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NUMBER OF PHYSCIAL THERAPY VISITS PREDICTS DISPOSITION FOLLLOWING ACUTE HOSPITALIZATION FOR UTI IN COMMUNITY DWELLING OLDER ADULTS

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Number of Physical Therapy Visits Predict Disposition Following Acute Hospitalization for UTI in Community-Dwelling Older Adults

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Abstract

Background: Immobility often results in functional dependence in community-dwelling older adults. Expenditures for healthcare related to immobility are projected to increase exponentially as the older adult population is expected to double by the year 2030.

Purpose: The purpose of this retrospective study was to determine if differences in disposition and length of stay (LOS), were related to the number of physical therapy (PT) sessions completed during an acute hospitalization for urinary tract infection (UTI).

Method: Medical records of 523 participants were reviewed. Community-dwelling older adults admitted from home and functionally independent 30 days prior to hospitalization were included in the study. Demographic and patient characteristic data were collected as well as the number of PT sessions, LOS, and disposition status (home with self-care, home with home health PT, or subacute rehabilitation). Data were analyzed to determine if there was a predictive relationship between the number of PT sessions and LOS and the number of PT sessions and disposition status.

Results: Not being discharged home with self-care increased LOS by 0.78 days. Those discharged to subacute rehabilitation stayed longer than those who returned to the community. When LOS and PT sessions increased together, discharge to subacute rehabilitation decreased. When LOS increased without additional PT, discharge to subacute rehabilitation occurred more frequently.

Conclusions: It is imperative that older adults admitted for an acute hospitalization are prioritized for PT during their stay. Increasing the frequency of PT for these patients can improve their potential to be discharged back to the community.

Key Words: acute care, community dwelling, disposition, mobility, older adults, physical therapy, urinary tract infection

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Chapter 1: Introduction

Functional dependence in older adults results in large expenditures of government funded healthcare (Bernhardt et al., 2016; Fried, Bradley, Williams, & Tinetti, 2001; Jecker, 2017). As healthcare resources become more limited and the older adult population grows, it is imperative to prevent new onset of functional dependence as a result of acute hospitalization in this population (Gustavson, Falvey, Jankowski, & Stevens-Lapsley, 2017). The number of older adults in the United States (U.S.) is projected to double by 2030 (Kortebein, 2009). Physical therapists, who are experts in movement science, can play a key role in maintaining functional independence in this multiplicative and health care costly sector of our population (Bernhardt et al., 2016; Kortebein, 2009). As experts in maintenance and restoration of movement, physical therapists are in a unique position to make positive contributions to the healthcare resource dilemma.

Statement of the Problem

The focus of physical therapy (PT) in the acute care setting is on functional mobility (Jette, Brown, Collette, Friant, & Graves, 2009). However, many older adults admitted with acute, non-life threatening illnesses may not receive sufficient PT because of the high demand for services (Hobbs, Boysen, McGarry, Thompson, & Nordrum, 2010). In acute care hospitals, physical therapist intervention is prioritized when the demand for services outpaces staffing resources. According to Hobbs et al. (2010), individuals admitted to the hospital with non-life threatening illnesses, such as urinary tract infection (UTI), are often given low priority for PT treatment. Priority, and therefore a greater number of PT treatments, are given to those who are post-surgical, and it is often patients with non-life threatening illnesses who are not highly prioritized to receive PT services. High inpatient census and limited staff can result in reduced

PT follow-up visits when the prioritization of staff resources is directed toward new patient evaluations and for patients in need of high frequency therapy visits due to elective post-surgical protocols (Hobbs et al., 2010). Functional loss as a result of an acute care hospitalization often leads older adults to be discharged to sub-acute rehabilitation settings, inflating the cost of health care for this population (Das, Norton, Miller, & Chen, 2016). Once admitted to sub-acute rehabilitation, individuals often fail to recover to pre-illness level of function and suffer the added personal and financial cost of long-term care placement (Gill, Gahbauer, Han, & Allore, 2009).

Purpose

The purpose of this study was to determine if participation in PT during an acute hospitalization had an impact on inpatient length of stay (LOS) and post-hospitalization disposition status among community-dwelling, older adults. Specifically, this study addressed the following objectives:

- To determine if there was a predictive relationship between the number of inpatient PT sessions and inpatient LOS. Regression analysis was used to determine if LOS could be predicted based on the number of PT sessions and patient characteristics.
- To determine if there was a difference in the number of inpatient PT sessions by post-hospitalization disposition status. Regression analysis was used to determine if post-hospital disposition status could be predicted based on the number of PT sessions and patient characteristics.

Results from this study may provide insight to the relationship between physical therapist intervention and reduction of hospital-acquired mobility impairments resulting in subsequent

subacute rehabilitation. In addition, this study may provide insight to the relationship between physical therapist intervention and additional cost savings of reduced LOS.

Operational Definitions

The following definitions were used for this study.

- An acute condition resulting in treatment for a UTI was considered to be present if one of the following ICD-10 codes are present on the admission record: I N390 UTI, N3000 acute cystitis without hematuria, N3001 acute cystitis with hematuria, N3080 another acute cystitis without hematuria, N3081 other acute cystitis with hematuria, N3090 cystitis, unspecified without hematuria, N3091 cystitis unspecified with hematuria, N2886 urethritis cystica, N342 other urethritis, E 860 dehydration, E861 hypovolemia, E869 volume depletion unspecified, R400 somnolence, R410 disorientation unspecified and R4182 altered mental status.
- Length of stay was the number of days the participant was hospitalized from admission to discharge. Regardless of admission or discharge time of day. It was calculated by calendar days.
- Number of PT sessions was the number of times billable service physical therapy services were provided.
- Admission status was the participants' location 30 days prior to hospital admission.
- Disposition status, location to which the participant was released post-discharge, was categorized as one of the following:
    - Home with self-care (HSC)
    - Home with home health PT (HHPT)
    - Subacute rehabilitation (SAR)

- Standard UTI care was defined as gentle hydration with intravenous fluids and the use of narrow spectrum antimicrobial medication (Beetz, 2003; Beveridge, Davey, Phillips, & McMurdo, 2011).
- Community-dwelling was defined as living at home with or without family and was determined based on living status at time of hospital admission.
- Functionally independent was defined as being able to perform activities of daily living (ADL) independently.

Chapter 2: Literature Review

The literature is rich with evidence linking mobility with health and maintenance of functional independence for all age groups. There is robust evidence linking immobility during acute hospitalization with newly acquired functional impairment and potential permanent disability in the older adult population (Falvey, Mangione & Stevens-Lapsley, 2015) Lacking, however, is evidence linking interventions to prevent hospital-acquired mobility impairments for the older adult with physical therapy. It is imperative to explore how physical therapist intervention is related to prevention of new onset impairments in order to improve transitional outcomes.

Cost Benefit Ratios of Healthcare Spending in the Older Adult Population

Many parts of the world, including the U.S., have experienced a significant increase in the number of older adults greater than 65 years old that make-up their population (Anderson, Seib, & Rasmussen, 2014). The older adult population was projected to double according to the 2009 census report but now, it is expected to triple when compared to census numbers reported in 2000 (Bernhardt et al., 2016; Kortebein, 2009). Enhanced provision of medical care results in an average of 21 additional years of life for today's average 65 year-old (Favreault, Gleckman, & Johnson, 2015). It comes as no surprise that the rapidly expanding population of Medicare eligible recipients is predicted to have a significant effect on healthcare spending in the U.S. (Favreault et al., 2015; Fried et al., 2001). While persons 65 years and older comprise approximately 13% of the U.S. population as recently as 2013, they account for nearly 36% of all health care spending (Fried et al., 2001; Jecker, 2013). In 2015, post-acute care spending alone accounted for 10% of the Medicare budget (Falvey et al., 2015). With nearly 70% of the older adult population being discharged from hospitals functioning at a level below their prior

level, Falvey et al., (2015) projected continued spending in the years to come. Gill, Allore, Gahbaurer, & Murphy (2010) forecasted that a significant number of older Americans will develop a disability over the next few decades. A recent longitudinal study confirmed this projection with objective measures of reduced Life-Space Assessment (LSA) scores, a manifestation of mobility disability, in community-dwelling older adults 75- 90 years old (Portegijs, Rantakokko, Viljanen, Sipila, & Rantanen, 2016)

Risks associated with increased healthcare spending. As the older adult population avoids fatal events as a result of advanced provision of healthcare, they experience instead diminished strength, endurance, and physiologic resilience resulting in disability. With current advanced health care practices, older adults often avoid fatal health events and extend their lives with less resilient years, bearing multiple chronic conditions and disability (Bernhardt et al., 2016). Nearly one in five community dwelling older adults discharged from hospitals do so with some new level of dependence that results in significant post-acute care expenditures (Chandra, Dalton, & Holmes, 2013; Kortebein, 2009). Immobility during an acute hospital stay causes deconditioning and results in approximately 50% of older adult discharges to SAR as opposed to home (Chandra et al., 2013; Das et al., 2016; Fried et al., 2001; Gill et al., 2009). Subacute rehabilitation increases the cost of an older adult's episode of care and runs counter to preferred Medicare economical practices (Das et al., 2016; Hoverman, Shugarman, Saliba, & Buntin, 2008). Community-dwelling older adults are often discharged to SAR settings when they lose function that resulted from an acute hospital stay (Gill et al., 2009). This subacute care adds to the expense of patients' episode of care. When older adults are discharged from acute care hospitals to SAR facilities, they are less likely to recover pre-admission levels of function and are at greater risk of being permanently institutionalized (Gill et al., 2009).

Sepsis has been identified as the most common cause for hospital admission in the older adult population and the second most common causes for delayed hospital discharge (Lim, Doshi, Castasus, Lim, & Mamun, 2006). Sepsis is defined as systemic inflammatory response syndrome due to an infection (Sweis, Ortiz, & Biller, 2016). In cases of sepsis, UTI is the most common cause of infection at 45% just ahead of pneumonia at 43% (Lim et al., 2006). Significant health risks are associated with acute hospitalization for the older adult population (Unruh, Trivedi, Grabowski, & Mor, 2013). Older adults admitted with a UTI without complications demonstrated an absolute increase in episodes of rehospitalization and mortality following discharge to a Medicare paid post-acute care setting according to Unruh et al. (2013).

Medicare cost benefit measures. Medicare mandated 85% of acute-care fee-for service reimbursement be based on the quality and value measures defined in the CMS Hospital Value Based Purchasing (HVBP) initiative beginning January 2016 (Burwell, 2015). Hospitals that perform well per the CMS HVBP quality and value outcome measures are now reimbursed at a higher rate than competitors who do not. Burwell (2015) projected increases in the HVBP ratio up to 90% of total hospital reimbursement by 2018. With the majority of hospital reimbursement being determined by the HVBP scores, Das et al. (2016) concluded that hospitals that reduce post-discharge spending in a 30-day episode of care would perform well on the HVBP levels of reimbursement. Emphasizing functional outcomes as well as physiological outcomes is more likely to result in satisfied, functioning patients leaving the hospital; thereby, reducing risk for excessive post-acute spending during an episode of care (Das et al., 2016). As experts in maintaining and restoring movement, physical therapists are uniquely qualified to preserve an older individual's mobility and function when admitted into the hospital. By preserving function once hospitalized, physical therapists facilitate improved functional outcomes and improved

patient satisfaction scores, which decreased Medicare spending (Burwell, 2015; Peiris, Taylor, & Shields, 2011).

Benefits of Exercise and Mobility in the Community-Dwelling Older Adult

Typical aging is associated with loss of muscle mass and decreased flexibility, coordination and balance leading to decreased functional mobility and depression (Barcelos-Ferreira, Nakano, Steffens, & Bottino, 2013). Older adults who are physically active have a 33% reduced mortality rate and are, therefore, more likely to remain independent in the community (Nocon et al., 2008; O'Connor et al., 2015). Increased physical activity reduces risk for disability and improves overall mobility in the older adult population (Song et al., 2017).

Exercise in the non-frail community-dwelling older adult population. In a 2013 study, community-dwelling older adult patients without history of frailty demonstrated significant improvements in gait speed, leg strength and endurance with reduced risk for falls when exercising regularly (Vrantsidis et al., 2014). Regular physical activity, as simple as scheduled walking, was associated with significant improvements in functional outcomes when compared with a control older adult population who continued normal daily activities, or who did not participate in regular physical activity (O'Connor et al., 2015). Older adults experience improvements in strength, balance and cardiovascular fitness while preventing functional decline with regular physical activity (Anderson et al., 2014; Hanson & Jones, 2015; O'Connor et al., 2015). O'Conner et al. (2015) also reported improvements in functional ability and reduced pain with regular walking programs for the older adult. A strong relationship between mobility and life satisfaction was linked with exercise in the older adult as well (Barcelos-Ferreira et al., 2013; Mollaoglu, Tuncay, & Fertelli, 2010). The incidence of depression was drastically decreased when older adults were active and mobile (Anderson et al., 2014; Barcelos-Ferreira et al., 2013).

In addition, resistance training reduced expected loss in muscle mass and helped prevent the onset of frailty in the vulnerable older adult population (Falvey et al., 2015). Participation in resistance training, dance, aerobics, Tai Chi and yoga contributed to improvements in strength, balance, endurance and flexibility in the older adult (Ross, Schmidt, & Ball, 2013). Tai Chi in particular markedly reduced risk for falls (Ross et al., 2013). Physical activity also reduced risk in all causes of mortality (Anderson et al., 2014; Nocon et al., 2008).

While there is strong evidence supporting the benefits of exercise and mobility in older adults, the level of compliance to exercise that older adults are able to achieve remains a concern (Aartolahti, Tolppanen, Lonnroos, Hartikainen, & Hakkinen, 2015). Aartolahti et al. (2015) recently addressed the compliance question with findings that support older adult's ability to maintain compliance to exercise and mobility training programs over a 24-month period of time in spite of comorbidities and hospitalization. Patients with cognitive deficits, however, were found to be overall less compliant (Aartolahti et al., 2015). The authors suggested that their findings support identifying and implementing training options to support the specific needs of older adults (Aartolahti et al., 2015). Training programs that provide exercise and mobility interventions described by Cesari et al. (2014) are a promising target for prevention of disability in the older adult population.

Exercise in the frail community dwelling older adult. While a definitive description of frailty in the older adult has not yet reached a consensus, the most commonly cited description is a phenotype outlined by Fried et al. (2001). The primary descriptors of the frailty phenotype are unintentional weight loss, weakness and fatigue with overall decreased activity and reduced gait speed (Fried et al., 2001). Frailty syndrome in the older adult was described as having overall reduced reserve and decreased resistance to stressors (Cesari et al., 2014). In 2015, 15% of the

older adult population met the criterion for the frailty phenotype (Bandeen-Roche et al., 2015). In spite of the decreased verve of the frail older adult, PT interventions directed to address deficits in proprioception, endurance, strength and flexibly can stop the progression, as well as reverse the symptoms, of frailty syndrome (Cesari et al., 2015; Gustavson et al., 2017; Tarazona-Santabalbina et al., 2016). Theou et al. (2011) also found that physical activity reduced the incidence and gravity of frailty. Structured exercise interventions positively impact frail older adults and are indicated in the management of frailty (Theou et al., 2011). Resistance training is an effective method of increasing lean muscle mass to offset the reduced ability to synthesize protein from dietary intake (Falvey et al., 2015). Falvey et al. (2015) also reported improvements in ADL performance and gait speed with resistance training. Resistance and balance interventions improve strength and mobility, which are often deficient in the frail patient leading to functional impairment (Brown & Flood, 2013). In addition, frail older adults are more likely to describe their wellbeing as "good" or "very good" when participating in regular physical activity (Blodgett, Theou, Kirkland, Andreou, & Rockwood, 2015). Preventative interventions aimed at the maintenance of function of frail older adults can limit or prevent functional disability, maintain or improve perceived quality of life and limit or reduce symptoms of depression (Aartolahti et al., 2015; Barcelos-Ferreira et al., 2013; Hanson & Jones, 2015; Levasseur, Desrosiers, & St-Cyr Tribble, 2008; Nocon et al., 2008; Ross et al., 2013; Vrantsidis et al., 2014). More importantly, maintaining strength and endurance in the frail older adult can reduce the deconditioning effects of immobility that frequently accompany cases of acute illness (Fisher et al., 2013). Deconditioning that leads to ADL disability is correlated with increased utilization of healthcare services (Blodgett et al., 2015).

Effects of Immobility and Bed Rest

Activity of daily living disability is a predicted consequence of reduced activity in the community dwelling older adult (Gill, Allore, & Guo, 2003). Gill et al. (2003) defined reduced activity in the older adult population as staying in bed for greater than half a day and/or reduced ADL and instrumental activities of daily living (IADL). Periods of reduced activity due to illness or injury occur frequently in the older adult population (Gill et al., 2003). Several authors identified a strong association between immobility and new onset ADL dysfunction (Brown & Flood, 2013; Brown, Friedkin, & Inouye, 2004; Brown, Redden, Flood, & Allman, 2009; Gill et al., 2003; Gill, Allore, Gahbauer, & Murphy, 2010; Gill et al., 2009; Gill, Gahbauer, Han, & Allore, 2011). For this reason, research with the aim of preventing deconditioning in the older adult caused by prolonged bed rest when hospitalized is warranted. Older adults represent the majority of hospitalized patients making discovery of the effects of immobility and risk for ADL and mobility impairment so important (Gill et al., 2003; Gill, Allore, & Guo, 2004). Gill et al. (2010) surmised that the absolute number of disabled older Americans might continue to grow exponentially matching the rapid rate of growth expected for this population. A 2009 summary of U.S. census data and Social Security Administration data confirmed the growth expectancy of the older adult population to double by 2030 and triple by 2050 (Olshansky, Goldman, Zheng, & Rowe, 2009). Because older adults are more likely to be hospitalized, Gill et al. (2010) encouraged researchers to identify steps to prevent disability in cases of acute hospitalization older adults.

Effects of immobility in the non-frail older adult. For the older adult, staying in bed for as little as half a day represents increased risk for the development of new disability (Gill, Allore, Gahbauer, & Han, 2015). Gill et al. (2004) reported a strong link between immobility and

decline in ADLs, physical activity and social engagement. A significant relationship between mortality and reduced Timed Up and Go scores (TUG), a measure of mobility, has been observed in both older men and women (Bergland, Jorgensen, Emaus, & Strand, 2017). Immobility gives rise to and perpetuates functional disability (Gill et al., 2015). When bed rest is unavoidable due to illness or injury, measures to prevent functional decline may be warranted (Gill et al., 2015). In as few as 10 days of immobility the older adult loses approximately 16% of their lower extremity strength, 1 kg of lean muscle mass and 50% of their aerobic capacity (Kortebein et al., 2008). Older adults who previously had not been labeled as frail demonstrated a greater loss of function than those who had previously been deemed frail (Gill et al., 2015; Kortebein et al., 2008). Newly acquired ADL dependency is a strong risk factor for both in-hospital and post hospital discharge mortality (Ponzetto et al., 2003). Even more alarming is the high one-year mortality rate following hospitalization of the older adult (Baztan, Galvez, & Socorro, 2009). Baztan et al. (2009) found that 32.6% of community-dwelling older adults admitted with an acute illness that resulted in deconditioning passed away within one year of hospitalization. This was a higher rate than for orthopedic and strokes admissions combined (Baztan et al., 2009). Gill et al. (2003) summarized that the risk for the development of ADL disability is intimately related to immobility and not simply an expected feature of aging. Because ambulation mobility and ADL ability suffer in at least a third of all older adult patients immobilized during an acute hospitalization, immobility alone presents a tremendous risk for permanent disability (Kortebein, 2009). Permanent disability in this population projected to double in the next few years and triple by 2050 resulting in a profound financial impact on generations to come (Olshansky et al., 2009). Olshansky et al. (2009) contended that if extension

of life is united with healthy productive years, the anticipated financial challenges posed by the rapidly growing older adult population might be more readily controlled.

Effects of immobility in the frail older adult. For many frail older adults an acute hospitalization results in considerable functional decline, regardless of the diagnosis, due to bed rest and immobility (Kortebein, 2009). Immobility presents a considerable increased risk for a number of additional comorbidities that quickly complicate the case of the frail older adult patient. Immobile frail older adults are prone to contractures, pressure ulcers, sarcopenia (accelerated loss of muscle mass), depression, and permanent disability (Abate et al., 2007; Kortebein, 2009; Wagner et al., 2008). New disability acquired during an acute hospitalization will often prohibit discharge from the hospital to home. A patient's discharge to SAR due to new levels of disability following acute hospitalization results in a poor likelihood of regaining prior level of function (Gill et al., 2009). Gill et al. (2009) reported that, as a result of poor potential for functional return, older adults often remain in the nursing home after discharge from SAR due to continued ADL and functional dependence.

Hospital-Associated Disability

Hospital-associated disability (HAD) is a rapid multi-system deterioration in function related to an acute period of extremely restricted mobility (Falvey et al., 2015). Also referred to as medical deconditioning and more recently as post-hospital syndrome, Brown et al. (2004) and Falvey et al. (2015) suggested that these syndromes represent an iatrogenic phenotype of frailty. Hospital associated disability presents with symptoms that mirror frailty and yet is distinctly different in onset and prognosis. While frailty develops insidiously over several months or even years, HAD develops very rapidly rendering an otherwise healthy older adult unable to care for themselves in just a few short days (Falvey et al., 2015). Rapid loss of strength, endurance,

appetite, gait speed, and ADL ability are the most common symptoms associated with HAD (Covinsky, Pierluissi, & Johnston, 2011; Kortebein, 2009). The older adult population is 61 times more likely to develop a permanent ADL disability due to HAD, regardless of past medical history, than those who are not hospitalized (Falvey et al., 2015). This statistic is related to the still current standard hospital practice of taking responsibility for ADLs away from hospitalized adults and placing it in the hands of hospital staff (Covinskey et al., 2011; Falvey et al., 2015). The dearth of time spent participating in upright mobility during hospitalization is reflected in statistics reported by Brown et al. (2009); the older adult spent 85% of the day in bed and 12% up in a chair leaving a mere 3% spent in weight bearing mobility. Disturbed sleep, fatigue, and alterations in nutrition compound the downward spiral thought to be initiated with hospital-induced immobility (Kortebein, 2009; Krumholz, 2013). Brown et al. (2004) found that patients are frequently given orders for bed rest upon hospital admission without documented medical support, which adds an additional barrier to mobility during the hospital stay.

Complications related to hospital associated disability. Individuals who acquire HAD are more likely to require post-acute rehabilitation because they are unable to resume self-care function following the acute care stay (Gill et al., 2009; Gill et al., 2010; Kortebein, 2009). The detrimental effect of functional decline following hospitalization is often confounded by reduced cognition and long-term independent ADL dependency as a result of HAD (Zisberg et al., 2016). Depalma et al. (2013) and Hoyer et al. (2014) reported significantly increased risk for 30-day readmission for patients with HAD, at a rate higher than medically complex patients who have high levels of functional mobility. Community-dwelling older adults readmitted to acute care hospitals soon after discharge have high one-year mortality rates and send-up red flags to Medicare because their episodes of care cost more than those with no readmission (Lum,

Studenski, Degenholtz, & Hardy, 2012). In Medicare's recently implemented system of reimbursement, hospitals that avoid re-hospitalizations are rewarded with higher reimbursement (Burwell, 2015; Chandra et al., 2013; Das et al., 2016). Therefore, avoiding HAD could be a key cost savings to hospitals in the future. Brown et al. (2004) and Gill et al. (2009) found that older adults with HAD demonstrated a much lower rate for community discharge following post-acute rehabilitation indicating a high rate of permanent institutionalization for the older adult population with HAD with an overall increase in medical spending expected when extended care is required. Gill et al. (2011) concurred noting that hospital readmission often resulted in increased disability with subsequent decreased potential for functional recovery resulting in increased need for long term extended care contributing to increased cost of care. In addition to negative financial ramifications, the consequences of HAD result in grim future potential for older adults who are hospitalized. Hospital Associated Disability is an independent predictor of mortality with the older adult population (Brown et al., 2004; Ostir et al., 2013). Covinsky et al. (2011) reported that 41% of older adults with HAD died within one year of their initial hospitalization.

Mobility and exercise in acute hospitalization. Results of research conducted in the past 10 years indicate that increased levels of mobility during acute illness may be a significant biomarker predictive of positive functional outcomes (Fisher et al., 2013). Fisher et al. (2013) found that adults were less likely to be readmitted and had shorter LOS when more time was spent up and walking during the hospital stay. Peiris et al. (2011) also reported reduced LOS for the community-dwelling older adult with higher levels of participation with physical therapist intervention during an acute hospitalization. Raymond et al. (2017) suggested that participation in a high-intensity fitness exercise group program combined with individual physical therapy for

older hospitalized adults was a safe and effective method of rehabilitation for this population. Participation in ADL programs was related to improved health status and feelings of life satisfaction in the older adult (Peri et al., 2008). Improvements in life satisfaction reported by Mollaoglu et al. (2010) signify that when the older adult participates in interventions to reduce mobility disability, they also experience improvements in psychosocial aspects of living. Killey and Watt (2006) found that the older adult who participated in a walking program during hospitalization had remarkably improved scores on the Barthel Index (BI). While the BI is a measure of ADL competence, the authors concluded the improved BI scores were largely due to improved mobility scores in the index (Killey & Watt, 2006). In response, several authors have recommended future research endeavors, specifically addressing interventions, to prevent or minimize the effects of HAD (Bandeen-Roche et al., 2015; Falvey et al., 2015; Gill et al., 2015; Hoyer et al., 2014; Zisberg, Shadmi, Gur-Yaish, Tonkikh, & Sinoff, 2015).

Physical Therapists: Movement Experts

The assessment and treatment of movement dysfunction is the hallmark of PT practice across specialties (Jensen, Gwyer, & Shepard, 2000). Physical therapists focus on functional movement specific to each individual (Jensen et al., 2000). Treatment of movement dysfunction to facilitate skills sufficient to return home after illness is the primary focus of the physical therapist in the acute care setting (Jette et al., 2009). While studies specifically addressing the effect of PT on HAD and/or PT with older adults admitted for UTI were not identified, considerable evidence regarding the positive effect of PT in the acute care setting is readily available. Recent research indicates frailty may be prevented or reversed with physical therapist intervention which could result in significant improvement in the health in the older adult population (Song et al., 2017). Simply increasing the frequency and intensity of PT interventions

during an acute hospitalization resulted in reduced LOS and improved functional outcomes (Peiris et al., 2011). Adding Saturday PT sessions resulted in similar findings (Brusco, Shields, Taylor, & Paratz, 2007). A structured seven day per week rehabilitation program similarly reduced LOS and yielded improved discharge home without home health needs (DiSotto-Monastero, Chen, Fisch, Donaghy, & Gomez, 2012).

A search for PT interventions in the ICU yielded the most results. A 2013 systematic review of mobilization with mechanically ventilated patients produced sound evidence for early active mobilization in the ICU (Li, Peng, Zhu, Zhang, & Xi, 2013). Another systemic review of early ICU interventions revealed improved functional mobility and reduced ICU LOS (Stiller, 2013). Stiller (2013) suggested the evidence indicates that early and progressive physical mobility are indicated as a priority in adult ICUs. In addition to improved physical outcomes and reduced LOS, early PT in the ICU was safe and cost effective when compared to those who did not participate in the early mobility program (Morris et al., 2008). Needham et al. (2010) found that early rehabilitation in the ICU resulted in decreased need for sedation and improved mental status for those participating in the program. By reducing ICU delirium with reduced levels of sedation, earlier and more frequent rehabilitation interventions were possible (Needham et al., 2010). In addition the authors noted not only a reduced ICU LOS, but also an overall reduction of days spent in the hospital (Needham et al., 2010).

Physical Therapy Opportunities: Gaps in the Literature

Efforts to identify precipitants of immobility and alternatives to bed rest are warranted to reduce functional disability and decline in the older adult population (Gill et al., 2004). Gill et al. (2014) provided strong evidence that immobility in the older adult population precipitates and perpetuates disability. The authors recommended that prompt attention be paid to the immobile older adult to prevent the disabling consequences associated with bed rest (Gill et al., 2015). Ponzetto et al. (2003) concurred and recommended functional evaluation of the older adult be performed upon hospital admission to help identify risk for mortality and assist in the allocation of rehabilitation and case management resources. Authors of a systematic review revealed evidence supporting the magnitude of the problem of immobility with the older adult population and recommended further research for prevention of frailty and associated disability in the frail older adult (Daniels, van Rossum, de Witte, Kempen, & van den Heuvel, 2008). In their systematic review of the literature, Theou et al. (2011) confirmed significant elevated risk for disability in older adults with immobility and outlined a compelling need to identify effective interventions for hospitalized older adults to address and manage symptoms of frailty.

In a literature review specifically addressing rehabilitation in cases of HAD, the authors concluded that evidence based interventions in the treatment of HAD are lacking (Kortebein, 2009). More recently Falvey et al. (2015) proposed research questions directed at the needs of the older adult with HAD. The authors stated that despite evidence that correlates low levels of physical mobility with higher rates of re-hospitalization, there is a lack of evidence supporting physical therapy in transitional care (Falvey et al., 2015). In addition, they purported that research and clinical attention is greatly needed to address the needs of patients with HAD. There

is no evidence currently available that specifically addresses rehabilitation treatments of older adults with HAD (Falvey et al., 2015).

Urinary tract infections frequently result in hospitalization of the older adult (Rowe & Juthani-Mehta, 2014; Woodford & George, 2009). As Kortebein et al. (2009) reported, hospitalization of the older adult results in prolonged periods of immobility and bed rest regardless of the admitting diagnosis. Any bed rest in the older adult population increased their risk for HAD (Brown et al., 2009; Covinsky et al., 2011; Falvey et al., 2015; Kortebein, 2009; Zisberg et al., 2015). Several authors identified a strong association between immobility and new onset mobility and ADL dysfunction, recommending investigation of prevention and intervention (Brown & Flood, 2013; Brown et al., 2004; Brown et al., 2009; Gill et al., 2003; Gill et al., 2010; Gill et al., 2009, 2011). There was no literature identified however that specifically addressed prevention and treatment of HAD, LOS, or discharge disposition status of the community-dwelling older adult following admission due to a UTI. Physical therapists' experience and training in movement dysfunction and skill in treating mobility deficits uniquely qualifies physical therapists to address this gap in the literature (Kortebein, 2009). Considering the strong correlation between functional abilities in the immediate post hospitalization period to readmission, physical therapists should be at the helm developing evidence in the prevention and treatment of HAD (Falvey et al., 2016; Kortebein, 2009).

Chapter 3: Method

This study examined the relationship between the number of PT sessions patients' received during an acute inpatient stay and their inpatient LOS and ultimate discharge disposition. Prior to the start of the study, the University of Indianapolis Human Research Protection Program and the Institutional Review Board at Community Health Network (CHN) approved the study.

Study Design

This was a retrospective cohort study that included patients who were hospitalized at Community Hospital South (CHS) in Indianapolis, Indiana, between the dates of June 1, 2013 and June 1, 2016. Data were extracted from the CHN electronic medical record (EMR).

Participants

Participants were community-dwelling older adults admitted from home to CHS during the time frame established for this study. Inclusion criteria included: (a) age 65 years and older; (b) functionally independent 30 days prior to admission; and (c) hospitalized due to an acute illness that resulted in standard treatment for UTI. Exclusion criteria included: (a) hospitalization within 30 days of the qualifying admission and (b) prior level of function either missing or incomplete data in the EMR. Cases were not excluded based on race, ethnicity, or gender.

Data Collection

The following demographic data were collected: age, gender and living status (alone, with spouse or family member). In addition the following outcome data were collected: LOS, number of PT visits, and disposition status (home with self-care, home with home health PT or discharge to a rehabilitation facility). Patient's age, gender, and LOS were collected as part of the initial query and provided to the primary researcher (T. S.) in an Excel file via the encrypted

email system of the CHN. The primary researcher extracted the following from each patient's EMR: living status, disposition status, number of PT visits, and the presence of selected comorbid conditions. The comorbid conditions documented include: myocardial infarct, congestive heart failure, peripheral vascular disease, dementia, cerebrovascular disease, chronic lung disease, connective tissue disease, ulcer, chronic liver disease, diabetes, hemiplegia, moderate or severe kidney disease, diabetes with end organ damage, tumor, leukemia, lymphoma, moderate or severe liver disease, and malignant tumor, metastasis, or AIDS, as defined by Charlson, Pompei, Ales, and MacKenzie (1987). This information was used to calculate the Charlson comorbidity index (CCI; Charlson et al., 1987). This index has been updated to address ICD-10 codes (Sundararajan et al., 2004). Data extracted by the primary researcher were transferred directly into a Microsoft Excel spreadsheet.

Charts with incomplete or unclear information concerning disposition status were removed from the study and their patient numbers permanently deleted from the query document. Once data were collected on participants, all patient identifiers were permanently deleted from the Excel file. The Excel file was then prepared for statistical analysis.

Procedures

The primary researcher (T. S.) collaborated with the coding manager at CHN to determine the appropriate ICD-10 codes to identify potential participants. The coding manager ran the query in EPIC, the EMR system for CHN. The query parameters included diagnosis codes present on admission and patient age at the time of admission. The results of the query were provided to the primary researcher in an Excel file. To determine if any of the potential participants had an inpatient admission at any CHN facility 30 days prior to the selected admission, the primary researcher reviewed the EMRs of participants netted in the initial query.

If an inpatient admission was found, the patient was excluded. The primary researcher manually reviewed charts of the identified participants to determine if they met the inclusion criterion of admission from home, functionally independent at least 30 days prior to admission and received standard care for the treatment of UTI as defined in this paper. Any mention in the participant's EMR of an inpatient admission to a facility outside of the CHN, 30 days prior to the admission used for the study, resulted in exclusion from the study. Participants netted in the initial query who did not meet the inclusion criteria were permanently deleted from the Excel file and no further data were collected. The primary researcher kept track of how many participants were excluded from the study and why they were excluded. If a participant had more than one inpatient admission at CHS during the query period, only the first admission was used for this study.

Statistical Analysis

Data were analyzed using IBM Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY). Descriptive statistics were conducted on the total sample. The Shapiro-Wilk test was used to determine if the data were normally distributed. All comparisons were two-tailed and a significance level less than .05 was considered statistically significant. Nominal data are presented as frequencies and percentages, and interval and ratio data are presented as medians and interquartile ranges due to the data not being normally distributed. To address objective 1, to determine if there was a relationship between number of PT sessions and LOS, a Spearman rho correlation was conducted. The strength of correlation coefficients was interpreted as: r = .00 - .30, negligible; r = .30 - .50, low; r = .50 - .70, moderate; r = .70 - .90, high; r > .90, very high (Hinkle, Wiersma, & Jurs, 2003). Multivariate regression analysis was conducted to determine if LOS could be predicted based on number of PT sessions and patient characteristics. To address

objective 2, to determine if there was a difference in the number of PT sessions by disposition status, a Kruskal-Wallis test was conducted. Multinomial logistic regression was used to determine if disposition status could be predicted based on number of PT sessions and patient characteristics.

For both multivariate and multinomial regression analyses exploratory variables that demonstrated a statistically significant difference or correlation with LOS and disposition status were entered into the appropriate model simultaneously using the Enter method. Nominal data were compared using the Pearson chi-square test, while interval and ratio data were compared using the Mann-Whitney *U* test or the Kruskal-Wallis test, as appropriate. Pairwise post hoc analyses were conducted when significant multivariate results were found using either a Mann-Whitney *U* test or a Pearson chi-square test and the Bonferroni correction at an adjusted alpha significance level of .017. Significant correlations were determined based on the Spearman rho correlation. Data screening and preliminary analyses were performed to confirm assumptions of normality, linearity, multicollinearity, and homoscedasticity.

Chapter 4: Results

A total of 2,410 charts were identified based on the ICD-10 codes. Patients who did not receive standard UTI care, who were admitted from a facility, or were otherwise dependent for care within 30 days of admission were excluded. See Figure 1 for a breakdown of why patients were excluded from the study. Data from the remaining 523 charts were collected and analyzed. Descriptive statistics for the total sample can be found in Table 1. The median age of participants was 79 years old, the majority were female, and most did not live alone at the time of admission.

Objective 1

To address Objective 1, does the number of inpatient PT sessions predict inpatient LOS in cases of UTI, a correlation between LOS and PT sessions was first conducted which resulted in the following, $r_s = .504$, $p < .001$ indicating a moderate positive correlation. The null hypothesis was rejected, $r \neq 0$ at a .05 alpha level indicating there was a relationship between inpatient LOS and the number of PT sessions received during their hospitalization. Next, results from bivariate tests of difference and correlation between LOS and patient demographic and clinical variables were used to determine which other predictor variables should be entered into the regression model. There was not a statistically significant difference in LOS by gender ($p = .93$) or by living status ($p = .69$). However, there was a significant difference in LOS by disposition status, X^2 (2, $N = 523$) = 102.2, $p < .001$, with those being discharged home having shorter LOS (see Table 1). The Spearman rho correlations showed that CCI score was negligibly, yet significantly associated with LOS ($r_s = .10$, $p = .020$). Based on these results, the following potential predictor variables were entered into the multivariate regression model: disposition status, number of PT sessions, and CCI score to determine the significant predictors of LOS.

Prior to and after conducting the regression analysis, assumptions of the tests were confirmed using criteria reported by Field (2013). Linearity was assessed by visual inspection of partial regression plots and a plot of studentized residuals against the predicted values. Multicollinearity was assessed and determined to not be present since correlations between independent variables were < .80 and tolerance values were > 0.10. The Durbin-Watson statistic of 1.72 indicated the assumption of independence of observations was met. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There were no studentized deleted residuals greater than ± 3 standard deviations, no leverage values greater than 0.20, and values of Cook's distance above 1.00. The assumption of normality of residuals was met as assessed by Q-Q Plot and Shapiro-Wilk test. The regression analysis indicated a linear predictive model, $F(2,520) = 156.97$, $p < .001$, $R^2 = .38$, with PT sessions and disposition status adding statistically significantly to the prediction of LOS, $p < .001$. The resulting table of coefficients can be found in Table 2. These results indicate that 38% of the variance is accounted for by the model and for every additional PT session the LOS increased by 0.93 days, and not being discharged to home with self-care increased the LOS by 0.78 days.

Objective 2

To address Objective 2, to determine if there is a difference in the number of inpatient PT sessions by the post-hospital discharge status, a Kruskal-Wallis test was conducted. Results indicated a statistically significant difference, X^2 (2, $N = 523$) = 72.89, $p < .001$. Pairwise post hoc tests results demonstrated a statistically significant ($p < .001$) difference in the number of PT sessions (median difference of 1.0) between the HSC and HHPT groups, and similar results were found between the HSC and SAR groups, with a statistically significant median difference of 1.0

($p < .001$). There was not a statistically significant difference in the number of PT sessions between the HHPT and the SAR groups (both groups had a median number of PT session of 2.0; $p = .50$).

To determine significant predictors of disposition status, the potential predictive independent variables of age, gender, living status, CCI score, number of PT sessions, and LOS were tested. These findings are displayed in Table 1. There was not a statistically significant association between disposition status and gender ($p = .163$) or living status ($p = .073$). There was a statistically significant difference in age ($p < .001$), CCI ($p = .001$), number of PT sessions ($p < .001$), and LOS ($p < .001$) by disposition status. Therefore, the following variables were entered into the multinomial regression model: age, CCI, number of PT sessions, and LOS. In addition, because there was a significant relationship between LOS and number of PT sessions, an interaction term LOS*PT was also included in the model.

Linearity of the continuous variables was assessed by visual inspection of normal Q-Q plots of expected versus observed values. The assumption of multicollinearity was assessed by looking at collinearity statistics and diagnostics obtained by running linear regression analysis. All tolerance values were greater than 0.10 and VIF values were less than 10 indicating there was not a problem with multicollinearity. However, an evaluation of the eigenvalues and variance proportions indicated there might be collinearity between LOS and PT sessions. This association was already recognized and accounted for in the analysis with the use of the LOS and PT interaction term. The multinomial logistic regression model was statistically significant, $\chi^2(2) = 6.90$, $p = .032$. The model explained 36% (Nagelkerke R^2) of the variance in discharge disposition. All five of the predictor variables significantly added to the model. The parameter estimates can be found in Table 3. Increasing age, number of inpatient PT sessions, and a higher

CCI score were associated with being discharged to HHPT and SAR. Increasing LOS was associated with being discharged to SAR, but not to HHPT. In addition, the interaction of LOS and number of PT sessions (increase in both) was associated with a reduced likelihood of being discharged to SAR.

CHAPTER 5: DISCUSSION

The purpose of this study was to investigate whether the number of PT sessions a community-dwelling adult participates in while hospitalized for a UTI could predict LOS and disposition. Based on anticipated exponential growth of the older adult population and potentially devastating physical and financial effects of forecasted HAD by Olshansky et al. (2009), predicting disposition and LOS are important first steps in the implementation of preventative measures.

Predicting Length of Stay

There were no significant differences in LOS by gender or living status. In addition, the regression analysis indicated that while PT sessions and disposition status were predictive of LOS, age and CCI scores were not. Initially this finding seemed surprising considering older adults are more likely to be hospitalized (Gill et al., 2010) and the prevalence of cardiovascular comorbidities increases considerably in adults greater than 75 years old (Rich et al., 2016). Descriptive statistics of participant characteristics (Table 1) indicated the median age of the sample was 79 years old with a median age of those at least risk for mobility disability (HSC group) at 76 years old. In addition, the median age for both the HHPT group and the SAR group was 80 years thereby yielding similar age and CCI score medians.

There was a significant difference in LOS by disposition status. Discharge with HHPT or to SAR increased LOS by .78 days compared to those discharged HSC. Those discharged to SAR had a median of two days greater LOS than those discharged home with self-care ($p <$ .001), while those discharged home with home health PT had one day greater LOS than those discharged home with self-care ($p < .001$). Data analyzed in the present study is consistent with the literature in which authors report that nearly 70% of the older adult population is being

discharged from the hospital below their prior level of function (Falvey et al., 2015). Mobility disability is a predicted consequence of reduced activity which is defined in the older adult population as greater than one half day in bed (Gill et al., 2003). Results of this study indicated with an additional one day LOS, almost certainly spent in bed (Brown et al., 2009), participants were more likely to need home PT to address hospital acquired mobility deficits upon discharge. With only two additional days LOS, mobility deficits were more likely to be to require subacute rehabilitation. All of the subjects in our sample were independent with their own care prior to hospital admission. With only two additional days LOS they were significantly more likely to be discharged to subacute rehabilitation who Gill et al. (2009) identified at greater risk of being permanently institutionalized due to mobility disability. Olshansky et al. (2009) projected permanent disability in the older adult population will double in the next few years and triple by 2050. Reducing LOS with improved rates of return home with self-care as identified in this study might be an avenue to slow the exponential growth of permanent disability forecasted in the near future for the older adult population.

Predicting Disposition Status

Sample characteristics of the HHPT and SAR disposition groups (Table 1) reveal an interesting trend. The median age, CCI score, and PT sessions were alike in both groups. The only median difference between the two groups was LOS. The SAR group stayed a median of one day longer without receiving any additional PT sessions. The SAR group, being similar in age and comorbidity status, received fewer average daily PT sessions thereby having less daily mobility opportunity during their hospitalization. In a retrospective study published last year the authors concluded that early and more frequent PT was associated with prevention of HAD with lower odds of needing care upon discharge (Hartley et al., 2017). Additional recommendations

from recent authors of mobility research recommend studies be conducted to determine the underlying mechanisms of HAD and mobility impairment to advance proactive treatment (Hartley et al., 2017; Hoyer et al., 2016). Results of the current study support these findings and recommendations.

The potential predictive variables for disposition status in this study were gender, living status, age, CCI score, LOS and number of PT sessions during the hospital stay. No statistical relationship was identified between disposition status and gender or whether the participant lived alone or with a spouse or family member. The variables of age, CCI score, LOS and the number of PT sessions received during the hospital stay did have a statistically significant relationship to disposition status. As age and CCI scores increased, the likelihood that PT in the home or inpatient rehabilitation were more likely. This is not a surprising finding as increased age and comorbidity levels are associated with frailty (Abate et al., 2007; Kortebein, 2009; Wagner et al., 2008). More noteworthy, however, are the results relating LOS and PT sessions to hospital disposition status. As LOS and the number of PT sessions increased together, discharge to a subacute rehabilitation facility decreased. When LOS increased without additional PT sessions, discharge to subacute rehabilitation was more likely. For patients in the SAR group, increased frequency and duration of PT interventions during the hospitalization could make the difference between discharge to a facility and discharge home with home health support without any additional time in the hospital. Direction of PT resources toward patients at greatest risk for newly acquired mobility impairments within the timeframe the SAR group had already spent in the hospital is a logical first step in reducing the need for post-acute inpatient rehabilitation based on the findings in this study. Researchers report that patients who return home are less likely to be readmitted within 30 days of discharge, which reduces the cost of an episode care (Fisher et

al., 2013; Hartley et al., 2017; Hoyer et al., 2014). The cost of a slightly longer inpatient stay that results in discharge home eliminates the cost of post-acute inpatient rehabilitation and potentially reduces risk of the costs typically incurred for readmission within 30 days (Fisher et al., 2013; Hartley et al., 2017; Hoyer et al., 2014).

Clinical Relevance

Detrimental effects and resultant functional dependence in cases of immobility in the community dwelling older adult population is apparent in the literature and supported by data collected and analyzed in this study. Increased expenditures of government-funded healthcare related to new onset mobility impairment as identified in this study are consistent with the projected increases over the next several years (Kortebein, 2009; Olshansky et al., 2009). Reduction of frailty and the HAD epidemic in older adults is necessary to preserve quality of life and reduce healthcare spending. The findings of this study demonstrate that it is imperative that community dwelling older adult patients admitted with UTI for acute hospitalization be prioritized for physical therapy treatment during their stay in order to reduce or prevent deconditioning to the degree that return home is possible. An admission to rehab not only increases the cost of an episode of care but also increases the risk of readmission within 30 days of discharge (Fisher et al., 2013; Hartley et al., 2017; Hoyer et al., 2014). There is an alarming relationship between hospital readmission and increased risk of one-year mortality for this population (Lum et al., 2012). Results of this study show that increasing the average daily number of PT sessions for these patients can improve their potential to be discharged to the community thereby reducing rehab admissions and potential hospital readmissions.

Patients in this study were prioritized in a similar fashion identified in the Hobbs et al. (2010) study. New evaluations, orthopedic cases, neurological cases and patients in the ICU are

prioritized over patients in medical areas of the hospital resulting in increased potential for missed follow up visits for patients admitted for UTI. To reduce the potential for missed PT intervention, the addition of a physical therapist assistant whose scope of practice is to execute the physical therapist's plan of care for the prevention of mobility impairment might help reduce the rate of missed PT sessions, thereby reducing likelihood of discharge to SAR identified in this study for the older adult admitted with a UTI. Redesign of the current method of patient prioritization aimed at reducing the number of inappropriate referrals as reported by Hobbs et al. (2010) would allow allocation of staff and resources to those at risk for missed PT visits providing additional PT interventions to those at highest risk for discharge to SAR.

Patient mobility is a multifactorial issue. If more PT can not be provided, engaging a multidisciplinary approach using the skills of each discipline involved with the patient in a structured and organized manner might enhance accountability for patient mobility from the ground up. Smalls steps such as assisting all appropriate patients to a chair for meals and to the restroom for toileting rather than use of a bedside commode or bedpan are frequently missed opportunities for functional mobility outside of skilled therapy intervention. In addition, non-skilled ambulation intermittently throughout the day for patients deemed by the physical therapist as safe and appropriate for such activity would provide additional mobility for this population at serious risk for the development of functional impairment.

Limitations of the Study

There were three major limitations in this study. First, standardized application of PT could not be accomplished due to the retrospective nature of this study. While PT sessions were calculated identically with every subject included, the type and nature of the activity could not be standardized retrospectively. The second limitation was data regarding admission day of the

week was not evaluated. The long standing practice of skeleton weekend therapy staffing has not stayed in pace with the current culture of hospital patient care resulting in a high percentage of missed therapy treatments on the weekend (Hobbs et al., 2010; Young, Moonie, & Bungum, 2016). Those admitted on a Thursday or a Friday are likely to miss additional therapy visits until Monday resulting in fewer PT sessions per admission (Hobbs et al., 2010; Young et al., 2016). Patients in this study were no exception. Young et al. (2016) suggested that the impact of missed therapy treatments be assessed and consideration given to rehab staffing practices in the acute care setting. Last, preexisting levels of frailty could not be assessed retrospectively. Identification of older adults at greater risk for HAD due to premorbid frailty, yet still functioning independently, might shed light on additional risk factors for HAD and add to the equation for assessment, treatment and prevention of the development of mobility impairment during a hospitalization.

Recommendations for Future Research

To our knowledge, this is the first study to predict both LOS and disposition status for community dwelling older adults admitted with UTI. Increased PT intervention was predictive of reduced SAR admissions in this study. The findings of this study parallel recent similar findings. Potential cost saving benefits associated with return home and reduced 30-day readmission warrants further exploration of potential impact of increased physical therapist intervention and improved ability to return to the community. Prospective research with a standardized mobility protocol for both skilled and non-skilled mobility intervention is indicated based on the findings here. Screening for prior levels of frailty in a prospective study is also recommended to help reduce confounding findings prospectively.

Conclusion

Prevention of deterioration in patient function that frequently occurs during hospitalization is imperative. There is a wealth of evidence supporting a positive relationship between early and frequent mobility with PT and improved functional outcomes. Little evidence, however, is available associating mobility during hospitalization and disposition. No evidence was identified linking participation with PT during acute hospitalization for UTI and the ability to return home with older adults. Understanding factors that contribute to disposition is imperative because of the patient physical and mental health benefits as well as cost savings associated with reduced need for home health or inpatient rehab upon discharge (Bernhardt et al., 2016; Centers for & Medicaid Services, 2015; Chandra et al., 2013; Das et al., 2016; Favreault et al., 2015). The relationship identified between the number of PT sessions and improved functional outcomes as demonstrated by disposition status and LOS in this study is a positive step in helping the older adult population age in place.

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Table 1

Demographics and Patient Characteristics for the Sample and by Disposition

	Total	**HSC**	**HHPT**	**SAR**	
	(*N* = 523)	**(*N* = 177)**	**(*N* = 146)**	**(*N* =200)**	
Characteristic	***N (%)***	***N (%)***	***N (%)***	***N (%)***	***p***
Gender: Female	383 (73.20)	121 (68.40)	108 (74.00)	154 (77.00)	.163
With Family	316 (60.40)	108 (61.00)	98 (67.10)	110 (55.00)	.073
	***Mdn* (25, 75)**	***Mdn* (25, 75)**	***Mdn* (25, 75)**	***Mdn* (25, 75)**	***p***
Age (years)	79 (72,85)	76 (69,81)	80 (73,86)	80 (75,86)	<. 001
CCI	3 (2,5)	3 (1,4)	3 (2,5)	3 (2,5)	.001
LOS	4 (3,6)	3 (2,4.5)	4 (2,5)	5 (4,7)	<. 001
PT sessions	2 (1,3)	1 (0,2)	2 (1,3)	2 (1,3)	<. 001

Note: HSC = home with self-care; HHPT = home with home health and physical therapy; SAR = subacute rehabilitation; LOS = length of stay; CCI = Charlson comorbidity index; PT = physical therapy

Table 2

Multiple Regression Results for Length of Stay (N = 523)

					95% CI	
Variable	β	*SE*β	*t*	*p*	*LL*	*UL*
Constant	2.06	0.18	11.65	<.001	1.72	2.41
PT Session	0.93	0.07	13.44	<.001	0.80	1.06
Disposition	0.78	0.12	6.78	<.001	0.55	1.00

Note: PT = physical therapy

Table 3

Multivariate Logistic Regression Results for Disposition Status

HHPT					95% CI	
Variable	β	*Wald*	*p*	Exp(β)	*LL*	*UL*
Intercept	-7.59	27.93	< .001			
Age	0.07	17.50	< .001	1.07	1.04	1.11
LOS	0.15	1.78	.182	1.17	0.93	1.46
CCI	0.13	4.39	.036	1.13	1.01	1.27
PT Sessions	0.80	17.03	< .001	2.22	1.52	3.25
LOS*PT Sessions	-0.05	2.51	.113	0.95	0.89	1.01
					95% CI	
SAR Variable	β	*Wald*	*p*	Exp(β)	*LL*	*UL*
Intercept	-12.14	60.71	< .001			
Age	0.10	34.95	< .001	1.11	1.07	1.15
LOS	0.71	41.53	< .001	2.03	1.64	2.52
CCI	0.21	11.83	< .001	1.23	1.09	1.39
PT Sessions	0.68	12.26	< .001	1.98	1.35	2.90
LOS*PT Sessions	-0.09	9.74	.002	0.91	0.86	0.97

Note: The reference category is home with self-care (HSC); HHPT = home with home health physical therapy; SAR = subacute rehabilitation; LOS = length of stay; CCI = Charlson comorbidity index; PT = physical therapy

Figure 1. Participants excluded from the study