using 2003-2004 Medicare database information, Jencks, et al., (2009) reported a hospital readmission rate of 19.6% for all patients.

Few studies have described the health status of older adults who have been discharged home from a hospital by including quality of life survey data or information. A recent article published by Gorina and colleagues (2015) describes older adults in Medicare Fee for Service (FFS) system who are living in in the community but have used the healthcare system for an inpatient hospital admission. The authors include details of the social, physical and medical characteristics of older adults who are hospitalized and the certain characteristics of those same individuals including readmission rate, self-reported health status, and death one year after the initial need for acute hospitalization (Gorina, et al., 2015). Consistent with previous published work with similar classifications of older adult characteristics (Jencks, et al., 2009), Gorina et al. (2015) detail the consistent rate of hospital readmission for older adults in Medicare FFS system which remains about 20-25%, re-admission within 30 days of initial discharge remains about 15-20% and approximately 1/3 of those hospitalized expire while in the hospital (Gorina, et al., 2015). Unfortunately, this data analysis of Medicare FFS entry points does not demonstrate

gains in the healthcare systems ability to assist with health and wellness of older adults who have been admitted to a hospital.

In summary, older adults who live in the community and are admitted to a hospital are at higher risk for complications not only from the medical condition which caused the hospitalization, but also from complications occurring during the hospital stay and the period of prolonged recovery after they return home (Gill et al., 2001; Gorina, et al., 2015; Greysen, 2016). Although healthcare has begun to address effective transitions for older adults from one setting to another, readmission and more serious medical consequences, including death are real factors that continue to persist (Greysen, Stijacic Cenzer, Auerbach & Covinsky, 2015: Greysen, 2016). While certain studies have identified risk factors of falling in the hospital and once home, these studies have not been able to pinpoint with accuracy which of the known risk factors has contributed more to the actual fall events. In addition, published articles and commentaries using the Centers for Medicare and Medicaid Services (CMS) databases have documented the characteristics of older adults once home, but the data supports little has changed for older adults managing their own transitions from the hospital to the home specific to readmissions, further illness and stress related factors (Anderson & Steinberg, 1984; Ginsburg & Carter, 1986; Courtney, et al., 2011). Modifications of our current healthcare model are urgently needed to mitigate the inefficient and ineffective current discharge process. Effective intervention strategies to prepare for hospital discharge may be an effective and efficient means to prevent adverse medical events, prevent falls and reduce future injuries related to falls, decrease future healthcare resources needed and even prevent functional decline while in the hospital.
Thus, the purpose of this study was to provide a description of the health status of older adults discharged home from an acute care hospital. Health status included elements of the

participants' medical condition(s), functional status and a self-reported quality of life survey. Examination of the health status elements may provide direction to guide future interventions better targeted to reduce the injury related to falls and reduce the negative effects of hospitalization including decline in functional status and cost to the institution and individual.

Chapter II

REVIEW OF THE LITERATURE

Falls Risk

Older adults living in the community are confronted with various threats to healthy living including falls, hospitalization for fall related injuries and medical conditions and declining functional status due to aging as well as complications from a change in medical health. A significant risk to older adults in the home is unintentional injury due to falls (Ruynan, et al., 2005). Falls are one of the leading causes of home related deaths for those aged 60 or older (Ruynan, et al., 2005) and hospital admission (Gorina, et al., 2015). More research is implicating even the short stay hospitalization with decline in functional status and activities of daily living/ADL (Sager, et al., 1996). The rising concerns of management of continued health for the older adult should be carefully considered and include accurate description of the health conditions including costs, medical conditions and quality of life description from the individuals that compromises a comprehensive view of the physical, psychological and environmental challenges of daily living.

Falls associated with persons 65 years or older are a major health concern in the United States (Roudsari, et al., 2005). Falls have been defined in a variety of ways, but for purposes of this study, a fall will be defined as "an event which results in a person coming to rest inadvertently on the ground or other lower level, other than as a consequence of the following: sustaining a violent blow, loss of consciousness, sudden onset of paralysis as in a stroke, or an epileptic seizure" (Kellogg International Working Group on Prevention of Falls in the Elderly, 1987). Depending on literature cited, approximately one third of older persons living in the community fall annually. The overall cost associated with falls in the United States has been

estimated to the 2004 consumer price index rates at approximately $17, 500 if the faller is hospitalized in an acute care facility with the estimated annual cost of direct medical care provided at approximately $31 billion as of 2004 adjusted rates (Roudsari, et al., 2005). Studies in the United States generally limit cost of falls to direct medical costs.

Similarly, rising health care costs for fallers has been noted in other developed countries such as England and Australia (Murray, Cameron & Cumming, 2007). Hall and Hendrie (2003) in Australia were interested in the total costs associated with falls once the person was discharged home from a hospital setting and for the following three consecutive months post discharge. Total costs calculations were based on medical, allied health and community services received: pharmaceuticals; tests; home modifications; durable medical equipment required and services received from social support services and friends (Hall & Hendrie, 2003). The total cost estimate per participant was approximately $333,648 of which the majority of the expense was associated with hospital costs. This figure places the costs associated with falls in Australia at $24.12 million annually (Hall & Hendrie, 2003) which is less than the total costs calculations for the United States for fall related injuries. In evaluating the burden of the cost, Hall and Hendrie (2003) considered all costs incurred related to the fall incident including doctor's co-pay and community resources costs for activities of daily living such as home cleaning and lawn care which would have previously been completed by the participant. In the current literature, no other study included these associated costs in financial analysis. The authors found that persons discharged home after a hospitalization because of a fall were spending the greatest amount of money on costs associated with personal care and assistance in and for the home. The costs of these services were higher in the first month than the two subsequent months and suggest to the authors that there are long term costs to consider in persons who fall and are hospitalized (Hall &

Hendrie, 2003). While there was a decline in costs over time to the person who fell after the initial first month home, the continued payment for services may indicate that the person likely never regained the initial independence realized prior to the fall. The lack of pre-existing independence adds and additional cost burden to the individual who fell (Hall & Hendrie, 2003). In the United States, there would likely be a larger burden of cost to the consumer as the medical structure in the United States does not provide for the same local, state and federal funding after a fall as did the government health care system in Australia. For instance, in Australia, the cost for health care transportation is subsidized by the government thereby limiting the cost directly incurred by the healthcare consumer to manage their health care (Hall & Hendrie, 2003). In addition to the issues surrounding the cost associated with falls and the financial impacts it has on one's health care management, falls also influence one's quality of life. Thus, identifying the likelihood of a person sustaining a fall can be monumental in ensuring one's ability to be functionally independent, so understanding the factors that contribute to falls is imperative.

Patient Profile

Patient related characteristics such as the age of the faller further influences health care cost especially in the hospital setting where health care cost for elderly patients frequently can be higher. In a study completed in Singapore, Lim and colleagues (2006) looked at factors of elders admitted to a hospital that cause delay in discharge. The average age of these patients was 84 years old and 55.5% were women and less than 25% did not have assistance or support upon discharge home. Since the length of stay can reflect the total cost of the hospital stay, the authors used data from the diagnostic related group (DRG) calculation of length of stay which is based on the admission diagnosis and condition of the patient to produce an assigned number of predicted days for the hospital stay (Lim, Doshi, Castasus, Lim & Mamun, 2006). In this study,

older patients from a geriatric medicine ward had a longer length of stay than the predicted length of stay based on the diagnostic related group (DRG) if there was the presence of an infection, loss of function while in the hospital compared to baseline function, the presence of a fall or confusion (Lim et al., 2006). Increased length of stay was associated with both an increase in the overall hospital costs and poor outcomes like a decline in functional status. Likewise, Wu, Sahadevan and Ding (2006) performed a retrospective cohort study to examine discharge status from a geriatric unit and outcomes related to function three months after discharge. Independent predictors of functional decline at the time of discharge from the hospital included number of falls, pre-admission independence level, and length of stay. At the three month follow up visit, 29.6% of the elderly population demonstrated functional decline. In the elderly population, prolonged length of hospital stay adds to the cost of healthcare and adds risk for other medical complications (Lim et al., 2006; Wu, Sahadevan & Ding, 2006).

The findings of Lim et al. (2006) and Wu, et al. (2006) are supported in other research publications. Rubenstein (2006) evaluated older persons who fell and the consequences of the fall. In this article, Rubenstein (2006) calculates 40% of falls occurring in the home with 1 in 40 of all hospitalized older adults potentially experiencing a fall. Age has been noted to be a significant factor in the injuries following a fall. Someone ≥75 years of age is two times more likely to have an injury associated with a fall than someone ≤65 years old. Rubenstein's (2006) findings support that when there is a longer recovery period following a fall event, there are more hospital costs, greater overall functional decline and greater self-reported restrictions due to post fall anxiety and injuries.

Friedman and colleagues (2008) investigated hospital admission of elderly patients to an Acute Care Elder (ACE) unit in the United States. The primary focus of this research study was

to examine if the fallers residence status prior to admission and adverse events associated with the hospitalization impacted discharge plans. Adverse events associated with hospitalization of elderly patients included functional decline, delirium and falls (Friedman, Mendelson, Bingham & McCann, 2008). Friedman's et al. (2008) research findings support that elderly patients admitted from assisted living facilities and nursing homes are more likely to experience complications, including functional decline and falls compared to elderly persons admitted from the home setting. While residence prior to admission was not an independent predictor of poor outcomes, the statistical analysis did support that this may be a marker for risk of increased costs and functional decline in elderly patients (Friedman et al., 2008). Rubenstein (2006) noted that if someone was a repeated faller in the hospital, the numbers of repeat falls was a positive predictor of discharge to a nursing home.

Falls can result in a decline in one's ability to walk and remain independent with self-care tasks. Additionally, falls negatively impact one's confidence related to their functional abilities and increases their fear of future falls (Roudsari, et al., 2005; Mahoney, et al., 2000). Mahoney et al. (2000) used a modeled approach to examine the potential decline in falls risk of those admitted to an acute care hospital over a three-month course of time. Two models were used in the analysis: model one examined only pre-hospital factors and model two examined pre- and post-hospital factors and hospital predictors in relation to functional outcomes and fall incidence. Pre-hospital factors included dependence in more than one activity of daily living (ADL), use of a standard walker indoors, history of falls and previous admissions to the hospital. Post-discharge risk factors for falls included certain antidepressant medications, poor balance and suspected delirium (Mahoney et al., 2000). In Mahoney's research (2000), factors present prior to and after hospital admission could identify patients at high risk for falls and functional decline.

Recently, Russell and colleagues (2010) collected data from older persons presenting to the emergency department (ED) because of a fall and who were discharged directly home. In this study, the authors used a home-based assessment which combined known assessments to target fall risk after the ED clearance to determine the functional level and future fall risk of those still living in the home. The average age of the person was 76.9 years old and approximately 47% lived alone. Home assessment occurred up to 20 days after discharge from the ED. The home risk assessment included: functional assessment, medication use, home environment assessment, objective measures for balance, depression assessment and falls efficacy. Results indicate that those discharged home from the ED after a fall are more likely to fall again once home at a rate of 7.3/1000 days compared to 1.9/1000 days if there was no ED visit for a fall. Of the patients who fell and visited the ED, 91% present with injury, 32% demonstrate continued decline in function once discharged home as measured by change in assistance level needed for activities of daily living and had a significantly greater risk of falling again in the next twelve months (Russell, et al., 2006).

In summary, the current findings support that falls remain a significant cost to society and the person both from a financial and quality of life perspective. A fall event for an older person places that person at greater risk of future functional decline and increases the likelihood of future use of healthcare services. Appropriate tests and measures to identify fallers may enhance the risk factor assessments to determine interventions to decrease falls and fall injuries. An accurate model is needed to identify patients in the hospital or persons in the community likely to fall since impairments are likely to be present in the older population.

Clinical presentation of hospitalized older adults

Falls of older adults in the hospital remain problematic and establishing a certain profile of those patients is elusive. Researchers have offered various explanations for potential causes of falls. Falls occur frequently in the elderly population in the hospital setting (Corsinovi, et al., 2009; Vassallo, Azeem, Pirwani, Sharma & Allen, 2000; Schwendimann, Milisen, Buhler &De, 2006). When trying to establish a patient profile in the acute care setting, researchers examine many factors which includes patient characteristics, the actual hospital setting, the location of the fall event, the circumstances of the fall or the patient activity surrounding the fall (Kelly & Dowling, 2004; Corsinovi, et al., 2009; Vassallo, Vignaraja, Sharma, Briggs & Allen, 2004; Gaebler, 1993; Stevenson, Mills, Welin & Beal, 1998; Vassallo, et al., 2000; Schwendimann, et al., 2006). Medication use and medical diagnoses have been linked to falls while in the hospital (Vassallo, et al., 2006). To date there is no single factor or combination of factors that can predict the fall event of the patient in the hospital (Kelly & Dowling, 2004; Stevenson, et al., 1998). The lack of a predictive model for falls or a patient profile of a person most likely to fall further complicates the ability to design and implement a strategy for fall prevention in the hospital setting.

Patient characteristics are often cited in association with fall incidence and the severity of any injury associated with the fall. Corsinovi et al. (2009) examined 340 patients admitted to an Italian Geriatric Ward at a University Hospital. Independent predictors of falls included age, presence of delirium, diabetes, balance deficits and polypharmacy. In his analysis, those who fell had longer lengths of stay in the hospital and were more likely discharged to nursing homes after the acute care hospital stay (Corsinovi, et al., 2009). Interestingly, those who fell experienced the first fall within the first few days of admission (3-5 days), with greater

occurrence in their room and specifically related to bathroom needs. These findings are consistent with other studies which identified impairments of gait instability, urinary incontinence, previous falls, mental status changes and medications as likely to increase the risk of falling while in the hospital (Stevenson, et al., 1998; Oliver, Daly, Martin & McMurdo, 2004).

Vassallo et al. (2000) performed research that supports some of the findings in the Corsinovi study. The prospective study supports the fall event occurred near the bedside, in the room and likely while the patient was attempting some type of ADL. In another study by Vassallo et al. (2004), predictors of falls include confusion, hearing deficits, use of certain medications, in particular tranquilizers, and decrease strength in the lower extremities. An independent predictor of falls in this study was unsafe gait (Vassallo et al., 2004). The patient characteristics are similar but neither of the studies produced the same profile of characteristics despite examination of comparable patients in the hospital setting.

Regardless of the hospital patients included, no two studies have produced the same patient profile (Stevenson, et al., 1998). While decrease in functional mobility, performance of unsupervised ADL's, culprit medications and change in mental status are mentioned in several articles, there remains no single patient profile of a patient who is at greatest risk of falling. Therefore, at this time the certain known risk factors that indicate an increase in the likelihood of falls should be considered and addressed for best patient outcomes. The Stevenson article (1998) produces a patient profile but like other researchers, this profile cannot be exactly replicated in other institutions for the same results. The variability of the characteristics associated with falls limits the ability of the healthcare provider to provide the best protection against the fall event or best understand the short term and long term implications of the fall on the patient's quality of life.

Falls related research has a greater focus on older persons either living in the community or hospitalized older adults. There are a few articles which focus on older adults recently discharged from the hospital to home. Gaebler (1993) examined patient falls in the hospital for those who were single fallers and those who were recurrent fallers. In this study, a person who fell once was likely experiencing a state of medical decline and the fall event likely occurred in the room while the person was moving to or from the bed. While a patient who had more than a single fall presented with decreased vision and had received sedation after the initial fall (Gaebler, 1993). The person with multiple falls in the hospital course had an increased length of stay and would likely be discharged to a nursing home. In both patient profiles either for single or multiple falls, the patient demonstrated decrease in functional ability and changes in medical status (Gaebler, 1993). These findings are consistent with previously presented studies, however the notation of the clinical decline at the time of the fall and the vision problems are newly included in this patient profile.

Vassallo et al. (2000) examined the configuration of the hospital ward as a potential link to fall events in the acute care setting. This prospective study examined two configurations of hospital floors: longitudinal versus a nuclear ward set configuration. In the longitudinal setting, the nurse can view only 20% of the patients from the nursing station. In the nuclear ward set up, the nurse can view approximately 85% of the patients from the nursing station (Vassallo, et al., 2000). Each ward configuration presented different circumstances related to fall events but the actual lay out could not be isolated as the single contributing factor of the fall. In the longitudinal set up, falls occurred most frequently when the patient was trying to perform ADL's and occurred near the bed (Vassallo, et al., 2000). In the nuclear ward set up, falls occurred most frequently in the bathroom and away from the room (Vassallo, et al., 2000). Complete analysis

of all the data reveal when a fall occurs in the hospital setting, intrinsic causes like mobility and balance were more likely to be linked to the fall event. The authors suggest that with several intrinsic factors likely to contribute to a fall, attention to the patient and their functional status should be included in the examination and intervention. Less attention needs to be paid to the actual environment or external factors for those likely to fall in the hospital (Vassallo, et al., 2000).

The concern for older patients when they are in the hospital is that they are more likely to experience a functional decline as the length of time in the hospital increases (Vassallo, et al., 2004). Functional decline is described as a change in ability to walk and transfer during the hospital stay compared to the patient's ability prior to the hospitalization. Functional decline of a patient has been linked to increase risk of fall while in the hospital (Kelly & Dowling, 2004). The combination of decline in functional mobility and the increased risk of falls will make it less likely that a patient will be able to return home safely when medically stable and ready for hospital discharge.

As Kelly & Dowling (2004) stress in their article, the cause of falls is not the result of a single factor but the combination of factors. Some falls will result in little to no injury while other falls have an injury component. Vassallo et al. (2004) examined the relationship of falls to injury among hospital inpatients with impaired mobility and what characteristics were present in patients who fell in the hospital. While a high percentage of falls was associated with injury, only 2% of those injuries were serious. When comparing patients who fell to patients who did not fall, the researchers were unable to identify specific characteristics that would indicate an injurious from a non-injurious fall. Murray, et al. (2007) examined the consequence of falls that result in proximal femur fracture. When patients fell in the hospital with a resulting femur

fracture, those patients had worse outcomes compared to persons who had similar fractures that occurred because of a fall in the community setting. The patients who sustained a fracture in the hospital had higher morbidity, were less likely to return to preadmission ambulation or activity of daily living status and had an increased length of stay in the hospital (Murray, et al., 2007). In this research study, the patient profile for older adults who fell in the hospital and suffered a femoral fracture differed from the older adult who suffered a femoral fracture in the community. The older adult in the hospital likely had a more complicated medical history, had a previous fracture due to osteoporosis and had a previous hospital fall (Murray, et al., 2007). Falls in the hospital can increase healthcare costs but as this research indicates, falls in the hospital can also result in poor outcomes for the patient.

Currently, there is not a consistent patient profile recognized by physical therapists or any other healthcare provider to identify a patient as "at risk to fall" in the hospital setting (McFarlane-Kolb, 2004). There are however, existing tests and measures that have been used and validated by individual hospitals to identify patients likely to fall in their setting (Vassallo, et al., 2004).

Interventions for Falls

Several hospital based intervention programs have been designed and tested for effectiveness in reducing the incidence and severity of injury related to falls of older people. While no one program has produced the desired outcome of significantly decreasing falls and reducing the injuries associated with falls, many programs have demonstrated an impact on these negative outcomes. This evidence further supports that multifactorial strategies have a place in reduction of fall related injury in older persons in the hospital.

Murphy, Labonte, Kloch & Houser (2008) implemented a strategic plan, in a tertiary hospital in units with a negative 3-year history surround fall, to positively affect the fall rates and or injuries associated with falls. The strategic plan consisted of a comprehensive program to change the knowledge, signage, equipment use, toileting schedule and assistance for patient transfers by the nursing staff. The results indicated a positive trend in reducing falls as measured by the National Database for Nursing Quality Indicators (NDNQI). NDNQI database allows like hospitals to compare rate and injury of falls using benchmarking abilities through an electronic reporting system (Murphy, et al., 2008). Similarly, Williams, et al. (2007) found that implementing a fall reduction program in an acute care tertiary hospital in Australia resulted in a reduction in overall falls. The programs' intervention strategies included reviewing the usages of risk assessment tools and opportunities for review and reflection on individualized patient care scenarios by the nursing staff (Williams, et al., 2007).

O'Connell & Myers (2001) reported the barriers to improvements in fall incidence following a comprehensive intervention plan with nursing staff. During the 12 months period of the study, 1065 patients were enrolled with 580 pre-intervention and 485 post intervention. The intervention plan included signage, bands on the patient arms, risk evaluations at designated intervals, transfer assistance, use of the call bell and ensuring walking aides were available for all patient mobility (O'Connell & Myers, 2001). At the end of the intervention phase, the researchers could not demonstrate a significant reduction in falls and in fact, falls were actually higher in number after the interventions were applied on designated floors. Interestingly, there were fewer fallers in the intervention phase (N=80) compared to the pre-intervention phase (N=92), however post intervention the number of falls was higher (139 falls versus 124 falls). These results suggest that learning did not occur.

Cameron, et al. (2010) examined randomized controlled trials (RCT) of older adults who fell. Cameron separated the acute care and sub-acute settings of older patients from those living at home regarding risk and incidence of falling. In the hospital based setting (acute and sub-acute), 4 of the 41 total articles reviewed matched the criteria set by the researchers for a pool of 6478 participants. In the pooled data, when comparing the usual care, multimodal intervention strategies involving exercise to the multi-disciplinary team, the latter were found to be more effective in decreasing the number of falls (RaR 0.069, 95% CI 0.049 to 0.96) (Cameron, et al., 2010). However, this observation was not as strong when reviewing the data separately for each study noted in the pooled data. For instance, in the Cumming, et al. (2008), with 3999 participants, the results indicated that usual care compared to intervention strategies which were multimodal and included multiple disciplines did not show a difference in the rate or relative risk of falling while in the shorter stay acute care hospital (Cumming, et al., 2008). Overall, the Cochrane review concludes that falls interventions in the acute care setting may not be effective and the authors indicate little change may be due to the relatively short length of stay of the patient in the acute care hospital given that changes were seen when the patient had a longer length of stay as in the sub-acute facilities (Cameron, et al., 2010).

In the case of older persons living at home, studies have investigated the benefit of various interventions to reduce falling. Pardessus, et al., (2002) in a single study examined the use of an Occupational Therapy (OT) home visit for older persons living at home who were previously in the hospital. The home visit occurred during the hospitalization of the patient. An evaluation of function in the home setting and the environment were completed in a single two hour visit by an OT and an ergotherapist (Pardessus, et al., 2002). Over a 12 month follow up period, the results indicated that slightly less falls had occurred in the intervention group,

however, the patients in the intervention group showed significantly ($p<0.05$) better ability to maintain functional abilities and better independence in activities of daily living (ADL) in all domains tested at 6 month and 12 month follow up. These findings further support Cumming, et al., 1999 work which demonstrated that home visits by an OT enhanced ability and decreased fall rate of older persons discharged from a hospital to their home (Cumming, et al., 1999).

Finally, exercise in general has demonstrated a positive effect on the quality of life of older persons and consistently demonstrates a decrease in fall rates. Day, et al., (2002) published an RCT comparing three interventions to decrease the rate of falls of those ≥70 in Australia. All 1090 participants were living at home and rated their own health as good to excellent. In this study, the interventions were used for eight distinct groups using different combinations of group exercise, home hazard modifications, and vision improvements (Day, et al., 2002). When exercise was combined with the other modalities, there was a significant effect ($p<0.05$) with a 14% reduction of the rate of falls in the community. Shumway-Cook, et al., (2007) also used a multifactorial intervention design to examine falls and fall risk in sedentary older adults age ≥ 65 living in the community. In this study, the control group received only written materials on falls prevention while the intervention group received exercises, education and risk assessment testing. In a 12 month follow up, Shumway-Cook et al. (2007) observed that a multifactorial interventions approach including exercise was more effective in reducing falls in older community living adults than using only written materials.

Limited studies have investigated older adults who have been hospitalized and have transitioned to the home setting. This time of transition has been identified as a particularly vulnerable state with increased risk of further functional decline and future falls (Mahoney, et al., 2000; Krumholtz, 2013). Regardless of the setting, multifactorial interventions have be found to

have a greater effect in decreasing the number of falls, however, accurate identification of those likely to fall remains elusive. Currently, neither risk analysis nor balance assessments provide the specificity needed to identify older adults at risk. Developing a reasonable fall assessment tool for those recently discharged home from the hospital could have positive effects on healthcare costs, quality of life for those in a transitional state and decrease the future need for healthcare intervention after the hospital stay is completed.

Hospital Acquired Deconditioning

When a patient is admitted to the hospital, there is an expectation that the medical management provided will lead to a recovery. Unfortunately, many patients who are admitted and stay in the hospital have complications including deconditioning which can result in a decrease of their ability to care for themselves compared to their baseline status prior to acquiring the medical illness (Convertino, Bloomfield & Greenleaf, 1997; Hoogerduijn, et al., 2007; Covinsky, 2003; Resnick, 2012). The detrimental effects of strict bedrest have been known for many years (Deitrick, 1948). In this hallmark study, healthy men were placed on strict bedrest with the goal to examine the effects on physiology and function for the immediate and long term. Cardiovascular, hematologic and musculoskeletal changes were documented and remained evident in these men when compared to age matched men who were not placed on strict bedrest (Deitrick, 1948). Several studies since this date have modified the strict bedrest conditions but examined similar effects on a person's ability to adapt to conditions of decreased activity (Convertino, et al., 1997; Suesada, Martins & Carvalho, 2007; Resnick, 2012). Results are consistent with each study that demonstrates the person with decreased or limited activity will have detrimental changes in all systems including: musculoskeletal, hematological, cardiovascular and skeletal (Convertino, et al., 1997; Suesada, et al., 2007; Resnick 2012).

Suesada and colleagues (2007) examined the effect of short term hospitalization on functional capacity of 78 individuals admitted to a Brazilian hospital. These individuals were pre-admitted for either work up or diagnostic evaluation for a planned admission to manage the condition later. These patients could not be receiving Respiratory or Physical Therapy while in the pre-admission phase or they were excluded from the study. While the individuals could move freely about the hospital, there was a noted limitation in overall mobility and activity (Suesada, et al., 2007). Objective measurements provided evidence of decrease in: body mass index, grip strength and upper extremity limb strength, lung function, chest wall expansion and exercise tolerance as measured on the six-minute walk test (Suesada, et al., 2007).

In a larger prospective study conducted in the United States, Gill, Allore, Holford and Guo (2004) monitored the development of disability of adults age 70 years and older who were not disabled at the time of the initial assessment with follow up phone calls for up to a 5-year period. The 754-community living older adults were categorized in two groups as either frail or not frail as measured by gait speed (Gill, Allore, Holford & Guo, 2004). Disability was defined as needing assistance in bathing, dressing, walking in the house or transferring from a chair. Restricted activity was measured by adding two questions to gauge the health status of these adults during the study period which were: 1-since we last talked, have you cut down on your usual activities due to an illness, injury or other problem; 2- since we last talked, have you stayed in bed for at least half a day due to an illness, injury or other problem (Gill, et al., 2004)? Demographic information as well as gait speed, strength, depression, race and ethnicity and medical conditions were included. The primary outcome measured was the first sign of disability which was considered persistent if lasting at least 2 consecutive months. Results demonstrated that any disability was present in 55.3% of the cases, persistent disability in 36.9%

of cases and disability with need for nursing home placement in 26.4% of the cases followed (Gill, et al., 2004). The presence of illness and injury either leading to hospitalization or disability should be strongly considered in health management of older adults (Gill, et al., 2004). Covinsky and colleagues (2003) describe changes in ability to perform activities of daily living (ADL) when an older adult is hospitalized. The researchers used interview questions at the time of admission asking the patient or a surrogate about the ability to complete ADL's 2 weeks prior to the admission, at the time of admission and at discharge (Covinsky et al., 2003). Thirty-five percent of the patients declined in functional status at the time of discharge compared to the pre-admission status and age was a factor in lack of ability to regain pre-admission functional status due to the hospital stay (Covinsky et al., 2003).

Recently, deconditioning and loss of function in older persons due to hospitalization has been called (HAD) hospital acquired deconditioning (Covinsky, Pierluissi & Johnston, 2011; Krumholtz, 2013). Krumholtz' (2013) commentary in the Journal of the American Medical Association describes the period of immediately post discharge as post hospital syndrome which accounts for the acute illness recovery as well as the period of increased risk to a range of other adverse events not related to the initial cause of hospitalization. Post hospital syndrome is defined as an acquired, transient period of vulnerability, which is influenced by what happened in the hospital and the acute illness (Krumholtz, 2013). In addition, the hospital stay may contribute to a level of physical and mental stress as well as physical deconditioning that imposes new challenges for the patient to fully recover from the issues surrounding their reason for hospitalization (Krumholtz, 2013; Covinsky, et al., 2011).

A study by Kortebein, Ferrando, Lombeida, Wolfe and Evans (2007) found that the effect of bedrest on healthy older adults produced significant changes in physiologic systems, however,

the bedrest itself produced no substantial changes in functional mobility or performance of ADL's. The researchers concluded that in healthy older adults, bedrest in and of itself was not sufficient condition to reduce functional mobility and ADL performance. There must be some cumulative effect not yet understood with older adults who admitted to the hospital to cause such a decline in ambulation and ADL performance (Kortebein, Ferrando, Lombeida, Wolfe & Evans, 2007).

Older adults are more commonly affected by HAD and reports of up to one third older adults admitted to the hospital experience decline in ambulation and ADL status at the time of discharge from the hospital (Kortebein, 2009). For older adults over 70 years old, hospitalization and decline in functional status is a key indicator of the condition of HAD (Covinsky, et al., 2011; Kortebein, et al., 2007). Covinsky, et al. (2011) describes the recovery from the acute illness, however, the complication of functional loss due to the hospital stay as HAD. In those individuals with recognized HAD, 41% died and 29% were disabled at one year and only 30% returned to their reported pre-existing status (Covinsky, et al., 2011). Prevention interventions were suggested and included: activity, close monitor of medications, maintain nutritional status, prevention of delirium and wider use of the geriatric specialized units which provide improved surveillance and models of care delivery designed to address older adult risk to hospital admissions (Covinsky, et al., 2011).

Hoogerduijn, Schuurmans, Duijnstee, DeRooij and Grypdonck (2006) completed a systematic review to determine factors associated with functional and ADL decline while in the hospital. The goal of their study was to develop a tool to identify and thus decrease the likelihood of decline with older adults who are hospitalized. Hoogerduijn et al. (2006) note that 30% of patients admitted to a hospital demonstrate decline in functional status which includes

ADL activity. This decline is associated with increased length of stay, increased overall costs to the health system and the patient, increased readmissions, can result in need for continued medical care after the medical condition is managed and increased mortality (Hoogerduijn, Schuurmans, Duijnstee, DeRooij & Grypdonck, 2006).

Tests and Measures

Gait speed is a recognized objective outcome to predict hospitalization in older adults (Studenski, et al., 2003) as well as functional decline (Studenski, et al., 2003; Welsh, et al., 2015; Bodilsen, et al., 2015). The 4-meter Walk Test (4MWT) is considered the gold standard to measure the gait speed of older adults in the community and can be used in the hospital setting (Studenski, et al, 2003; Studenski, et al., 2011). Participants start and end in a standing position and must walk a straight path, at their usual pace, on a level surface, for 4 meters or approximately 13 feet marked by 2 cones. To reduce the effect of a person slowing at the end of the distance, each participant is instructed to walk past the designated cone at the marked distance (Studenski, et al., 2011). If the person requires an assistive device such as a cane or walker, this may be used. The 4MWT is a timed distance using a stop watch to the hundredth of a second (Studenski, et al, 2003). Maggio et al. (2016) found significant correlation between manual collection of time compared to use of an accelerometer ($r = 0.62$, $p<0.001$ in men; $r = 0.73$, $p<0.001$ in women). In the research conducted by Bodilsen et al. (2015), the 4MWT was demonstrated to have good relative inter-rater reliability (ICC=0.91). However, they caution comparing gait speeds of older adults admitted to the hospital who are known to be slower walkers to those in the community. Yet, when normalizing the data results demonstrate very good inter-rater reliability (ICC=0.95) (Bodilsen, et al., 2015). Additionally, research studies suggest that there will be larger variation in gait speed for those in the hospital especially when

deemed a slow walker, <0.6m/s (Studenski, et al., 2011; Bodilsen, et al., 2015). Clearly, gait speed is an important indicator of: functional and ADL status (Gill, et al., 2004; Cesari, et al., 2005), is an indicator of functional and medical decline and possibly frailty (Studenski, et al., 2003; Gill, et al., 2004; Bodilsen, et al., 2015) and/or a marker of mortality and morbidity (Studenski et al., 2011) in older adults. The 4MWT has been identified as a reliable and valid measure of gait speed for use with older adults in a community based setting or in a clinical setting such as a hospital.

In a study by Graham, Fischer, Burges, Kuo and Ostir (2010), the researchers examined the walking speed of older adults in an acute care hospital. Graham et al. (2010) found that those in a hospital walk slower than age matched older adults not in the hospital. In addition, the average walking speed in this study indicated that hospitalized older adults gait speed is 0.35 m/s.

The World Health Organization Quality of Life Survey-brief format (WHO-QOL-BREF) is a comprehensive self-reported quality of life survey consisting of 26 questions (McDowell, 2006). It is a paper and pencil test that can be self-administered or read to the participant when self-completion is not possible (Skevington, Lofty & O'Connell, 2004). The WHO-QOL BREF version was developed from the WHO-QOL 100 for those participants who needed a shorter version due to time restrictions, to decrease the burden when filling out the survey or because the detail was not needed from the full 100 item WHO QOL (Skevington, et al., 2004). Researchers have performed psychometric testing using the WHO-QOL-BREF in 23 countries with large samples of respondents (n=11,830) (Skevington, et al., 2004) and report good to excellent results in domain categories as well as the single overall total QOL, single overall total health scores and combined total QOL plus health scores (Skevington, et al., 2004).

The WHO-QOL-BREF uses a 5-point Likert scale with anchor wording to indicate intensity (how much), capacity (how completely), frequency (how often), and evaluation (how satisfied) (Skevington, et al., 2004). There are 4 domains, which cover the areas of quality of life across cultures (McDowell, 2006) including: physical, psychological, social and environmental. In general, positive terms are used when answering the survey which can be used for well or sick persons (McDowell, 2006; Skevington, et al., 2004). The WHO-QOL-BREF is not a single score but rather 4 domain scores with 2 individual scores on overall QOL and overall health which can be combined to a single overall score (Skevington, et al., 2004). The survey takes approximately 5-10 minutes to complete (McDowell, 2006).

Reliability of the WHO-QOL-BREF has been reported with Cronbach alpha ranging from 0.86-0.88 for the physical domain; 0.79 to 0.82 for the psychological domain; 0.72 to 0.73 for the social domain; 0.85 for the environmental domain (McDowell, 2006; Skevington, et al., 2004). Interclass Correlation coefficient (ICC) for measuring the test-retest reliability in 2 weeks ranged from 0.83 to 0.96 and for 4 weeks 0.64 to 0.79.

Validity of the WHO-QOL-BREF has been examined. The United States version of the WHO-QOL-BREF demonstrated concurrent validity with the subscales of the SF-36 ranging from 0.6-0.7 which is a frequently used and accepted QOL scale in clinical practice and research (McDowell, 2006). Skevington, et al. (2004) report no item for the total sample correlated more strongly with another domain. Further, the 4 domains strongly correlated to the overall score in QOL plus health R^2 =0.46-0.67 ($p<0.0001$) the overall assessment of health score was most closely associated with the physical domain and the total overall score was most closely associated with the psychological and environmental domains (Skevington, et al., 2004).

Summary

Falls and fall related injury remain a problem in every setting with persons 65 years old and older (Roudsari, et al., 1996; Ruynan, et al., 2005). While research continues to support the use of evaluation tools and interventions based on risk factors, there has not been a substantial change in the injury or falls rate in any setting (Stevenson, et al., 1998; Vassallo, et al., 2004). Despite best attempts to modify evaluations, interventions and falls prevention strategies, the national statistics presented in the National Database for Nursing Quality Indicators (NDNQI) still present a consistent trend of falls risk and potential injury for older adults, especially those in the hospital for any cause.

While in the hospital, older persons requiring medical care are often restricted to limited activity while in the hospital and are often discouraged from remaining as mobile as prior to their admission when discharged (Sager, et al., 1996; Convertino, et al., 997; Covinsky, et al., 2003; Resnick, 2012). This condition of deconditioning compounds the complexity of risk of developing frailty related to the hospitalization. In addition, approximately 50% of older adults do not have a hospital stay which precipitates development of disability (Gill, Williams & Tinetti, 1995; Gill, et al., 2004). Thus, older adults remain susceptible to decline in health status and decline in functional and ADL ability.

Transitions in care, especially related to potential and re-admissions to the hospital after a short discharge home is a clear focus of government agencies and hospitals (Roudsari, et al., 2005; Hall & Hendrie, 2003). While, studies have identified risk factors associated with falls, they have not been able to pinpoint with accuracy which of the known risk factors has greater contribution to falls or injury (McFarlane-Kolb, 2004; Vassallo, et al., 2004). In addition,

research has been unable to identify intervention strategies to significantly and consistently reduce the rate falls or injury in any one setting (Rubenstein, 2006).

Falls and deconditioning are not the only concern for older adults. In addition to effects of medical issues that require medical attention significant enough for hospitalization, older adults have demonstrated insidious onset of disability (Gill, et al, 2004; Stuck, et al., 1999). While impairments have been linked to disability, many older adults do not have a specific episode such as a hospitalization that would account for the development of frailty (Gill, et al., 1999; Gill et al, 2004). Identifying the precipitating factor to development of frailty and disability may lead to more targeted approaches in interventions as well as improved monitoring for older adults in the community or living with assistance.

Finally, although numeric measurements can indicate certain aspects of health and wellness in older adults, quality of life (QOL) constructs need to be measured in the research. The QOL measures need to be inclusive for a range of populations and not focus solely on absence of disease, falls or deconditioning, but include items relevant to older adults that reflect ability to perform and function in society. The economics of healthcare has led to cost/benefit driven surveys driven to reduction of health status by a single numeric value. However, measuring health status with surveys such as the WHO-QOL-BREF can lead to a comprehensive presentation of the perception of a person's position in life in the context of their culture and value systems in which they live (McDowell, 2006). The QOL perspective offers important insight that help to define cost/benefit relative to the individuals' goals, expectations and concerns within the context of their health condition.

Chapter III

METHODOLOGY

Older adults admitted to an acute care hospital experience positive and negative changes in their overall health status, which may impact overall medical condition, functional status and well-being (Covinsky, et al., 2003; Brown, Redden, Flood & Allman, 2009; Kortebein, 2009; Greysen, Cenzer, Auerbach & Covinsky, 2015). Often, the health status of an older adult in the hospital is described by the progress of the medical condition and the basic demographic data of the individual (Melfi, Holeman, Arthur & Katz, 1995; Gorina, et al., 2015). Discharge planning begins at admission and healthcare providers attempt to predict the ability of the person to continue to manage the gains or concerns associated with their medical condition and functionally manage their needs at home with or without support systems in place (Rochon et al., 1996; Hoogerduijn, et al., 2012; Asmus-Szepesi, et al., 2013; Greysen, et al., 2015). However, health status encompasses more than the medical condition and the functional ability at the time of discharge when dealing with older adults (Allan, Campbell, Guptill, Stephenson & Campbell, 2006; Jencks, et al., 2009). The literature supports that older patients admitted to an acute care hospital while being treated for the underlying medical condition(s) are subject to adverse events within the hospital which may further affect their overall health status and thus result in hospital admission acquired medical concerns (Mahoney, et al., 2000; Oliver, 2008; Covinsky, et al., 2011; Masley, Havrilko, Mahnensmith, Aubert & Jette, 2011; Krumholz, 2013).

Medical concerns and overall decline in their health status, which are unrelated to the index admission reason, include decline in functional status, falls in the hospital and readmission to the hospital within 30 days of initial discharge (Covinsky, et al., 2003; Oliver, 2008; Brown, et al., 2009; Kortebein, 2009). The readmission rate for Medicare recipients has not significantly

declined in the last 20 years despite hospital and at home care services implementing various interventions to attempt to mitigate known risk factors for health status changes within the older adult population (Melfi, et al., 1995; Gorina, et al., 2015).

Attention must be paid to understand and explore the factors influencing older adult's ability to care for themselves after experiencing a hospital stay to address potential readmissions and delayed recovery (Runyan, et al., 2005; Rubenstein, 2006; Jencks, et al., 2009; Wiegand, et al., 2012; Krumholtz, 2013). Therefore, the purpose of this study was to describe the health status of older adults discharged home from an acute care hospital using a biopsychosocial framework overlaying the functional status of older adults and the impact of quality of life perception to specifically explore potential factors that contribute to hospital readmission.

Participants

All participants admitted to the Hospital of the University of Pennsylvania regardless of admission reason (medical or surgical) were eligible to participate. Seventy-three participants were recruited between the ages of 65 to 92 years old using a sample of convenience (Portney & Watkins, 2009). Forty-three of the participants were admitted for a surgical reason and thirty of the participants were admitted for a medical reason.

Participants were excluded from the study, if they did not have a current order for Physical Therapy, were under the age of 65 years old, could not speak and understand English, could not follow verbal commands or complete all study outcomes measures collected (4-meter walk test and WHO QOL BREF questionnaire), if they were discharged from the hospital 48 hours or more after completing the 4MWT, if they did not have access to a phone after discharge, could not participate in the follow up calls for 4 weeks, or if they were being discharged to an environment other than an independent living community setting.

Design

This study was exploratory and utilized a descriptive research design.

Measurements

Descriptive Characteristics

Descriptive characteristics were collected for all participants including: age, sex, ethnicity, admission and discharge dates, reason for admission to the hospital, and number of comorbidities. The number of comorbidities was calculated using a direct count (DC) method. This method accounts for each comorbidity in one of fourteen categories as described by DiBari, et al. (2006). This method was validated in older adults living in the community to determine mortality and incident of ADL disability related to the comorbidity status (DiBari, et al., 2006). The authors could provide predictive validity for the DC method regarding mortality and healthcare costs. In the Di Bari study (2006), report of the burden of comorbidity using the differences in the areas under the receiver of operating characteristic (ROC) curves after adjustment for age, sex and race was 0.648 to 0.685 for hospital admission and 0.662 to 0.767 for mortality. These research results suggest that using a simple disease count (DC) can reasonably account for the burden of comorbidity in community dwelling older adults (age 60 and older) using a hospital database (DiBari et al., 2006). In this study using the DC, the authors also collected a functional score using Guralinik's short battery for lower extremity performance (DiBari, et al., 2006). These results support that there is a prognostic ability of comorbidity burden, however, the authors conclude that outcomes for older adults cannot solely be predicted based upon the presence of comorbidity (DiBari et al., 2006).

In the hospital setting where the study was conducted, falls are recorded in the electronic medical record (EMR) primarily by the nurse but also from other members of the healthcare

team. There is a designated location on the EMR to record fall events and follow up interventions to assist with future safety of the patient. In this study, a fall event was known to the PI through investigation of the EMR of each participant. During the EMR review, the section where fall event would have been recorded was examined from the admission date until the discharge date. If a fall event was noted, then the PI recorded an inpatient fall for that participant. Falls definition for purpose of this study was taken from the Kellogg International Work Group: "unintentionally coming to the ground or some lower level and other than as a consequence of sustaining a violent blow, loss of consciousness, sudden onset of paralysis as in a stroke or epileptic seizure" (Kellogg International Work Group, 1987). This definition was selected as it is consistent with the definition of fall events used in the acute care hospital of the study participants.

4Meter Walk Test (4MWT)

The 4-meter walk test is completed on a level surface with or without an assistive device. In this study, each participant was instructed to walk at a preferred pace for 4 meters (approximately 13.2 feet) between two cones. The cones were placed at the appropriate distance on the floor prior to the walk. Each participant was instructed that the first trial was a practice trial and the following two trials would be timed. The faster of the two trials was recorded (Studenski, et al., 2011). The 4 MWT has excellent test-retest reliability as reported by intraclass correlations coefficients (ICC) ranging from 0.84 to >0.90 (Simonski, Gardner & Poehlman, 2000; Studenski, et al., 2011). For the 4 MWT excellent interrater reliability is reported by ICC above 0.9 (Simonski, et al., 2000; Studenski, et al., 2003; Studenski, et al., 2011). There is predictive validity for hospitalization or deterioration in health status using gait speed determined from the 4 MWT (Studenski, et al., 2003) and for gait speed of older adults in general

(Bohannon, 1997). Pooled analysis of a large study (N=34,485) of older adults, provided the ability to predict survival rate in older adults as well as health and functional status by using the 4 MWT with a HR of 0.88, 95% CI, 0.87-0.90, $p<0.001$ (Studenski, et al., 2011). In this same study (Studenski, et al., 2011), survival and health status increased across all gait speeds with a change of 0.1 m/s in gait speed.

WHO QOL BREF

The WHO QOL BREF questionnaire is a 26-question paper and pencil test that can be completed independently or read to the participant. It was developed with input of clinicians and the users of the questionnaire and truly is an international patient centered outcome measure (Skevington & McCrate, 2011). The WHO QOL BREF factor analysis indicated facets within the domain are part of the hypothesized domain with exploratory factor analysis providing no better model. Confirmatory factor analysis results demonstrated acceptable fit for domain questions and demonstrated each domain made an independent contribution to the overall quality of life score (Skevington, et al., 2003). The WHO QOL BREF discriminate reliability suggests the WHO QOL BREF can be used with many people with different diseases and is acceptable to good at all ages ($F_{7,3880}=5.23$, $p<0.001$) (Skevington, et al., 2003; Skevington & McCrate, 2011). The WHO QOL BREF has acceptable internal reliability using Cronbach's alpha: at 0.82 for physical health domain; at 0.81 for psychological domain; at 0.80 for environment domain and marginal at 0.68 for the social domain (Skevington, et al., 2003). The 4-week retest reliability ranges from alpha 0.64 to 0.79 (McDowell, 2006) and discriminant reliability is good for illness and chronic conditions for all domains (Skevington & McCrate, 2011). Examination of concurrent validity with the SF-36 using the United States version reveals the US WHO QOL BREF and the SF-36 was generally high (alpha 0.6-0.7) for SF-36 equivalent sub scales

(McDowell, 2006; Skevington &McCrate, 2011). Two questions on the WHO QOL BREF evaluate the self-perceived quality of life and satisfaction with health followed by questions which evaluate physical, psychological, social relationships and environment aspects of well-being. The WHO QOL BREF uses a 5 point Likert scale throughout the remaining 24 questions ranging from "very poor to very good" (evaluation scale); "very dissatisfied to very satisfied" (evaluation scale); "none to extremely" (intensity scale); "none to complete" (capacity scale); and "never to always" (frequency scale). When using the WHO QOL BREF, the higher the score the better the perceived quality of life (Silva, Soares, Santos & Silva, 2014). After completing the questionnaire, a total score for overall health is produced by combining question 1 and 2 as well as raw scores for four domains: physical, psychological, social and environmental. Each of the raw scores can be transformed to a 0 to 100 number using the scoring sheet provided by the WHO QOL BREF workgroup (Skevington, et al., 2003). The WHO QOL BREF provides a broad range of coverage for quality of life indicators that can be used across cultures and has been used with older adults (Skevington, et al., 2003).

Although there is no cut score for the overall health questions or the individual domain scores to date, some researchers are investigating this approach to better understand use of the WHO QOL BREF. Silva et al. (2014) initiated a study with older adults in Brazil using the WHO QOL BREF to determine if a cut score is evident when grouping overall quality of life to predict good versus poor quality of life using a receiver-operating characteristic (ROC) analysis. The ROC analysis model was used to suggest diagnostic capacity of different cut points with the WHO QOL BREF to categorize individuals into either good quality of life or poor quality of life (Silva, et al., 2014). The results of this study suggest the potential use of the score of 60 as the indicator of the extremes of overall quality of life, however, when using this cut score, the

negative predictive value (99.5% negative predictive value) for poor quality of life (95% sensitivity) is stronger than a positive predictive value for good quality of life (Silva, et al., 2014). The authors noted several limitations in this study including generalizability as the sample had limited diversity of sex, age and education as well as few participants in the poor quality of life category (Silva, et al., 2014). This study demonstrates the need for further research to provide an accurate cut score when using the WHO QOL BREF. While this study implies the ability to categorize either good or poor quality of life overall, the results are not yet ready for generalizability outside the study sample. Therefore, these results will not help with determination of a cut score to correlate readmission and WHO QOL BREF score in this study.

Follow Up Survey

A follow up survey was developed by the principal investigator to monitor participants' health status and activity level once discharged home from the hospital. Weekly phone calls to the participants were asked from a structured questionnaire with all questions answered by a "yes/no" response. The first question asked of the participant was "have you used emergency department services or been in an observation unit even for a day?" This was followed by asking if the participant had been readmitted to any hospital even for a day?" If there was not a "yes" response to readmission, the rest of the questions were completed. The questions followed with asking "have you experienced a fall either inside or outside the house?" Each participant was reminded of the study definition of a fall. There were two questions asked to indicate activity level: "since we last spoke, have you remained in bed for a half day or longer due to injury, illness or other cause?" and "since we last spoke, have you cut down on your usual activity due to an injury illness or other cause?" (Gill, Desai, Gahbauer, Holford &Williams, 2001). These last two questions monitor for a decrease in overall activity levels once discharged home from a

hospital and may indicate decrease in overall health if there is a self-reported "yes" to either or both questions (Gill, et al., 2001).

Procedures

IRB approval for this study was received from University of Pennsylvania Internal Review Board (IRB) and Seton Hall University IRB (Appendix A and B respectively). All acute care physical therapists at the Hospital of the University of Pennsylvania receive physical therapy referrals via the electronic medical record system. All acute care physical therapists complete Physical Therapy evaluations and determine the likely discharge destination for each patient based on the best practice standards of care (Masley, et al., 2011). The PI approached the acute care physical therapists to review the caseload and to provide the principal investigator (PI) with the names and room numbers of patients who had a completed a Physical Therapy evaluation and who were going to be discharged home within 24-48 hours. The PI or the study research assistant (RA) contacted all patients either by visiting the patient in their room or in a private area of the Physical Therapy department at which time they presented them with the Institutional Review Board (IRB) approved solicitation flyer (Appendix D) which explained the study. If a patient did not wish to participate in the study after reading the solicitation flyer, no further contact was made with the patient. If a patient agreed to volunteer for the study, the PI would approach the patient and began the informed consent process (Appendix C). After reviewing the informed consent form and having the opportunity for all questions to be answered, if still willing to volunteer for the study, the potential participant was required to sign the informed consent form. Each participant was instructed that they could withdraw from the study at any time. A copy of the informed consent form was given to each participant at the time of the data collection in the hospital.

Data collection began with each participant completing the WHO QOL BREF questionnaire. If the participant was unable to read and answer the questionnaire or preferred for the questionnaire to be read to them, the PI did so as described by the tool instructions. Answers were recorded on the copy of the WHO QOL BREF form and later transcribed to the data collection sheet (Appendix E). A blank copy of the WHO QOL BREF questionnaire was issued to the participant so that they could take it home upon discharge and refer to it during the follow up phone call which required completing the WHO QOL BREF at 4 weeks post discharge.

After completing the WHO QOL BREF in the hospital, the participant completed the 4-meter walk test either in the hallway outside their room or in the Physical Therapy department. The distance for the 4-meter walk test was measured and marked with cones as noted in the testing procedures. All participants engaged in one practice trial, followed by two timed trials with the faster time recorded on the data collection sheet (Appendix E). Every participant walked on a level walking surface independently at a self-selected pace and could use an assistive device if needed. Although assistance is permitted for the 4MWT, none of the participants needed physical assistance to complete the test. For each trial, the participant was instructed to walk at a comfortable pace starting at one cone and continue by walking past the second cone. Per standard protocol, the starting position was standing behind the cone so that both feet did not cross the line of the cone. The PI used a stopwatch to record the time to complete the 4 meter walk to the hundredth of a second. Each participant was returned to their room by the PI after completing the WHO QOL BREF and the 4 MWT.

The PI obtained from the electronic health record, patient demographic information, medical information and inpatient falls information and transcribed it to the study data collection

sheet (Appendix E). The PI monitored the discharge status of the participant after the data was collected by viewing the status in the EMR daily. The date and time of the discharge are entered by the provider discharging the participant and this was recorded to ensure timely discharge after the 4MWT time was recorded per protocol. Once the participant was discharged home, the research assistants (RA) or the PI completed weekly phone calls using structured questions and recorded answers on the structured question sheet (Appendix F). All the information was securely sent to the PI. The weekly phone calls occurred for no more than 4 weeks after the initial discharge from the hospital or until readmission or death resulted. All participants were confirmed to be readmitted to the hospital during the scheduled follow up phone call time and then removed from further data collection efforts. If there was a fourth follow up phone call for those still involved in the study, the WHO QOL BREF questionnaire was again completed over the phone by reading the questionnaire to the participant and recording the answers on the WHO QOL BREF form. These final scores were transferred to the data collection sheet (Appendix E) and calculated by the PI. After the fourth call data was collected, there was no further contact with any of the participants.

Data Analysis

Quantitative data was entered into a statistical software program (SPSS®, Version 24.0) for descriptive and inferential statistical analyses. The present study contained two groups: those that were readmitted to the hospital within 30 days after discharge and those that were not readmitted to the hospital after discharge. This is a descriptive study using descriptive statistics such as demographic information, characteristics of the participants, structured questions, outcome measures and the WHO QOL BREF at discharge and 30 days after discharge to provide analysis of the health status of older adults discharged home from a hospital. Differences

between groups readmit to the hospital and not readmit to the hospital in response to QOL item responses were calculated using the Mann-Whitney U- test, using 2-sided tests with *p*-values set at .05. Differences within the group not readmit to the hospital in response to QOL item responses were calculated using the Wilcoxon Signed Rank test, using 2-sided tests with *p*-values set at .05. Stepwise regression analyses were performed to provide a potential model explaining factors that might contribute to readmission to the hospital after initial discharge.

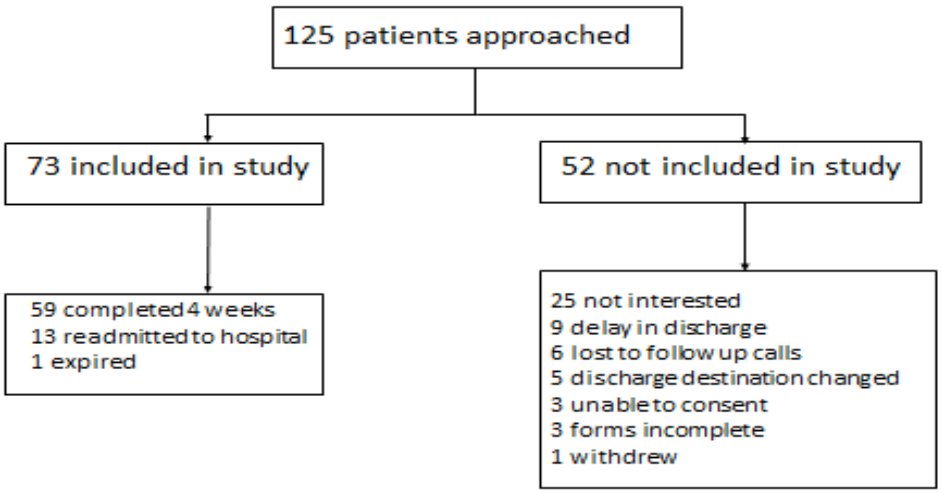
Chapter IV

RESULTS

One hundred and twenty-five (125) patients within the same academic medical center in Pennsylvania meeting the study criteria were approached to participate in the study. Of the 125 patients approached, 73 patients consented to participate and completed the follow up period, while 52 patients did not meet inclusion criteria therefore their information could not be used in the data analysis. Of the 52 patients approached but whose information or data was not included in the study: 25 noted they were not interested in the study and did not provide consent, 9 had an unexpected delay in discharge time which was greater than 48 hours from the time the 4MWT data collection and did not meet the inclusion criteria, 6 were lost to follow up phone calls after initially consenting to be in the study, 5 had a change in discharge location from home to a medical facility or another facility which provided assistance for function and ADL's after consenting and completing inpatient data collection, 3 were unable to provide consent and therefore no data was obtained and 3 had incomplete information on the WHO QOL BREF forms after providing consent and completing the inpatient data collection. During the execution of the study, one participant asked to withdraw for personal reasons and thus none of the data collected during the inpatient stay or after discharge was used in the results analysis as it was incomplete (Figure 1).

Figure 1.

Participants of the Study



The first research question, "what is the health status of older adults discharged home from a hospital" is addressed by examining the characteristics of the sample. Table 1 provides descriptive statistics for the entire group of participants (N=73) and the two sub groups studied: readmit (N=14) and not readmit (N=59) to the hospital within 30 days of discharge. The total sample presented with a mean age of 74.6 (SD=7.2) years, with a larger percentage of male participants, N=49 (67%) and with predominantly white ethnicity, N= 64 (88%). The 14 participants readmitted to the hospital within 30 days of discharge presented with an average age of 76.3 (SD=9.3) years, were predominately males, N= 8 (57.2%) and were predominantly white, N= (78.6%). The 59 participants not readmitted to the hospital within 30 days of discharge had an average age of 74.2 (SD= 9.3) years, were predominately male, N=41 (69.5%) and were predominantly white, N=53 (89.9%). Both the readmitted to the hospital group and the not readmitted group were closely matched for age bands of 65-74 years old and 75-84 years old but the readmitted group had a larger percentage in the oldest age band (85+ years old) with 21.4% compared to only 6.8% in the not readmitted group. The reason for admission to the hospital for

the total sample was larger for those admitted for a surgical reason (N= 43, 59%) compared to those admitted for a medical reason (N= 30, 41%). The reason for admission to the hospital was different in each of the sub groups: the readmit group having a larger percentage of medical admission reason (N= 10, 71.4%) compared to the not readmit group (N= 20, 33.9%) and the not readmit group had a larger percentage of participants admitted for a surgical admission reason (N= 39, 66.1%) compared to the readmit group (N= 4, 28.6%).

Table 1.
Descriptive characteristics of the sample: total sample, readmitted and not readmitted participants

Characteristic	Total Sample N=73	Readmit to hospital N=14	Not Readmit to hospital N=59
Age, mean ± SD	74.6 ± 7.2	76.3± 9.3	74.2 ± 6.6
Age, # (%)			
65-74	39 (53%)	7 (50%)	32 (54.2%)
75-84	27 (37%)	4 (28.6%)	23 (39.0%)
85+	7 (10%)	3 (21.4%)	4 (6.8%)
Sex			
Female, n (%)	24 (32.9%)	6 (42.8%)	18 (30.5%)
Male, n (%)	49 (67.1%)	8 (57.2%)	41 (69.5%)
Ethnicity			
White, n (%)	64 (87.7%)	11 (78.6%)	53 (89.8%)
Black, n (%)	9 (12.3%)	3 (21.4%)	6 (10.2%)
Reason for Admission			
Medical	30 (41%)	10 (71.4%)	20 (33.9%)
Surgical	43 (59%)	4 (28.6%)	39 (66.1%)

Table 2 provides a summary of the data on participants' responses to structured questionnaire. The questionnaire provides further detail on the health status of older adults discharged home from an acute care hospital. The number and week of readmission, incidence of falls at home, use of emergency room services, need to stay in bed for half a day and decreased activity was reported. All participants were asked these questions on the follow up phone call each week unless they reported a readmission to the hospital. Of the 73 participants who were

discharged home from the hospital, 4 participants were readmitted in the first week and therefore only 69 participants completed the structured questionnaire at the end of the first week. Within the second week from hospital discharge, three more participants were readmitted to the hospital and therefore 66 participants completed the structured questionnaire at the end of the second week. In week three of the study, 5 participants were readmitted to the hospital thus, 61 participants completed the structured survey at the end of the third week. In week 4, 2 participants were readmitted to the hospital resulting in 59 participants completing the structured questionnaire at the end of the fourth week. Once participants were readmitted to the hospital all data collection stopped. Interestingly, participants were readmitted to the hospital throughout the 4-week follow up period with the largest number of participants admitted during week three (n=5).

Over the 4-week follow up period after hospital discharge, 5 falls were reported, with the greatest number of falls (3) reported in week 2. All the participants during the follow up survey who reported a fall while home completed the entire 4 week of follow up. Surprisingly, none of the participants reporting a fall at home after discharge were readmitted to the hospital for any cause. During the follow up, reports by participants indicate minimal use emergency department (ED) services. Only 3 participants who completed the follow up period used ED services and none of those participants were readmitted to the hospital. Of those readmitted to the hospital, it is unknown if the participant used ED services as a mechanism in the readmission process or if a fall was the result of that readmission. The cause and/or system by which participants were readmitted to the hospital was not investigated.

To examine activity level of the participants, two questions requiring a “yes/no” response were asked of each participant during the follow up calls. The first question asked, “since we

last spoke, have you stayed in bed for half a day or longer due to illness, injury or some other cause?" The second question asked, "since we last spoke, have you decreased your usual activity due to an illness injury or some other cause?" In the first week of the follow up, 23.2% (n=16) reported staying in bed for at least half a day while at home. In the second week, 15.1% (n=10) reported staying in bed for half a day. This pattern of inactivity was reported at 9.8% (n=6) in week 3 and 11.90% (n=7) in week 4. Although there was no consistent trend or pattern of inactivity related to staying in bed for half a day, by week 4, the incidence of staying in bed for half a day was approximately half the rate as the report in week 1. When participants were asked about decreased activity levels, 76.8% (n=53) responded that in the first week a decrease in activity level was noted. This decrease in usual activity continued with: 62.1% (n=40) in week 2, 54.1% (n= 33) in week 3 and 44.1% (n= 26) at week 4. While, a decrease in activity level was noted throughout the 4 weeks of follow up, it was less prevalent at week 4 then in week 1. Decreased activity is demonstrated when there is a positive response to one or both questions (Gill et al., 2001). For both questions combined, there was a total of 245 positive responses throughout the 4 week follow up. There were only 5 instances (2%) when participant responded that they stayed in bed for at least half a day due to illness, injury or other case when they also did not report a decrease in usual activity.

Table 2.
Responses for Readmission, Incidence of Falls, Use of Emergency Department Services, Stay in Bed for Half a Day, Decrease from Usual Activity

Week after hospital discharge	Participants, #	Re-admit, #	Falls at home, #	ED visit, #	Stay in bed half day, # (%)	Decreased activity, # (%)
Week 1	69	4	1	0	16 (23.2%)	53 (76.8%)
Week 2	66	3	3	1	10 (15.1%)	41 (62.1%)
Week 3	61	5	0	0	6 (9.8%)	33 (54.1%)
Week 4	59	2	1	2	7 (11.9%)	26 (44.1%)

Table 3 describes the outcome measures used in the study which address the second research question, "what is the length of stay, number of comorbidities and walking speed of older adults discharged home from an acute care hospital based on readmit and not readmit status?" Results are presented for the entire sample and the two sub groups studied: those readmitted to the hospital within 30 days of discharge from the hospital and those not readmitted to the hospital within 30 days of discharge from the hospital. The entire sample of participants, N=73, stayed in the hospital an average of 8.2 days (SD=5.5) with 3.9 (SD= 1.6) comorbidities and took an average of 7.0 (SD= 3.0) seconds to complete the 4MWT. In the sub group analysis, the readmit group, N=14, had a length of stay for 9.3 (SD= 3.4) days with 3.9 (SD=1.6) comorbidities and took 8.1 (SD=3.4) seconds to complete the 4 MWT. The not readmit sub group, N=59, had a length of stay for 9.0 (SD=6.0) days with 3.9 (SD= 1.6) comorbidities and took 6.7 (SD=2.9) seconds to complete the 4 MWT.

Table 3.
Outcome Measures for Sample: Total Sample, Readmitted and Not Readmitted Participants

Outcome Measure	Total Sample, N=73	Readmit to hospital, N=14	Not readmit to hospital, N=59
Length of Stay, days	8.2 ± 5.5	9.3 ± 3.4	9.0 ± 6.0
Comorbidities, #	3.9 ± 1.6	3.9 ± 1.6	3.9 ± 1.6
4 MWT, seconds	7.0 ± 3.0	8.1 ± 3.4	6.7 ± 2.9

To compare the total group and the two sub groups, readmit to the hospital within 30 days after discharge and not readmit to the hospital within 30 days after discharge, normality statistics were performed. Table 4 indicates there is not a normal distribution for data the total sample (N=73). For all characteristics, the K-S significance $p < 0.05$ indicates the total sample is significantly not normal.

Table 4.
Evaluating Normality in the Total Sample, N=73

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Comorbid	0.153	73	0	0.944	73	0.003
LOS	0.165	73	0	0.856	73	0
Age	0.123	73	0.008	0.941	73	0.002
FourMWT	0.144	73	0.001	0.956	73	0.013
IWHODOM1	0.113	73	0.023	0.979	73	0.272
IWHODOM2	0.121	73	0.01	0.968	73	0.058
IWHODOM3	0.227	73	0	0.883	73	0
IWHODOM4	0.217	73	0	0.838	73	0
IWHOTOT	0.259	73	0	0.87	73	0

Note. a. Lilliefors Significance Correction

Table 5 indicates there is not a normal distribution for data for the sub group not readmit (n=59) to the hospital within 30 days of discharge from the hospital. For all characteristics, the K-S significance $p < 0.05$ indicates the not readmit sub group is significantly not normal (Field, 2009).

Table 5.
Evaluating Normality for Not Readmit Sub Group, n=59

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Comorbid	0.165	59	0	0.935	59	0.004
LOS	0.175	59	0	0.844	59	0
Age	0.127	59	0.018	0.944	59	0.009
FourMWT	0.142	59	0.005	0.862	59	0
IWHODOM1	0.135	59	0.009	0.961	59	0.053
IWHODOM2	0.162	59	0.001	0.921	59	0.001
IWHODOM3	0.148	59	0.003	0.923	59	0.001
IWHODOM4	0.194	59	0	0.878	59	0
IWHOTOT	0.245	59	0	0.873	59	0
DWHODOM1	0.118	59	0.04	0.962	59	0.062
DWHODOM2	0.159	59	0.001	0.946	59	0.011
DWHODOM3	0.157	59	0.001	0.948	59	0.014
DWHODOM4	0.169	59	0	0.868	59	0
DWHOTOT	0.21	59	0	0.915	59	0.001

Note. a. Lilliefors Significance Correction

Table 6 data supports that a normal distribution exists in the sub group readmit (n=14) for all characteristics except WHO QOL BREF total score at the time of hospital discharge, D (14) = 0.001, p, 0.05 (Field, 2009). For all other characteristics for the sub group readmit, the K-S significance $p > 0.05$, indicates the sub group readmit is significantly normally distributed (Field, 2009). Since the total group and the sub group not readmit group did not demonstrate normality, all groups were evaluated using non-parametric statistical tests to allow for equal comparison.

Table 6.
Evaluating Normality for Readmit Sub Group, n=14.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Comorbid	0.203	14	0.123	0.955	14	0.646
LOS	0.098	14	.200 *	0.962	14	0.749
Age	0.143	14	.200 *	0.913	14	0.172
FourMWT	0.199	14	0.136	0.889	14	0.078
IWHODOM1	0.15	14	.200 *	0.947	14	0.514
IWHODOM2	0.15	14	.200 *	0.947	14	0.514
IWHODOM3	0.186	14	.200 *	0.916	14	0.191
IWHODOM4	0.183	14	.200 *	0.945	14	0.48
IWHOTOT	0.312	14	0.001	0.811	14	0.007

Note. a. Lilliefors Significance Correction

Table 7 addresses the third research question, "what is the perceived quality of life of older adults who will be discharged home from a hospital based on the WHO QOL BREF for those readmitted and not readmitted to the hospital?" Total scores are derived from the answers to the first two questions using a scale of 0-5, which is then summed to produce a total score with the best possible score being 10. All domain raw scores were transformed to 0 to 100 using the WHO QOL BREF calculation sheet. Total score and the four domain scores were similar with a larger standard deviation in the not readmit group. To determine if there was a difference between the two groups, the Mann-Whitney U test was used. The two groups did not differ significantly for the total score, U= 403, z= -0.133, p= 0.89. The two groups did not differ significantly for domain 1/ physical, U= 403.5, z= -0.126, p= 0.89. The two groups did not differ significantly for domain 2/ psychological, U= 402.5, z= -0.140, p= 0.88. The two groups did not differ significantly for domain 3/social, U= 402.5, z= 0.210, p= 0.834. The two groups did not differ significantly for domain 4/environment, U= 412, z= -0.007, p=0.99. No significant difference in the scores was noted between the readmit and not readmit groups for the total WHO

QOL BREF score or any of the domains assessed by the WHO QOL BREF at the time of hospital discharge.

Table 7.
WHO QOL BREF Scores Comparing Readmit and Not Readmit Groups at Time of Discharge from the Hospital

	Total (0-10)	Domain 1 Physical	Domain 2 Psychological	Domain 3 Social	Domain 4 Environment
Readmit at time of discharge	7.1 ± 2.0	58.7 ± 15.8	67.0 ± 13.7	75.9 ± 15.3	81.0 ± 12.5
Not Readmit at time of discharge	7.2 ± 1.9	57.3 ± 15.5	65.9 ± 14.3	76.2 ± 18.9	78.9 ± 17.7

Table 8 addresses the fourth research question which asks, "what is the perceived quality of life of older adults who will be discharged home from a hospital based on WHO QOL BREF for those readmitted and those not readmitted to the hospital?" Table 8 displays the scores of the not readmit group at the time of discharge from the hospital and their scores 30 days after hospital discharge. The two sets of scores for the total WHO QOL BREF did not significantly differ with W=311.5, z= -1.75, p= 0.08. The two sets of scores for domain 1/physical did not significantly differ with W=562.5, z= -0.497, p= 0.62. The two sets of scores did not significantly differ for domain 2/psychological with W= 609.5, z= -0.724, p= 0.47. The two sets of scores did not significantly differ for domain 3/ social with W= 465, z= - 0.35, p= 0.73. The two sets of scores did significantly differ for domain 4/environment with W= 416, z= -2.651, p= 0.008.

Table 8.
Wilcoxon Rank WHO QOL BREF Scores for Not Readmit Group at Time of Discharge from the Hospital and 30 Days after Discharge from the Hospital

	Total (0-10)	Domain 1 Physical	Domain 2 Psychological	Domain 3 Social	Domain 4 Environment
Not Readmit at time of discharge	7.2 ± 1.9	57.3 ± 15.5	65.9 ± 14.3	76.2 ± 18.9	78.9 ± 17.7*
Not Readmit at 30 days post discharge	7.6± 1.8	58.6 ± 11.3	67.4 ± 14.0	74.5 ± 16.3	84.4 ± 15.1*

Figure 2 addresses the fifth research question which asks, "Do factors such as perceived quality of life, walking speed, LOS, and number of comorbidities influence the readmission rate in older adults discharged home from an acute care hospital? Using inferential statistics, Chi Square analysis was not significant for any pairing of descriptive characteristics or outcome measure for the readmit and not readmit group (Appendix G). Simple regression analysis did not provide significant results for any descriptive characteristic or outcome measure for the readmit and not readmit group (Appendix H). Therefore, multiple regression analysis was used to determine if a combination of factors influence those participants readmitted to the hospital. Using the factors collected during the study, a regression model factor analysis was conducted to explain the potential factors contributing to readmission to the hospital within 30 days (Table 9). The factors were entered in the regression model by order of the value of the correlation, with the highest correlation (p value) entered first and the lowest correlation (p value) entered last. The model suggests that using the combination of the WHO QOL BREF domain 3/social and domain 4/environment and the 4 MWT score explains 93% of the variance. Adding the other factors examined in this study did not further explain the variance for readmission to the hospital.

Figure 2.
Regression Model Factor Analysis Using WHO QOL BREF Domain 3, Domain 4, 4 MWT, Domain 2, Age, Length of Stay, Domain 1, Total score, # of Comorbidities.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.849 a	.720	.717	.211	.720	182.974	71	71	.000
2	.961 b	.924	.922	.111	.204	188.705	70	70	.000
3	.964 c	.930	.927	.107	.006	5.636	69	69	.020
4	.965 d	.931	.927	.107	.001	.562	68	68	.456
5	.965 e	.931	.926	.108	.001	.691	67	67	.409
6	.967 f	.934	.928	.106	.003	2.854	66	66	.096
7	.967 g	.935	.928	.106	.001	.680	65	65	.412
8	.967 h	.935	.927	.107	.000	.062	64	64	.804
9	.967 i	.935	.926	.108	.000	.021	63	63	.884

Note. Variables entry.

Predictors: (Constant), IWHODOM3
b. Predictors: (Constant), IWHODOM3, IWHODOM4
c. Predictors: (Constant), IWHODOM3, IWHODOM4, FourMWT
d. Predictors: (Constant), IWHODOM3, IWHODOM4, FourMWT, IWHODOM2
e. Predictors: (Constant), IWHODOM3, IWHODOM4, FourMWT, IWHODOM2, Age
f. Predictors: (Constant), IWHODOM3, IWHODOM4, FourMWT, IWHODOM2, Age, LOS
g. Predictors: (Constant), IWHODOM3, IWHODOM4, FourMWT, IWHODOM2, Age, LOS, IWHODOM1
h. Predictors: (Constant), IWHODOM3, IWHODOM4, FourMWT, IWHODOM2, Age, LOS, IWHODOM1, IWHOTOT
j. Predictors: (Constant), IWHODOM3, IWHODOM4, FourMWT, IWHODOM2, Age, LOS, IWHODOM1, IWHOTOT, Comorbid

Chapter V

DISCUSSION

Older adults discharged home from a hospital experience a time of vulnerability as they have experienced a recent medical change warranting a hospital admission with advanced medical treatment (Krumholtz, 2013). The effect of hospitalization of older adults is known to have potential adverse effects to overall health, independence in activities of daily living and functional status (Mahoney, et al., 2000; Hitcho, 2004; Kortebein, 2009; Krumholtz, 2013; Greysen et al., 2015). Older adults discharged home from the hospital are more susceptible to falls (Jencks, et al., 2009), present with decreased activity levels (Covinsky, et al., 2011), and are readmitted back to the hospital within 30 days for reasons related to or even the same reason as their initial hospitalization (Gorina, et al, 2015). Rates of readmission back to the hospital after discharge have remained essentially unchanged for Medicare beneficiaries at approximately 20% (Jencks et al., 2009; Gorina et al., 2015) for the last 20 years. This is true despite interventions attempted in the hospital (Krumholtz, 2013) and interventions once the older adult returns home to prevent readmission (Jencks, et al., 2009; Gorina, et al., 2015). The purpose of this study was to provide a description of older adults discharged home from a hospital, to explore the impact of health status of older adults discharged home from a hospital and to examine potential factors that influence readmission back to the hospital within 30 days of discharge.

Ensuring the safety of older adults when discharged home from the hospital is paramount. In acute care hospitals after the medical care is initiated, physical therapists play a key role in determining the discharge location as well as predicting the ability of the person to function in their home environment based on the physical examination and a review of the prior functional status and potential assistance at home (Masley, et al., 2011). In the present study, data suggests

that the rate of readmission (19.2%) was consistent with previous research studies for Medicare beneficiaries (Gorina, et al., 2015). Although it is unknown if the study participants were all Medicare beneficiaries as this issue was not addressed, older adults in this study were defined as 65 years or older which is consistent with literature defining Medicare beneficiaries (Gorina et al., 2015). All participants in this study had a completed physical therapy (PT) evaluation prior to being asked to enroll in the study and were recommended for home discharge by the primary physical therapist. The standard of care for a PT examination includes a functional assessment which is then correlated to how well the person would function within their home environment. Despite the PT assessment and recommendation of the therapist for a home discharge, the readmission rate for participants was not lower than the known national readmission rate. The study results indicate that despite a physical therapist evaluation which includes functional ability, an assessment of the prior level of function and a verbal assessment of the home environment and support systems, the evaluation and subsequent recommendations of the physical therapist was not protective regarding readmissions rate. The rate of readmission in this study was very similar to the national rate of readmission. Functional status as the primary determinant of safe discharge to home, even when performed by a licensed PT who is considered an expert in the discharge planning process for inpatients, is not sufficient to assist with ensuring an older adult once discharged home can remain home and avoid readmission. It is possible other biopsychological factors not considered in a standard physical therapy examination likely need to be added to the evaluation and/or there needs to be a more formal outcome measure providing more detailed analysis of all the factors involved in the discharge of older adults in the hospital who will transition to the home setting.

Medical characteristics are important considerations in overall health. The descriptive statistics in the study include examined those readmitted to the hospital within 30 days of discharge by age band and revealed 50% were in the age band of 65-74, 28.6% were in the age band of 75-84 and 21.4% were in the age band of 85+ years old. For those participants readmitted to the hospital, the oldest age band 85+ years old, demonstrated a large discrepancy between those readmitted (21.8%) compared to those not readmitted (6.8%) to the hospital. Based upon this finding, age does seem to have a role in readmission to the hospital. For the total group regardless of age, length of stay was approximately 9.0 days and for each sub group, readmits and not readmits to the hospital within 30 days of discharge, was also approximately 9.0 days. However, the observed larger standard deviations for the sub group indicated larger variance for the readmit sub group. This data indicate that length of stay was likely not a critical factor in the analysis for readmission. The number of comorbidities was approximately 4 for each group and the standard deviation was identical in the sub groups, indicating little influence of the number of comorbidities in the readmission of the participant to the hospital.

The reason for admission to the hospital for this study was determined by what the admitting physician documented as the primary reason for admission to the hospital. An admitting diagnosis that would require a predicted surgery would be classified as surgical admission and the diagnosis that would require primarily medical management as a medical admission. In this study, the total number of participants that had a surgical diagnosis was 43 (59%) and the total number of participants with a medical diagnosis was 30 (41%). In the sub group readmit to the hospital, 10 (71.4%) had a medical diagnosis compared to the sub group not readmit to the hospital 20 (33.9%) had a medical diagnosis. Conversely, the sub group readmit to the hospital who had surgical diagnosis accounted for 4 (28.6%) participants and the sub

group not readmit to the hospital had 39 (66.1%) participants. This might suggest that those who were admitted for a medical reason are more susceptible to readmission to the hospital. In most of the cases in this study, a surgical diagnosis would be considered an "elective" event and therefore may allow for greater predictability to plan for discharge process including providing support from the participants' carer team after discharge.

In this study, fall events recorded either in the hospital or at home did not influence readmission to the hospital. The one participant who fell in the hospital was not readmitted after discharge to home and the five participants who fell after discharge to home were not readmitted to the hospital. Although fall events are frequently under-reported by older adults (Cummings, et al., 1988), this factor did not influence readmission back to the hospital. The average length of stay in the hospital and the number of comorbidities in both sub groups, readmit and not readmit to the hospital, was very similar and therefore not a likely factor in readmission.

The 4MWT has demonstrated accuracy in predicting mortality and morbidity in older adults (Studenski, et al., 2003). In this study, both the sub groups of readmit and not readmit, could walk faster than age matched groups recently discharged from the hospital (Graham et al., 2010), however, those that were readmitted to the hospital walked 20% slower (0.49 m/s) compared to those that were not readmitted (0.59m/s). The speed differential was a 0.1 m/s slower for those readmitted to the hospital which is a critical gait speed difference (Studenski et al., 2003; Fritz & Lusardi, 2009; Graham et al, 2010). This result suggests the influence on readmission for those with slower walking speed as measured by the 4MWT.

The use of the WHO QOL BREF questionnaire distinguished this research from other studies evaluating readmission based on medical, personal, or functional characteristics only. Inclusion of the perceived quality of life of the older adult provided potential insight into

readmission and expansion of current research theories for return to health and wellness. At the time of discharge, both sub groups readmit and not readmit, were not statistically different. In the sub group not readmitted to the hospital however, there were differences in the group scores that were significant. The WHO QOL BREF can detect changes in treatment when used with the same person during a retest (Skevington, et al., 2004). When comparing the discharge and 30 day after discharge WHO QOL BREF scores, statistical significance was reached only for the fourth domain/environment. Questions in the fourth domain of the WHO QOL BREF reference financial resources, security and satisfaction within your environment, access to and the degree of quality healthcare, opportunities to acquire new information when needed, participation in leisure activities and access to transport (Skevington & McCrate, 2012). These questions are not related to either medical or physical characteristics and yet seem to play a role in the ability of an older adult to not be readmitted to the hospital.

In the regression model, the third domain/social plus the fourth domain/environment accounted for 92.4% of the variance of influence in readmission. When adding the 4MWT to the model, 93% of the variance can be explained. The 4MWT was added to the model as this factor was significant. Further addition of traditional medical and physical characteristics such as LOS, comorbidities and age did not significantly increase the predictability in the regression model and none of these factors were significant at $p<0.05$. This study suggests that characteristics outside the traditional medical model and outside the traditional description of patients' functional status should be examined when evaluating for potential readmission to the hospital. The value of a biopsychological model, inclusive of a physical characteristic, gait speed, and inclusive of an individual's quality of life perception for their environment and their social condition is valuable.

As the length of stay in acute care hospitals continues to decline (Weiss & Elixhauser, 2006), the faster discharge to home may place a heavier burden on the patient and the caregiver which is not detected in the traditional medical models, yet may be captured in using the WHO QOL BREF. This QOL measure is unique in that the questions were created based on researcher and participant input (McDowell, 2006). In addition, the WHO QOL BREF captures not just the absence of the disease but physical, social and mental well-being (McDowell, 2006). This QOL measure gives equal attention to the physical well-being of the person and provides equal value to psychological, social and environmental factors of the person in measuring their quality of life (Skevington & McCrate, 2012). Research describing readmission rates thus far has focused more on medical and physical characteristics of the individual (Gorina et al., 2015).

Chapter VI

SUMMARY AND CONCLUSIONS

Every month in the United States, more than a quarter of a million people are turning 65 years old (Colby & Ortman, 2014). Health care use will continue to grow to manage the health needs of this age group and others in their communities (Colby & Ortman, 2014). When an older adult is admitted to the hospital, excellent medical care can be given but this care has also been associated with adverse events including risk of decline in functional status and activities of daily living (Kortebein et al., 2007; Krumholtz, 2013). While many interventions in the hospital and once home have been trialed and studied the rate of readmission to the hospital in the last 20 years has not significantly changed (Jencks et al., 2009; Gorina, et al., 2015). Providing examinations that identify and allow for the best plan of care in the hospital for safe discharge and continued healing and wellness in the home setting is critical.

The results of this study indicate that despite physical therapy evaluation and recommendation for home discharge, the readmission rate for all participants was not different than the known national value. In examining the data for the outcome measures and medical characteristics of the participants via a regression model, there was not as significant as an impact as the contribution of the WHO QOL BREF environment and social domain contributions combined with the functional measure in the 4 MWT score.

While the results of this study begin to indicate a new paradigm for inclusion of factors of self-perceived QOL, there are several limitations to this study. This study had a smaller sample size than predicted and thus was under powered. The setting in which all participants were included in the study has a high case mix index value and is a tertiary care facility within an academic medical center. This study used a sample of convenience but did not demonstrate

diversity regarding sex or culture. All these limitations should provide caution when considering generalizability of the results.

The study included only participants who had completed a physical therapy evaluation. This may have biased the type of participant able to be included as it is likely there was initial concern with discharge from a functional perspective based on the referral patterns in this acute care hospital. All participants were included if they were discharged to an independent living community which meant the level of independence at the time of discharge was likely better than if someone was discharged to another level of care such as a rehabilitation or assisted living community. Safety and readmission are not only concerns for those returning home but for all participants admitted and discharged from an acute care hospital.

There were several limitations with the follow up procedures for this study. All the survey questions were recorded as self-report responses to the questions asked. There was no in home follow up for outcome measures like the 4MWT once the participant was discharged and should be a consideration for future research given the merging evidence of the importance of gait speed in older adults. If participant was readmitted to the hospital, there was no follow up on the reason or the subsequent length of stay. These factors may be important considerations in the future to better understand the readmission reasons and process.

Future research studies should address the limitations discussed in this study. In addition, future research studies might also investigate the specific contribution of the environment and social domains for a cut score or a scoring marker indicating that the older adult may have difficulty after discharge from the hospital. Future research might investigate the discrimination of the admission reason by medical or surgical category to determine if there is a true difference when admission to the hospital and home discharge is predicted, as is more likely with a surgical

admission reason. Future research may include the ability to use gait speed early in the acute care admission as an indicator for inpatient training and influence recommendations for post-acute discharge with the goal to produce faster gait speed at the time of hospital discharge or the completion of physical therapy services.

In conclusion, the use of the WHO QOL BREF was reasonable in the acute care environment and generally well received by the participants completing the questionnaire. The finding that self-perceived QOL metrics in the environmental and social domains combined with the 4MWT speed offers a new paradigm consideration for all healthcare practioners when examining older adults for safe discharge home. In light of our findings, we suggest the biopsychological paradigm to be more inclusive of the needed characteristics to identify those at risk for readmission back to the hospital within 30 days of discharge.

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Appendix A

University of Pennsylvania IRB Approval

University of Pennsylvania
Office of Regulatory Affairs
3624 Market St., Suite 301 S
Philadelphia, PA 19104-6006
Ph: 215-573-2540/ Fax: 215-573-9438
INSTITUTIONAL REVIEW BOARD
(Federalwide Assurance # 00004028)

27-Nov-2013

Colleen Chancler
Colleen.Chancler@uphs.upenn.edu

PRINCIPAL INVESTIGATOR	: Colleen Chancler
TITLE	: The health status of older adults who are discharged home from an acute care hospital: a descriptive study
SPONSORING AGENCY	: No Sponsor Number
PROTOCOL #	: 819088
REVIEW BOARD	: IRB #7

Dear Colleen Chancler:

The above referenced protocol and was reviewed and approved by the Executive Chair (or her authorized designee) using the expedited procedure set forth in 45 CFR 46.110, category 5,7, on 26-Nov-2013. This study will be due for continuing review on or before 25-Nov-2014.

Approval by the IRB does not necessarily constitute authorization to initiate the conduct of a human subject research study. Principal investigators are responsible for assuring final approval from other applicable school, department, center or institute review committee(s) or boards has been obtained. This includes, but is not limited to, the University of Pennsylvania Cancer Center Clinical Trials Scientific Review and Monitoring Committee (CTSRMC), Clinical and Translational Research Center (CTRC) review committee, CAMRIS committee, Institutional Bio-safety Committee (IBC), Environmental Health and Radiation Safety Committee (EHRS), and Standing Conflict of Interest (COI) Committee. Principal investigators are also responsible for assuring final approval has been obtained from the FDA as applicable, and a valid contract has been signed between the sponsor and the Trustees of the University of Pennsylvania. If any of these committees require changes to the IRB-approved protocol and informed consent/assent document(s), the changes must be submitted to and approved by the IRB prior to beginning the research study.

If this protocol involves cancer research with human subjects, biospecimens, or data, you may not begin the research until you have obtained approval or proof of exemption from the Cancer Center's Clinical Trials Review and Monitoring Committee.

The following documents were included with this submission:
-HS-ERA IRB Application, (Confirmation Code : beajjbbg), submitted 11/20/2013
-Response Cover Letter, dated November 11, 2013
-Combined Informed Consent and HIPAA Authorization Form, Version 1, dated October 20, 2013
-Cover Letter, dated October 20, 2013
-Data Collection Sheet, uploaded 10/21/2013
-Phone Call Follow-Up Script, uploaded 10/21/2013
Quality of Life (WHOQOL)- BREF Questionnaire, uploaded 10/20/2013

When enrolling subjects at a site covered by the University of Pennsylvania's IRB, a copy of the IRB approved informed consent form with the IRB approved from/to stamp must be used unless a waiver of written documentation of consent has been granted.

If you have any questions about the information in this letter, please contact the IRB administrative staff. Contact information is available at our website: http://www.upenn.edu/regulatoryaffairs.

Thank you for your cooperation.

Sincerely,

Benjamin Hernberg
Digitally signed by Benjamin Hernberg
DN: cn=Benjamin Hernberg, o=ORA, ou=IRB, email=hernberg@upenn.edu, c=US
Reason: I attest to the accuracy and integrity of this document
Date: 2013.12.02 09:17:01 -05'00'

IRB Administrator

Appendix B

Seton Hall IRB Approval

SETON HALL UNIVERSITY
1 8 5 6

May 9, 2014

Colleen Chancler
[redacted]

Dear Ms. Chancler,

The Seton Hall University Institutional Review Board has reviewed the information you have submitted addressing the concerns for your proposal entitled "Health Status of Older Adults Discharged Home From an Acute Care Hospital: A Descriptive Study". Your research protocol is hereby approved as revised through full review.

Enclosed for your records is the signed Request for Approval form.

The Institutional Review Board approval of your research is valid until **November 25, 2014**. During this time, any changes to the research protocol must be reviewed and approved by the IRB prior to their implementation.

According to federal regulations, continuing review of already approved research is mandated to take place by **November 25, 2014**. You will receive communication from the IRB Office for this several months before this date.

Thank you for your cooperation.

In harmony with federal regulations, none of the investigators or research staff involved in the study took part in the final decision.

Sincerely,

Mary F. Ruzicka, Ph.D.

Mary F. Ruzicka, Ph.D.
Professor
Director, Institutional Review Board

cc: Dr. Genevieve Pinto Zipp

Office of Institutional Review Board
Presidents Hall • 400 South Orange Avenue • South Orange, New Jersey 07079 • Tel: 973.313.6314 • Fax: 973.275.2361 • www.shu.edu

Appendix C

Informed Consent and HIPAA Authorization Form

UNIVERSITY OF PENNSYLVANIA RESEARCH SUBJECT INFORMED CONSENT AND HIPAA AUTHORIZATION FORM

Protocol Title:	The health status of older adults who are discharged home from an acute care hospital: a descriptive study
Principal Investigator:	Colleen Chancler
Emergency Contact:	Colleen Chancler, PT, MHS

Why am I being asked to volunteer?

You are being invited to participate in a research study titled, "The Health Status of Older Adults Discharged Home from an Acute Care Hospital: a Descriptive study". Your participation is voluntary which means you can choose whether or not you want to participate. If you choose not to participate, there will be no loss of benefits to which you are otherwise entitled. Before you can make your decision, you will need to know what the study is about, the possible risks and benefits of being in this study, and what you will have to do in this study. The research team is going to talk to you about the research study, which will describe the health status of older adults discharged home from a hospital. The study will include a 4 meter walk test; a quality of life scale which is a paper and pencil survey tool; some of your medical information from the chart and a researcher will call you once you are home to find out information about how you are doing since your discharge. They will give you this consent form to read. You may also decide to discuss it with your family, friends, or family doctor. You may find some of the medical language difficult to understand. Please ask the study therapist about this form. If you decide to participate, you will be asked to sign this form and a copy will be given to you.

What is the purpose of this research study?

The purpose of this study is to assess the health status of ten patients admitted to a hospital and then follow then upon discharge home.

How long will I be in the study? How many other people will be in the study?

The study will begin while you are in the hospital. The study team will call you once a week for one month after you are discharged. The total time you will be involved in the study will not be longer than 45 days. Ten people will be involved in this pilot study.

What am I being asked to do?

After signing this consent form, you will be asked to complete a 26 question paper and pencil survey called the WHO-QOL-BREF. This should take approximately 10 minutes to complete. Next, you will be asked to complete a 4-meter walk test. You will be asked to walk 4 meters at a comfortable pace for three trials, with the time recorded each time. If you need help or a walker or cane, it will be provided for you. Once you are discharged home, a member of the study team will call you and ask you questions about any falls you may have had; how well you are moving around and any help you are receiving at home. During the last phone call, we will also ask you to fill out the WHO-QOL-BREF survey again. The last phone call should last approximately 20-30 minutes.

What are the possible risks or discomforts?

There are some minimal risks associated with this study. There is a small risk of a fall during the walking test and/or fatigue/ muscle pain after completing the test. Once you are discharged home, there is a minimal risk that you may fall when answering the phone. If that occurs, you will be instructed to contact your primary doctor. As with all research, this study may involve risks that are unforeseeable; all efforts will be made to minimize these risks.

What if new information becomes available about the study?

During the course of this study, we may find more information that could be important to you. This includes information that, once learned, might cause you to change your mind about being in the study. We will notify you as soon as possible if such information becomes available.

What are the possible benefits of the study?

You are not expected to get any benefit from being in this research study. However, your participation in this study may help us better understand the health status of older adults who are discharged home after being in the hospital.

What other choices do I have if I do not participate?

There are no other alternative treatments than participation.

Will I be paid for being in this study?

You will not be paid or compensated in any manner for participating in this study.

Will I have to pay for anything?

If you chose to participate, there will be no costs incurred to you for your participation.

What happens if I am injured from being in the study?

There are no plans for the University of Pennsylvania/Good Shepherd Penn Partners to pay you or give you other compensation for the injury. You do not give up your legal rights by signing this form.

If you think you have been injured as a result of taking part in this research study, tell the person in listed on the first page of this consent form as soon as possible.

When is the Study over? Can I leave the Study before it ends?

This study will end after all participants have completed all the follow up phone calls, and all information has been collected. This study may also be stopped at

any time by your physician or the Primary investigator, without your consent because:

- The Primary Investigator feels it is necessary for your health or safety. Such an action would not require your consent, but you will be informed if such a decision is made and the reason for this decision.
- You have not followed study instructions.
- The study Principal Investigator has decided to stop the study.

If you decide to participate, you are free to leave the study at anytime. Withdrawal will not interfere with your current or future care.

What information about me may be collected, used or shared with others?

The information that will be collected and disclosed for this study includes:

- Name, address, telephone number, date of birth and medical record number
- Medical history for the current hospital stay and your previous medical history
- Results from physical examinations, tests or procedures
- Information regarding number of falls and health care use once you are discharged home
- Self assessment answers of quality of life from the WHO-QOL-BREF questionnaire

Why is my information being used?

Your information is used by the research team to contact you during the study. Your information and results of tests and procedures are used to:

- do the research
- oversee the research
- to see if the research was done right.

Who may use and share information about me?

The following individuals may use or share your information for this research study:

- Colleen Chancler, PT, MHS
- Tami Levengood, OTR/L
- Genevieve Pinto-Zipp, PT, EdD
- Terrence Cahill, EdD, FACHE

- Laurita Hack, PT, DPT, PhD, MBA, FAPTA

Who, outside of the School of Medicine, might receive my information?

- Seton Hall University IRB
- Seton Hall University research committee

Once your personal health information is disclosed to others outside the School of Medicine, it may no longer be covered by federal privacy protection regulations.

The Principal Investigator or study staff will inform you if there are any additions to the list above during your active participation in the trial. Any additions will be subject to University of Pennsylvania procedures developed to protect your privacy.

How long may the School of Medicine use or disclose my personal health information?

Your authorization for use of your personal health information for this specific study does not expire.

Your information may be held in a research database. However, the School of Medicine may not re-use or re-disclose information collected in this study for a purpose other than this study unless:

- You have given written authorization
- The University of Pennsylvania's Institutional Review Board grants permission
- As permitted by law

Can I change my mind about giving permission for use of my information?

Yes. You may withdraw or take away your permission to use and disclose your health information at any time. You do this by sending written notice to the investigator for the study. If you withdraw your permission, you will not be able to stay in this study.

What if I decide not to give permission to use and give out my health information?

Then you will not be able to be in this research study.

You will be given a copy of this Research Subject HIPAA Authorization describing your confidentiality and privacy rights for this study.

By signing this document you are permitting the School of Medicine to use and disclose personal health information collected about you for research purposes as described above.

Who can see or use my information? How will my personal information be protected? See if this is already covered in the HIPAA info I added above

We will do our best to make sure that the personal information obtained during the course of this research study will be kept private. However, we cannot guarantee total privacy. Your personal information may be given out if required by law. If information from this study is published or presented at scientific meetings, your name and other personal information will not be used.

In order to maintain confidentiality during the study, all records recorded on paper will remain in a locked file cabinet in the locked office of the principal investigator. Only people who need to see the data will be allowed to view the data. The IRB at the University of Pennsylvania and Seton Hall University will have access to the records.

Electronic Medical Records and Research Results

What is an Electronic Medical Record?

An Electronic Medical Record (EMR) is an electronic version of the record of your care within a health system. An EMR is simply a computerized version of a paper medical record.

You are receiving care within the University of Pennsylvania Health System (UPHS) (inpatient) and are participating in a research study. Therefore, results of research-related procedures (i.e. laboratory tests, imaging studies and clinical procedures) may be placed in your existing EMR maintained by UPHS.

Once placed in your EMR, these results are accessible to appropriate UPHS workforce members that are not part of the research team. Information within your EMR may also be shared with others who are determined by UPHS to be appropriate to have access to your EMR (e.g. health insurance company, disability provider, etc).

Who can I call with questions, complaints or if I'm concerned about my rights as a research subject?

If you have questions, concerns or complaints regarding your participation in this research study or if you have any questions about your rights as a research

subject, you should speak with the Principal Investigator, Colleen Chancler, PT, MHS, listed on page one of this form. If a member of the research team cannot be reached or you want to talk to someone other than those working on the study, you may contact the Office of Regulatory Affairs with any question, concerns or complaints at the University of Pennsylvania by calling (215) 898-2614.

When you sign this form, you are agreeing to take part in this research study. This means that you have read the consent form, your questions have been answered, and you have decided to volunteer. Your signature also means that you are permitting the University of Pennsylvania/Good Shepherd Penn Partners to use your personal health information collected about you for research purposes within our institution. You are also allowing the University of Pennsylvania/Good Shepherd Penn Partners to disclose that personal health information to outside organizations or people involved with the operations of this study.

A copy of this consent form will be given to you.

Name of Subject (Please Print)	Signature of Subject	Date

Name of Person Obtaining Consent (Please Print)	Signature	Date

Appendix D

Solicitation Flyer

Older Adult (ages 65 and older) Volunteers Needed

for a Research Study

on Health Status after Hospital Discharge

Purpose of the Study: The purpose of this study is to describe the health status of older adults discharged to home from an acute care hospital as a means to better understand the effects of hospitalization on older adults.

Expected Duration of the Study: The study will start just before you are discharged home (within 48 hours of discharge) and will continue for no more than 45 days after you return home.

Description of Procedures the Research Team Will Use: You will be visited in the hospital by a researcher who is with the Therapy Department. She/he will complete a 4 meter walk test and a paper and pencil test on quality of life assessment with you (WHO-QOL-BREF). This should take approximately 15 minutes. After you are discharged home, a research assistant will call you each week for four consecutive weeks and ask scripted questions. These phone calls should last approximately 5 minutes except for the last phone call which will last approximately 15-20 minutes. The last phone call will include re-taking the quality of life assessment (WHO-QOL-BREF).

Voluntary Nature of the Study: Participation is completely voluntary and participants can withdraw at any time with no penalty, prejudice or questions asked.

Anonymity and Confidentiality: All information will be kept strictly confidential and anonymous by and separately securing the name/number key from subject data.

For More Details Please Contact: Colleen Chancler, PT, MHS. PhD student in the Department of Interprofessional Health Sciences and health Administration, School of health and Medical Sciences, Seton Hall University, 973-275-2076, colleen.chancler@student.shu.edu.

Appendix E

Data Collection Sheet

This is the data collection sheet used for all consenting participants.

Although only 20 lines listed, this sheet was used for all participants who gave consent to participate. Data was used only based on study criteria.

	Data Collection Sheet										Data Collection Sheet											
	Participant Name	admit date	discharge date	age in years	gender	ethnicity	admitting diagnosis	comorbidities	falls in the hospital (yes/No)	4 meter walk score; date and time completed	Initial WHO QOL BREF Total score; date and time completed	Initial WHO QOL BREF Domain 1 score	Initial WHO QOL BREF Domain 2 score	Initial WHO QOL BREF Domain 3 score	Initial WHO QOL BREF Domain 4 score	Discharge WHO QOL BREF Total score; date and time completed	Discharge WHO QOL BREF Domain 1 score	Discharge WHO QOL BREF Domain 2 score	Discharge WHO QOL BREF Domain 3 score	Discharge WHO QOL BREF Domain 4 score	Total weeks in follow up	reason for not completing follow up
1																						
2																						
3																						
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Appendix F

Structured Questions Sheet

The structured question sheet was used only for participants who could be contacted by phone for follow up during the 4 weeks of the trail per the study protocol.

Structured/Scripted Questions

Script. Worksheet for Phone Call Follow Up: Phone calls will be made weekly for each participant for a total of 4 weeks or until the participant is readmitted to a hospital as an inpatient.					
Good morning/afternoon Mr/Mrs/Ms._____ (participant name) this is XXXX and I am calling on behalf of the research study you participated in the hospital called, "The health status of older adults discharged home from an acute care hospital: a descriptive study." Briefly, this is the study that will describe how you feel and how well you are functioning when discharged home from a hospital. The therapist who saw you in the hospital told you I would be calling. Is this a good time to ask you some questions? This should take about 5 minutes of your time/ 20-30 minutes of your time if the last phone call.					
Participant:_____ (initials)	Participant number				
	_____	Date and time call made	Date and time call made	Date and time call made	Date and time call made
Health Status					
Since we last spoke/since your discharge from the hospital on _____ (list the date), have you used any services for your healthcare such as an emergency room, urgent care center or been seen in an observation unit? Yes/No					
Since we last spoke/since your discharge from the hospital on _____ (list the date), were you readmitted to a hospital for any length of time? This would mean you					

were an inpatient in the hospital again. Yes/ No					
Since we last spoke/since your discharge from the hospital on _____ (list the date), have you had any falls either inside or outside the house? A fall would be considered landing on a lower level from a higher level and may or may not involve an injury. Yes/No					
Since we last spoke/since your discharge from the hospital on _____ (list the date), have you cut down on your usual activities due to an illness, injury or other problem? Yes/No					
Since we last spoke/since your discharge from the hospital on _____(list the date), have you stayed in bed for at least half the day due to an illness, injury or other problem? Yes/ No					
Thank you for your time. I want to remind you that I will be calling again in another 7 days to ask the same questions (or if this is the third phone call, remind the participant they will be asked the same questions plus read the WHO QOL BREF assessment). Can we schedule that call now (or if this is the last phone call, remind the participant they have completed the study)? Have a nice day and thanks for your time.					

Appendix G

Chi Square Statistics Work Sheet

Chi Square statistics performed for various groups within the study.

Significance results for the chi square analysis did not yield significant values and therefore was not used in the final analysis.

Chi Square for Reason for Admission based on not readmit/readmit status

	Medical		Surgical		
	Observed	Expected	Observed	Expected	p
Not readmit	20	19.4	39	39.6	
Readmit	4	4.6	10	9.4	
Significance					0.7

Chi Square for LOS based on not readmit/readmit status

	LOS <7 days		LOS>7days		
	Observed	Expected	Observed	Expected	p
Not readmit	20	18.6	39	40.4	
Readmit	3	4.4	11	9.6	
Significance					0.37

Chi Square for ethnicity based on not readmit/readmit status

	White		Black		
	Observed	Expected	Observed	Expected	p
Not readmit	52	50.9	7	8.1	
Readmit	11	12.1	3	1.9	
Significance					0.35

Chi Square for sex based on not readmit/readmit status

	Male		Female		
	Observed	Expected	Observed	Expected	p
Not readmit	41	39.6	18	19.4	
Readmit	8	9.4	6	4.6	
Significance					0.38

Chi Square for age band based on not readmit/readmit status

	65-74		75-84		85+		
	Observed	Expected	Observed	Expected	Observed	Expected	p
Not readmit	32	31.5	23	21.8	4	5.7	
Readmit	7	7.5	4	5.2	3	1.3	
Significance							0.57

Chi Square for gait speed in m/s based on not readmit/readmit status

	<1.2		1.2 to 1.4		>1.4		
	Observed	Expected	Observed	Expected	Observed	Expected	
Not readmit	14	13	13	14	32	33	
Readmit	1	4	4	3	9	8	
Significance							0.38

Chi Square for number of comorbidities based on not readmit/readmit status

	0-2		3		4 to 5		6 to 10		
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected	p
Not readmit	14	12.9	10	12.1	26	25.1	9	8.9	
Readmit	2	3.1	5	3.9	5	5.9	2	2.1	
Significance									0.46

Appendix H

Single Regression for Readmit Participants Work Sheet

Single regression analysis performed after ANOVA determination.

Significance results for the ANOVA and subsequently single regression analysis did not yield significant values and therefore was not used in the final analysis.

Regression for comorbidity, LOS, 4MWT

ANOVA

	df	*SS*	*MS*	*F*
Regression	2	0.572542315	0.286271	0.10
Residual	11	33.1417434	3.012886	
Total	13	33.71428571		

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	4.692599462	1.972395275	2.379137	0.036557
4MWT	-0.04794665	0.145028831	-0.3306	0.747157
LOS	-0.049805907	0.145405585	-0.34253	0.738407

Regression for age, 4MWT, LOS

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	33.07613407	16.53807	0.165414	0.85
Residual	11	1099.781009	99.98009		
Total	13	1132.857143			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	80.6859559	11.36212038	7.101311	1.99E-05
4MWT	-0.47930127	0.835448684	-0.57371	0.577709
LOS	-0.05883795	0.837618999	-0.07024	0.94526

Regression for diagnosis, 4MWT, LOS, comorbidity

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	0.277491	0.138746	0.591631	0.57
Residual	11	2.579652	0.234514		
Total	13	2.857143			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.763583	0.519608	1.469536	0.1697
LOS	0.023532	0.039951	0.589027	0.567742
comorbid	0.080459	0.083705	0.961226	0.357092

Regression for total QOL, 4MWT, comorbidity

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	7.956663631	3.978332	1.047992	0.38
Residual	11	41.75762208	3.796147		
Total	13	49.71428571			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5.494858492	1.975660006	2.781277	0.017863
4MWT	-0.024653691	0.160261569	-0.15383	0.880527
Comorbid	0.478876434	0.336651076	1.422471	0.182622

Regression for total QOL, diagnosis, 4MWT

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	4.154895	2.077448	0.501585364	0.62
Residual	11	45.55939	4.141763		
Total	13	49.71429			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5.760136	2.30381	2.500266	0.029492447
dx	1.180591	1.219852	0.967815	0.353934558
4MWT	-0.01674	0.16905	-0.09902	0.922904195

Regression for LOS, total QOL, 4MWT

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	35.06157	17.53079	1.707467	0.23
Residual	11	112.9384	10.26713		
Total	13	148			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	16.34472219	4.109234	3.977559	0.002168
total QOL	-0.773291444	0.455712	-1.69689	0.117797
4MWT	-0.225517126	0.263435	-0.85606	0.410223