

FUNCTIONAL STATUS OF OLDER ADULTS AFTER HIP FRACTURE

CHRISTINA LOUISE GARCIA

A Dissertation Submitted in Partial
Fulfillment of the Requirements
for the Degree of

DOCTOR OF PHILOSOPHY

Mennonite College of Nursing

ILLINOIS STATE UNIVERSITY

2013

FUNCTIONAL STATUS OF OLDER ADULTS AFTER HIP FRACTURE

Christina Louise Garcia

66 Pages

August 2013

This dissertation includes three manuscripts describing research on functional status of older adults after hip fracture. The manuscripts are included as dissertation chapters and comprise a review of literature, a concept analysis, and a data-based manuscript.

FUNCTIONAL STATUS OF OLDER ADULTS AFTER HIP FRACTURE

Christina Louise Garcia

66 Pages

August 2013

This dissertation is composed of three manuscripts addressing functional status of adults age 65 years and older after hip fracture. The first manuscript is a review of the literature on the impact of gender, age, comorbidities, pain, depression, self-efficacy, cognitive status, and social support on functional status of older adults after hip fracture. Further research on the relationships among these factors will assist healthcare providers in early identification of adults age 65 years and older after hip fracture at risk of decline in functional status.

Results of this literature review led to a concept analysis aimed to provide clarity of the meaning of functional status. The Walker and Avant method was used to analyze the concept of functional status included formatting sample cases, defining attributes, identifying antecedents and consequences, and defining empirical referents. The definition of functional status is not clear in the literature. The influence of various aspects of life on the performance of activities of daily living by an individual needs further clarification.

The final manuscript is a descriptive correlational study of annual assessment data from the 2011 Minimum Data Set (MDS) 3.0 for adults age 65 and older who reside in nursing homes in Illinois for care following surgical repair of a hip fracture. The research questions were:

1. What is the relationship between cognitive status, depressive symptoms, comorbidities, pain, age, social support, and functional status?
2. What is the effect of cognitive status, depressive symptoms, comorbidities, pain, age, and social support on predicting functional status?

In this sample of 98 adults age 65 and older after surgical repair of a hip fracture, cognitive status significantly ($p < .01$) predicted functional status. Earlier detection, prevention, and treatment of cognitive status impairments may impact the attainment of prefracture functional status of older adults after hip fracture.

© 2013 Christina Louise Garcia

FUNCTIONAL STATUS OF OLDER ADULTS AFTER HIP FRACTURE

CHRISTINA LOUISE GARCIA

DISSERTATION APPROVED:

Date	Cindy Kerber, Chair
------	---------------------

Date	Kim Astroth
------	-------------

Date	Mary J. Dyck
------	--------------

Date	MyoungJin Kim
------	---------------

Date	Wendy Woith
------	-------------

ACKNOWLEDGMENTS

This dissertation is dedicated to my family. My husband Michael's constant support and understanding is immeasurable. I could not have completed this accomplishment without him by my side. To my daughter, Addison, who is still too young to understand the magnitude of this accomplishment, I hope it serves as an example of the importance of perseverance and dedication to obtaining personal goals.

I would like to thank my committee, Drs. Cindy Kerber, Kim Astroth, Mary J. Dyck, MyoungJin Kim, and Wendy Woith, who were generous with their time and provided constant guidance and attention through this process. In addition, Dr. Cindy Kerber was instrumental in my success throughout the PhD program. Her continuous support and guidance were greatly appreciated as I completed each benchmark throughout the program.

I would like to acknowledge Dr. Kim Astroth for the enormous amount of time and care she took in reading my manuscripts. In addition, her expertise in the content was integral to developing the manuscripts. I would also like to acknowledge Dr. Mary J Dyck, who was also gracious with her time in reading and providing feedback on my manuscripts. Her expertise in nursing home research was key in the acquisition of data needed for my final manuscript. I also recognize Dr. MyoungJin Kim for his patience in assisting me with statistical analysis of data needed for this study. His time and effort towards this study are much appreciated. I would also like to acknowledge Dr. Wendy Woith for the knowledge and expertise that she contributed to this study. She was gracious in giving of her time to read my manuscripts and provide detailed feedback to improve the study. Finally, I would like to acknowledge the following organizations who provided support to purchase the data needed for this study: Mennonite College of Nursing,

Xi Pi Chapter Sigma Theta Tau at Mennonite College of Nursing, Tau Omicron Chapter Sigma Theta Tau at Saint Francis Medical Center College of Nursing, and the William E. and Nancy Froelich Endowment for Long Term Care. I greatly appreciate the assistance provided by each one of them in the completion of this study.

C. L. G

CONTENTS

	Page
ACKNOWLEDGMENTS	i
CONTENTS	iii
TABLES	vi
CHAPTER	
I. ARTICLE ONE: FUNCTIONAL STATUS OF OLDER ADULTS AFTER HIP FRACTURE: A REVIEW OF THE LITERATURE	1
Abstract	3
Introduction	4
Functional Status	4
Research Questions	5
Methods	5
Findings	6
Factors Influencing Functional Status	6
Physical Domain: Gender	6
Physical Domain: Age	7
Physical Domain: Comorbidities	7
Physical Domain: Pain	8
Psychological Domain: Depression	8
Psychological Domain: Self-efficacy	9
Cognitive Domain: Cognitive Status	9
Social Capacity Domain: Social Support	10
Predictive Factors of Functional Status	10
Conclusion and Recommendations	11
References	12
II. ARTICLE TWO: FUNCTIONAL STATUS OF OLDER ADULTS: A CONCEPT ANALYSIS	16
Abstract	18
Introduction	19
Method	19
Data Sources	20

Results	20
Related Terms	20
Definitions of Functional Status	22
Defining Attributes of Functional Status	22
Constructed Case	23
Model Case	23
Borderline Case	23
Contrary Case	24
Antecedents	24
Consequences	25
Empirical Referents	25
Conclusion	26
References	27
 III. ARTICLE THREE: FUNCTIONAL STATUS OF OLDER ADULTS AFTER HIP FRACTURE WHO RESIDE IN NURSING HOMES IN ILLINOIS: A SECONDARY ANALYSIS	 30
Abstract	32
Introduction	33
Review of the Literature	34
Cognitive Status	34
Depressive Symptoms	36
Comorbidities	37
Pain	37
Age	38
Social Support	39
Conceptual Framework	39
Objectives/Research Questions	40
Method	40
Design and Sample	40
Measures	41
Nursing Home Minimum Data Set 3.0	41
Cognitive Status	42
Depressive Symptoms	43
Comorbidities	44
Pain	44
Age	44
Social Support	44
Functional Status	44
Statistical Analysis	45
Results	46

Sample Description	46
Research Question 1	49
Research Question 2	50
Discussion	51
Research Question 1	51
Research Question 2	53
Limitations	54
Conclusions	56
Recommendations	56
Nursing Implications	56
References	57
APPENDIX : Functional Status Model	66

TABLES

Table		Page
1.	Characteristics of Sample	47
2.	Frequencies and Percentages of Functional Status Levels	48
3.	Frequencies and Percentages of Comorbidities	49
4.	Correlations Among Predictor Variables and Between Predictor Variables With Functional Status	50

CHAPTER I

ARTICLE ONE: FUNCTIONAL STATUS OF OLDER ADULTS AFTER HIP FRACTURE: A REVIEW OF THE LITERATURE

Chapter one consists of a review of the literature submitted for publication to *Research in Gerontological Nursing*. The aim of this manuscript was to examine the literature for evidence of the impact of gender, age, comorbidities, pain, depression, self-efficacy, cognitive status, and social support on functional status of older adults after hip fracture.

Functional Status of Older Adults After Hip Fracture: A Review of the Literature

Christina L. Garcia, RN, MSN, Cindy Kerber, PhD, APRN, BC, Wendy Woith, PhD, RN,

MyoungJin Kim, PhD, Kim Astroth, PhD, RN

Mennonite College of Nursing at Illinois State University

Abstract

As the older adult population increases in size, there is a corresponding increase in the occurrence of hip fractures. Hip fracture is one of the most serious and debilitating injuries among older adults. Various factors have been examined which may impact functional status of older adults after a hip fracture. It is important to further examine the relationship between hip fractures in older adults and change in functional status. The purpose of this review is to provide a synthesis of the literature on the impact of gender, age, comorbidities, pain, depression, self-efficacy, cognitive status, and social support on the functional status of older adults after hip fracture. There is limited research regarding the impact of the combination of these factors on older adults after a hip fracture. Nurses are in a position to address these factors and advance the science of gerontology to improve outcomes for older adults after a hip fracture.

Functional Status of Older Adults After Hip Fracture: A Review of the Literature

Introduction

The incidence of hip fractures continues to increase as the older adult population increases. On average, 90% of hip fractures in the United States occur in adults older than 60 (Merck Sharp & Dohme Corp., 2008); there were 281,000 hospital admissions for hip fractures among older adults in 2007 (National Hospital Discharge Survey, 2010). By the year 2050, the incidence of hip fracture may range from 458,000 to 1,037,000 (Brown, Starr, & Nunley, 2012). In addition, the rate of mortality in older adults after hip fracture is approximately 9% of cases at 30 days postoperatively (Foss & Kehlet, 2005), and functional outcome is consistently affected by hip fracture in older adults (Arinzon, Gepstein, Shabat, & Berner, 2007). Approximately 32 to 80% of individuals have permanent disability from a hip fracture and 6 to 60% of individuals require long-term skilled nursing care after a hip fracture (Arinzon et al., 2007).

With the increase in occurrence of hip fractures, it is important to further examine the relationship between hip fractures and the change in functional status in older adults. Understanding the outcome postoperatively of hip fractures is an important step in improving the health of older adults (Brauer, Coca-Perrillon, Cutler, & Rosen, 2009). Functional status has been identified as an outcome of hip fracture in the older adult. The concept of functional status as well as specific factors that may impact functional status in the older adult after surgical repair of a hip fracture will be examined further in this review.

Functional Status

To understand functional status in the context of older adults after hip fracture, it is necessary to examine the various definitions of functional status found in the literature. Functional status is defined as a patient-oriented meaningful health outcome that concerns individual daily functioning (Wang, 2004). The concept of functional status is also defined as the individual's performance of activities associated with current life roles (Van Cleave, Egleston, & McCorkle, 2011). The lack of a consistent definition of functional status negatively impacts the

ability to compare studies that focus on older adults after hip fracture. For this literature review, functional status is defined as the individual's ability to perform activities of daily living.

Researchers report that functional status is influenced by factors present in the following domains: physical, psychological, cognitive, and social capacity. Within the physical domain, gender, comorbidities, and pain were identified. Within the psychological domain, depression and self-efficacy were identified. Within the cognitive domain, cognitive status was the primary factor identified. Within the social capacity domain, social support was identified as an important factor affecting functional status. The purpose of this review of literature is to demonstrate how each factor within each domain impacts functional status of the older adult after hip fracture.

Research Questions

Specific questions related to older adults after hip fracture were formulated to guide the review.

They included: In older adults after hip fracture

1. What is the relationship between gender, age, comorbidities, pain, depression, self-efficacy, cognitive status, social support, and functional status?
2. What is the effect of gender, age, comorbidities, pain, depression, self-efficacy, cognitive status, social support on functional status?

Methods

A systematic literature search was performed using the following databases: (a) Cumulative Index to Nursing and Allied Health Literature (CINAHL); (b) PubMed; and (c) PsycInfo, to identify appropriate articles for the review. The following criteria were used to determine if articles were appropriate to include in the review: (a) articles published between 2000 and 2012; (b) written in English; and (c) articles focused on the older adult population. When conducting the literature review, the following combinations of search terms were used: (a) *functional status and pain and hip fracture*; (b) *functional status and depression and hip fracture*; (c) *functional status and cognitive status and hip fracture*; (d) *functional status and social support and hip fracture*; (e) *functional status and comorbidities and hip fracture*; (f) *functional*

status and gender and hip fracture; and (g) *functional status and self-efficacy and hip fracture*.

Research conducted outside of the United States was included if the above criteria were met.

Findings

The search strategy yielded 125 articles from CINAHL, 149 articles from PubMed, and 73 articles from PsycInfo. After reviewing the abstracts of these articles, it was determined that 21 studies met the inclusion criteria and were appropriate for this review. The following sections of this review will examine the literature available related to the impact each factor has on functional status of older adults after hip fracture.

Factors Influencing Functional Status

Physical Domain: Gender

More hip fractures occur in women than men (American Academy of Orthopaedic Surgeons, 2013). The presence of osteoporosis in women increases the likelihood of sustaining a hip fracture. The National Osteoporosis Foundation (2011) estimates that more than 10 million women and men over age 50 in the United States have osteoporosis, and another 34 million are at risk for the disease. Approximately half of all women in the United States older than 50 and one in four men older than 50 will fracture a bone because of osteoporosis (National Osteoporosis Foundation, 2011).

Although women have more fractures than men, the rehabilitation process is similar. Lieberman and Lieberman (2004) compared male and female patients following surgical repair of hip fracture during the rehabilitation period. The primary finding of this study focused on the absence of a gender effect on the rehabilitation process as well as the outcome of rehabilitation (Lieberman & Lieberman, 2004). Curry, Hogstel, and Davis (2003) studied women aged 65 years and older who had experienced a recent hip fracture to describe functional status related to the performance of ADLs. The results suggested that older women residing independently or alone prior to hip fracture may be able to achieve a functional level that will support return to independence (Curry et al., 2003).

Physical Domain: Age

Age is considered a risk factor of hip fractures (Miller, 2009). Age-related changes such as a decrease in function, muscle strength, endurance, and coordination are decreased to some extent (Miller, 2009). There is limited literature specifically addressing the relationship between age and functional status. Penrod et al. (2007) examined differences in older adults after hip fracture to determine a possible variation in functional outcomes. Age was identified as a factor that may impact functional outcome after hip fracture. The results indicated moderate-functioning middle-old adults (75 – 84 years of age) and moderate-functioning old-old adults (\geq 85 years of age) walked with assistance prior to hip fracture and most likely will not be independent with mobility or ADLs postoperatively (Penrod et al., 2007).

Physical changes can occur when an individual ages which may also have an impact on functional status after hip fracture. Vitamin D levels continue to fall over time as individuals increase in age (Perry et al., 1999). Vitamin D is important in helping to build and maintain strong bones (University of Maryland Medical Center, 2011). It assists the body in absorbing and using calcium which is needed for strong bones (University of Maryland Medical Center, 2011). Presumably, older adults who reside in nursing homes are at more risk in developing a Vitamin D deficiency due to the lack of sun exposure.

Physical Domain: Comorbidities

The current literature suggests that the presence of comorbidities could impact functional status of the older adult after hip fracture. The presence of comorbidity triggers functional loss, especially when it occurs concurrently with an event that culminates in hospital admission (Francisco et al., 2012). Miller et al. (2004) investigated the effect of nine disabling medical conditions upon limitations in functional status of older adults and reinforced the known positive association between the number of comorbidities and the limited activities of daily living among older adults. These results also indicated an association between an increase in disease burden and a decreased level of functional status. Comorbid conditions that had the strongest adverse

effect upon functional status include diabetes mellitus, stroke, depressive symptoms, hip fracture, and knee pain (Miller et al., 2004).

Physical Domain: Pain

Pain is a major limitation to functional recovery in the postoperative patient (Morrison et al., 2006). Feldt and Oh (2000) found that pain severity with movement during hospitalization for a hip fracture was a significant predictor of functional outcome two months after surgery in hip fracture patients in two Midwestern urban hospitals. Covinsky, Lindquist, Dunlop, and Yelin (2009) examined the relationship between limitations in functional status and general pain in different age groups. The results indicated that participants with pain had more limitations in functional status than those without pain (Covinsky et al., 2009). This study also found that participants with significant pain were similar to participants without pain who are two or three decades older in terms of degree of functional limitation. Furthermore, Morrison et al. (2003) examined older adults following a hip fracture and the impact of pain on postoperative outcomes. Older adults with higher pain scores at rest had longer length of stays in the hospital, were significantly less likely to be ambulating by postoperative day three, and had significantly lower locomotion scores at six months after surgery (Morrison et al., 2003). These studies suggest that pain has a significant effect on functional outcome after hip fracture.

Psychological Domain: Depression

Hip fracture in older adults has been associated with rates of depression ranging from 9% to 47% (Holmes & House, 2000). Depression has been found to play a role in functional status change in the older adult after a hip fracture. Lenze et al. (2006) conducted a study to identify predictors of onset of major depressive disorder in adults who suffered a hip fracture. The results indicated that 14.3% of subjects developed major depressive disorder after hip fracture. In addition, the greatest period of risk was immediately after the fracture (Lenze et al., 2006). Guerini, Morghen, Lucchi, Bellelli, and Trabucchi (2010) conducted a study to examine the effect of depressive symptoms on one-year mortality in a population of older adults discharged from a

rehabilitation unit after orthopedic surgery of the lower limbs. The sample for this study included adults 65 years or older that had a hip fracture surgical repair, as well as elective knee or hip surgical replacement. The study indicated that severe depressive symptoms in addition to comorbidity were predictors of one-year mortality in this population and may suggest the need to assess for the presence of depressive symptoms in older adults after hip fracture (Guerini et al., 2010). Further research is needed to examine the effects of depression on participation in functional activities of the patient after a hip fracture.

Psychological Domain: Self-efficacy

There was a paucity of literature on self-efficacy and the older adult with a hip fracture. However, one study examined self-efficacy as a possible mediator of the relationship between quantity and quality of social relations and depressive symptomatology (Fiori, McIlvane, Brown, & Antonucci, 2006). The construct of self-efficacy may be particularly influential for the mental health of older adults (Fiori et al., 2006) and may impact the association between social support and an individual's well-being. More research is needed on how self-efficacy interacts with cognitive status, depression, comorbidities, pain, age, and social support, which ultimately impact functional status of the older adult after hip fracture.

Cognitive Domain: Cognitive Status

In order to provide appropriate care to the older adult population, the first step is to acknowledge the impact of cognitive impairment on rehabilitation of older adults after hip fracture (Dubljanin-Raspopovic et al., 2012). When examining hospitalized older adults, cognitive impairment is found to be higher in hip fracture patients postoperatively (Gruber-Baldini et al., 2003). Some studies have concluded that older adults with decreased cognitive status are less likely to achieve mobility and independence in activities of daily living. Lenze et al. (2004) identified a relationship between lower cognitive scores and a decreased improvement in motor function and outcome. In addition, a decline in cognitive function was found to adversely affect daily functional activities and independent living (Marks, 2002), whereas, the

results of a prospective study conducted by Beloosesky et al. (2002) indicated that patients with moderately impaired cognition and hip-fractured patients without cognitive impairment have the same increase in self-care and motor function after a rehabilitation period.

Social Capacity Domain: Social Support

Despite the important function of social support in the health versus illness situation, there is limited information available about the role of social support on functional recovery following hip fracture surgery (Oh & Feldt, 2000). Oh and Feldt (2000) identified social support as a factor that impacted functional outcome in older adults with hip fracture. Older adults who are discharged home or to the nursing home following surgical repair of a hip fracture will need assistance for activities of daily living, household chores, as well as managing the prescribed therapeutic regimen (Oh & Feldt, 2000). The availability of these resources can affect the older adult positively or negatively in relation to coping with imposed demands after hip fracture.

Social circumstances have also been found to influence functional status. Young and Resnick (2009) examined factors associated with functional recovery following hip fracture in the older adult and found that social support improved functional status after hip fracture. Specifically, participants described verbal encouragement from family and friends as an important factor in maintaining an optimistic attitude (Young & Resnick, 2009).

Predictive Factors of Functional Status

When researching the impact of influencing factors on older adults after hip fracture, it was found that a limited number of studies have examined a combination of the following factors: cognitive status, pain, gender, comorbidities, depression, self-efficacy, and/or social support. For example, Folden and Tappen (2007) conducted a study examining a combination of predictors that impact functional status recovery following hip fracture surgery. These predictors included balance, cognitive ability, comorbidity, age, postoperative complications, pain, depression, prior functional ability, gender, pain, fall efficacy, and fatigue. The results indicated that balance and cognitive ability were the best predictors of functional ability three months following discharge

from a rehabilitation setting. Balance, cognitive status, and prior functional ability were the best predictors of return to functional ability following discharge. Men reported higher functional levels three months following discharge and were more likely to return to their presurgical functional level. The study by Folden and Tappen (2007) is very beneficial to review when examining functional status of the older adult after hip fracture. Yet, the specific factors that were discussed in this review have not been found in combination in the literature.

Conclusion and Recommendations

As consequences of hip fracture in older adults become known, the significance of the problems regarding functional status is more apparent. Due to the increase in incidence of hip fracture in the older adult, a further understanding of specific factors affecting functional status after hip fracture is required to improve functional outcomes. The information in this review advances the discussion of how the factors of gender, comorbidities, pain, depression, self-efficacy, cognitive status, and social support may impact each other as well as the individual. Nurse researchers are in a position to address these factors and advance the science of gerontology to improve outcomes for older adults after a hip fracture.

Caring for older adults following a hip fracture is challenging for the nursing profession due to the complexity of factors present in this population. There is limited research available examining the combination of factors impacting the older adult after a hip fracture. Many factors are examined independently, but not in combination. Identification of the relationship and pervasiveness of these factors will allow nursing professionals to provide more holistic care to the patient. The need for methodologically strong research studies that demonstrate the impact of gender, comorbidities, pain, depression, self-efficacy, cognitive status, and social support on functional status is needed. Nursing implications suggested by this review indicate the need for early identification of older adults at risk of decline in functional status based on changes in gender, comorbidities, pain, depression, self-efficacy, cognitive status, and social support, which will assist in improving outcomes after surgical repair of hip fracture.

References

- American Academy of Orthopaedic Surgeons. (2007). Retrieved September 6, 2012, from http://orthoinfo.aaos.org/topic.cfm?topic=A00309&return_link=0
- Arinzon, Z., Gepstein, R., Shabat, S., & Berner, Y. (2007). Pain perception during the rehabilitation phase following traumatic hip fracture in the elderly is an important prognostic factor and treatment tool. *Disability and Rehabilitation*, 29, 651–658.
- Beloosesky, Y., Grinblat, J., Epelboym, B., Weiss, A., Grosman, B., & Hendel, D. (2002). Functional gain of hip fracture patients in different cognitive and functional groups. *Clinical Rehabilitation*, 16, 321–328.
- Brauer, C., Coca-Perrillon, M., Cutler, D., & Rosen, A. (2009). Incidence and mortality of hip fractures in the United States. *Journal of the American Medical Association*, 302(14), 1573 – 1579.
- Brown, C., Starr, A., & Nunley, J. (2012). Analysis of past secular trends of hip fractures and predicted number in the future 2010–2050. *Journal of Orthopedic Trauma*, 26, 117–122.
- Covinsky, K., Lindquist, K., Dunlop, D., & Yelin, E. (2009). Pain, functional limitations, and aging. *Journal of the American Geriatrics Society*, 57, 1556–1561.
- Curry, L., Hogstel, M., & Davis, G. (2003). Functional status in older women following hip fracture. *Journal of Advanced Nursing*, 42, 347–354.
- Dubljanin-Raspopovic, E., Markovic-Denic, L., Matanovic, D., Grajic, M., Krstic, N., & Bumbasirevic, M. (2012). Is pre-fracture functional status better than cognitive level in predicting short-term outcome of elderly hip fracture patients? *Archives of Medical Science*, 8, 115–122.
- Feldt, K., & Oh, H. (2000). Pain and hip fracture outcomes for elderly adults. *Orthopedic Nursing*, 19, 35–44.
- Fiori, K., McIlvane, J., Brown, E., & Antonucci, T. (2006). Social relations and depressive symptomatology: Self-efficacy as a mediator. *Aging & Mental Health*, 10, 227–239.

- Folden, S., & Tappen, R. (2007). Factors influencing function and recovery following hip repair surgery. *Orthopaedic Nursing, 26*, 234–241.
- Foss, N., & Kehlet, H. (2005). Mortality analysis in hip fracture patients: Implications for design of future outcome trials. *British Journal of Anaesthesia, 94*, 24–29.
- Francisco, J., Cuenca, F., Azana, S., Torres, J., Lopez, J., Castillo, J., & Duarte, L. (2012). Impact of incident comorbidity on functional loss in elderly chronic kidney disease patients undergoing hemodialysis. *Canadian Association of Nephrology Nurses and Technologists Journal, 22*, 25–29.
- Gruber-Baldini, A., Zimmerman, S., Morrison, R., Grattan, L., Hebel, R., Dolan, M., . . . Magaziner, J. (2003). Cognitive impairment in hip fracture patients: Timing of detection and longitudinal follow-up. *Journal of American Geriatric Society, 51*, 1227–1236.
- Guerini, F., Morghen, S., Lucchi, E., Bellelli, G., & Trabucchi, M. (2010). Depressive symptoms and one year mortality among elderly patients discharged from a rehabilitation ward after orthopaedic surgery of the lower limbs. *Behavioral Neurology, 23*, 117–121.
- Holmes, J., & House, A. (2000). Psychiatric illness in hip fracture. *Age and Aging, 29*, 537–546.
- Lenze, E., Munin, M., Dew, M., Rogers, J., Seligman, K., Mulsant, B., & Reynolds, C. (2004). Adverse effects of depression and cognitive impairment on rehabilitation participation and recovery from hip fracture. *International Journal of Geriatric Psychiatry, 19*, 472–478.
- Lenze, E., Munin, M., Skidmore, E., Dew, M., Rogers, J., Whyte, E., . . . Reynolds, C. (2006). Onset of depression in elderly persons after hip fracture: Implications for prevention and early intervention of late-life depression. *Journal of American Geriatrics Society, 55*, 81–86.
- Lieberman, D., & Lieberman, D. (2004). Rehabilitation following hip fracture surgery: A comparative study of females and males. *Disability and Rehabilitation, 26*(2), 85–90.

- Marks, B. (2002). Cognitive function: Its relationship with functional status, fitness, and vascular and cerebral blood flow. *Topics in Geriatric Rehabilitation, 17*, 33–41.
- Merck Sharp & Dohme Corp. (2008). *Merck manual home health handbook*. Retrieved September 6, 2012, from http://www.merckmanuals.com/home/injuries_and_poisoning/fractures/hip_fractures.html#v830047
- Miller, C. (2009). *Nursing for wellness in older adults*. Philadelphia, PA: Lippincott Williams & Wilkins.
- Miller, R., Zhang, Y., Silliman, R., Hayes, M., Leveille, S., Murabito, J., . . . Felson, D. (2004). Effect of medical conditions on improvement of self-reported and observed functional performance of elders. *Journal of the American Geriatrics Society, 52*, 217–223.
- Morghen, S., Gentile, S., Ricci, E., Guerini, F., Bellelli, G., & Trabucchi, M. (2011). Rehabilitation of older adults with hip fracture: Cognitive function and walking abilities. *Journal of the American Geriatrics Society, 59*, 1497–1502.
- Morrison, R., Magaziner, J., McLaughlin, M., Orosz, G., Silberzweig, S., Koval, K., & Siu, A. (2003). The impact of postoperative pain on outcomes following hip fracture. *Pain, 103*, 303–311.
- Morrison, R., Meier, D., Fischberg, D., Moore, C., Degenholtz, H., Litke, A., . . . Siu, A. (2006). Improving the management of pain in hospitalized adults. *Archives of Internal Medicine, 166*(9), 1033 – 1039.
- National Hospital Discharge Survey (2010). Retrieved May 27, 2013, from <http://www.cdc.gov/HomeandRecreationalSafety/Falls/adulthipfx.html>
- National Osteoporosis Foundation. (2011). Retrieved September 6, 2012, from <http://www.nof.org/node/40>
- Oh, H., & Feldt, K. (2000). The prognostic factors for functional recovery in elders with hip fracture. *Nursing and Health Sciences, 2*, 237–242.

- Penrod, J., Litke, A., Hawkes, W., Magaziner, J., Koval, K., Doucette, J., ... Siu, A. (2007). Heterogeneity in hip fracture patients: Age, functional status, and comorbidity. *Journal of the American Geriatrics Society*, 55, 407 – 413.
- Perry, H., Horowitz, M., Morley, J., Patrick, P., Vellas, B., Baumgartner, R., & Garry, P. (1999). Longitudinal changes in serum 25-hydroxyvitamin D in older people. *Metabolism*, 48, 771 – 775.
- University of Maryland Medical Center (2011). Vitamin D. Retrieved from <https://www.umm.edu/altmed/articles/vitamin-d-000340.htm>
- Van Cleave, J., Eggleston, B., & McCorkle, R. (2011). Factors affecting recovery of functional status in older adults after cancer surgery. *Journal of the American Geriatrics Society*, 59, 34–43.
- Wang, T. (2004). Concept analysis of functional status. *International Journal of Nursing Studies*, 41, 457–462.
- Young, Y., & Resnick, B. (2009). Don't worry and be positive: What helps the most in functional recovery one year after hip fracture? An exit interview. *Rehabilitation Nursing*, 34(3), 110–117.

CHAPTER II

ARTICLE TWO: FUNCTIONAL STATUS OF OLDER ADULTS: A CONCEPT ANALYSIS

Chapter two consists of a concept analysis submitted for publication to *Nursing Forum*. The aim of this manuscript was to provide a more comprehensive understanding of functional status.

Functional Status of Older Adults: A Concept Analysis

Christina L. Garcia, RN, MSN, Cindy Kerber, PhD, APRN, BC, Kim Astroth, PhD, RN, Wendy

Woith, PhD, RN, and MyoungJin Kim, PhD

Mennonite College of Nursing at Illinois State University

Abstract

Many older adults experience changes in functional status. The most common definition of functional status found in the literature is the physical performance of activities of daily living by an individual. The aim of this concept analysis is to provide clarity of the meaning of functional status, while gaining a more comprehensive understanding of application to practice. Using the concept analysis method described by Walker and Avant, an extensive literature review was conducted as well as the formation of sample cases, defining attributes, antecedents, consequences, and empirical referents of functional status. The most common definition found in the literature is the physical performance of activities of daily living (ADLs) by an individual. Further clarification of the psychological, social, spiritual, and intellectual well-being of the individual will advance the concept of functional status in the older adult population.

Functional Status of Older Adults: A Concept Analysis

Introduction

Functional status is an important concept to define in the older adult population, because many older adults experience changes in functional status. Historically, functional status has been defined as activities of daily living (ADLs) to determine disability and facilitate clinical management (Wang, 2004). Van Cleave, Egleston, and McCorkle (2011) further define functional status as the individual's performance of activities associated with current life roles. As the concept of functional status has evolved, the definition has incorporated the roles of physical and social components when assessing an older adult's functional status. Yet multiple terms are used to refer to functional status, potentially leading to disagreement within and across the disciplines of nursing, medicine, and therapy services as to how to define functional status (Wang, 2004). The lack of agreement on the definition of functional status may lead to problems in scientific communication, information retrieval, comparison of findings from study to study, and synthesis of the findings (Wang, 2004).

Thus, the purpose of this analysis is to provide a conceptual understanding of functional status. Analysis will be guided by the eight-step process as described by Walker and Avant's (2011) classic concept analysis method. The aim of this analysis is to provide clarity in the meaning of functional status, as well as a comprehensive understanding of its attributes, antecedents, consequences, and application to practice.

Method

Walker and Avant (2011) modified the method of concept analysis by refining and simplifying the original method. The method includes eight steps:

1. select a concept
2. determine the aims or purposes of analysis;
3. identify all uses of the concept that you can discover;
4. determine the defining attributes;

5. identify a model case;
6. identify borderline, related, contrary, invented, and illegitimate cases;
7. identify antecedents and consequences; and
8. define empirical referents (Walker & Avant, 2011)

For this concept analysis, a model case, borderline case, and contrary case were identified.

Data Sources

The uses of the concept functional status in published literature were identified by searching the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and PsycInfo. The terms used for the search included *functional status*, *functional capacity*, *functional performance*, *functional recovery*, and *functional decline*. The inclusion criteria included: (a) written in English; (b) published between 2004 and 2012; and (c) described or studied functional status in any setting with the older adult population that consists of individuals 65 years or older. The literature was examined starting in 2004 due to the limited information on functional status. Titles and abstracts were reviewed to identify 13 relevant articles to be used in this concept analysis. The reference lists of relevant articles were also reviewed for potential articles.

Results

The resulting concept analysis includes the uses of the concept functional status as well as the various definitions of functional status used in the literature. In addition, the attributes of functional status, three constructed cases related to functional status, the antecedents of functional status, the consequences of functional status, and the empirical referents of functional status are examined further.

Related Terms

Multiple terms have been used to describe functional status. Therefore, there is confusion about the definitions of functional status and related terms, including functional capacity, functional performance, functional recovery, and functional decline.

Functional capacity is defined as an individual's maximum potential to perform activities to meet basic needs, fulfill usual roles, and maintain health and well-being, which may include the cognitive and psychosocial components (Leidy, 1994). Functional capacity in the older adult population is measured by the ability to independently participate in ADLs (de Brito & Pavarini, 2012).

In contrast to functional capacity, functional performance refers to what an individual does in real situations (Wang, 2004). Leidy (1994) also defined functional performance as the physical, psychological, social, occupational, and spiritual activities that individuals actually perform to meet basic needs. Therefore, functional performance is the outcome of deliberate actions by the individual. Functional performance can capture subtle changes in physical function that may present prior to personal awareness of such changes (Mullen, McAuley, Satariano, Kealey, & Prohaska, 2012).

Functional recovery can be described as an individual's returning to performing ADLs independently. Ganz, Peterson, Russo, and Guccione (2007) measured functional recovery after hip fracture in the sub-acute setting using performance-based measures. In this study, the definition of functional recovery was congruent with the definitions that focused primarily on individual performance. Lin and Chang (2004) examined factors affecting recovery of ADLs one year after hip fracture in older adults to understand the factors that affect functional recovery in this population. Patients who had poorer ability to walk outdoors experienced delayed recovery in ADLs (Lin & Chang, 2004). This study supported a focus on overall performance of the individual when defining functional status.

Functional decline is defined as a deterioration of performance in self-care skills or a new loss of ability in self-care activities (Hoogerduijn, Schuurmans, Korevaar, Buurman, & de Rooij, 2010). Age is often connected with functional decline or loss of ability. The issue of functional decline in the older adult has become the focus of many studies. Hoogerduijn et al. (2006) conducted a systematic review to determine predictors of functional decline among older

hospitalized patients. They identified the following predictors of functional decline: (a) age upon admission into the hospital; (b) lower functional status; (c) cognitive impairment; (d) preadmission disability of IADLs; (e) length of stay; and (f) depression (Hoogerduijn et al., 2006). Christensen, Stovring, Schultz-Larsen, Schroll, and Avlund (2006) studied the effect of physical inactivity among older adults. The results indicated a strong relationship between physical inactivity at age 70 and functional decline at age 75. It was found that physical inactivity was indeed a risk factor for functional decline in the older adult population. Therefore, functional decline is usually measured in relation to the completion of ADLs.

Definitions of Functional Status

The term *functional status* does not appear in dictionaries as one term. However, the terms *functional* and *status* can be analyzed individually. First, *functional* is the adjective term of *function* and can be found in *Merriam-Webster's Online Dictionary* (2010). The term *functional* refers to: “(a) of, connected with, or being a function; (b) used to contribute to the development or maintenance of a larger whole; and (c) performing or able to perform a regular function” (Functional, 2012). Wang (2004) defined functional status as a patient-oriented meaningful health outcome concerning daily functioning of the individual in their environment. According to Wang (2004), if the meanings of *function* are examined further, the term can be found independently and refers to: (a) bodily or mental action such as behavior or performance; (b) the activity appropriate to the nature or position of a person or thing; (c) the normal contribution of any bodily part to the economy of a living organism; (d) the performance or fulfillment of a function; and (e) the acts or activity common in individuals by nature or position. The common theme that arises from these definitions focuses on the performance of the individual.

Defining Attributes of Functional Status

The defining attributes of functional status are those characteristics of the concept that both define and differentiate it (Walker & Avant, 2011). A critical attribute of functional status is activities in which individuals participate to maintain health and well-being while fulfilling roles

and meeting basic needs. These activities may include walking, bathing, dressing, and toileting. In addition, another critical attribute is physical performance of activities which corresponds to the expected level of the individual present within the environment (Wang, 2004). For example, some older adults may not be able to walk as fast as when they were younger.

Constructed Case

Constructed cases highlight the concept that is being analyzed by describing the concept's presence in a model case. In addition, the clarification of the defining attributes related to the concept of interest is presented in a borderline case. The absence of the concept in a contrary case will also be examined (Walker & Avant, 2011).

Model Case

A 65-year-old man has just returned home from playing golf with his friends. Although he feels tired, he knows that after resting, he can continue with his daily activities as usual. Like other people his age, his knees sometimes trouble him. However, by taking prescribed pain medications, he feels that his arthritis does not interfere with his life. He is able to leave the house on his own and perform activities independently, without any outside help from his family. He enjoys social activities with his friends as well as his family and is very active in his church as well as in the community.

This model case describes adequate functional status, because the man is able to perform various activities of daily living at a level that corresponds to his age and living conditions, even though diagnosed with arthritis. Through these activities or actions, his physical, psychological, social, and spiritual needs are fulfilled.

Borderline Case

An older woman suffers from major depression. When her friends and family visit her, they are surprised that her apartment is very messy. They also notice that her personal hygiene is poor, and she has not left her apartment for days. This individual had previously interacted with other older adults in her apartment complex and participated in activities in the community.

Although she can prepare a meal for herself, she does not do so. Her friends and family worry about her and want to help.

In this borderline case, although the woman possesses the physical ability to independently perform ADLs, due to the emotional barrier (i.e., a serious mood disorder); she is not performing them as expected. Therefore, her physical, psychological, and social needs are not fulfilled. The case can be considered borderline because, if the woman obtains treatment for her depression, her functional status could be expected to improve.

Contrary Case

An older man who suffered a stroke two years ago is currently residing in a nursing home. He is receiving tube feedings and is unable to independently fulfill basic needs such as bathing, dressing, toileting, transferring, grooming, and feeding. These activities can only be fulfilled through the help of others.

In this contrary case, the older man does not have the ability to perform any activity of daily living to meet basic needs, to fulfill usual roles in his environment, or to maintain health and well-being.

Antecedents

Antecedents are those factors that precede the occurrence of the concept (Walker & Avant, 2011). Therefore, the following antecedents were identified in the literature for the concept of functional status: (a) the ability of an individual to physically perform activities of daily living independently; (b) there are normal expectations related to each individual's activities; (c) activities of daily living can fulfill necessities of human life; (d) the abilities that are a function of age (Wang, 2004). For example, individuals who function independently in their environment by performing ADLs most likely exhibit adequate functional status. There are also individuals with disease processes who are able to manage the alterations in their daily life related to the disease and function appropriately in their environment.

Consequences

According to Walker and Avant (2011), consequences are events or incidents that occur as a result of the occurrence of the concept. The consequences of functional status are that functional status is either maintained or impaired. For example, a sample of outpatients with cancer was studied to determine the effect of pain over time on functional status (Barsevick, Dudley, & Beck, 2006). The findings demonstrated that increased pain resulted in restriction of activities (an indicator of functional status), which then predicted increased depressive symptoms. The authors suggest that the emotional well-being of the individual affected the change in functional status more than the degree of pain (Barsevick et al., 2006). Therefore, impaired functional status can lead to a decrease in the individual's emotional well-being.

Empirical Referents

Empirical referents are the processes that can be used to measure the concept (Walker & Avant, 2011). The following are examples of tools commonly used in the older adult population to measure functional status: (a) the Katz Index of Independence in ADL Scale; (b) the Barthel Index; and (c) the Functional Independence Measure. These tools measure actual activities performed in various aspects of life and can include personal care, ambulation, household activities, recreational activities, and community participation.

The Katz Index of Independence in ADL Scale is a standardized quantitative measure of evaluating treatment, prognosis, and functional change in older individuals (Katz, Down, Cash, & Grotz, 1970). The Katz Index ranks adequacy of performance in six functions: bathing, dressing, toileting, transferring, continence, and feeding. According to Wallace and Shelkey (2007), the instrument is most effective when used in a variety of care settings among older adults. The Katz Index has consistently demonstrated its utility in evaluating functional status in the older adult population (Wallace & Shelkey, 2007).

The Barthel Index measures the performance of ADLs by an individual (Mahoney & Barthel, 1965). There are ten variables on the Barthel Index that describe ADL and mobility.

Each variable is assigned points related to each level or ranking based on performance of the individual. According to O'Sullivan and Schmitz (2007), the Barthel Index signifies one of the first contributions to the functional status literature. The Barthel Index has demonstrated reliability and is highly correlated with measures of physical disability (O'Sullivan & Schmitz, 2007).

The Functional Independence Measure (FIM) measures the severity of disability in an inpatient rehabilitation setting (Mackintosh, 2009; Uniform Data System for Medical Rehabilitation, 2013). The FIM rates 18 ADLs on a scale that ranges from fully dependent to independent with no aids. Studies have validated the ability of the FIM score to discriminate between disabilities and levels of severity of impairment (Heinemann, Linacre, Wright, Hamilton, & Granger, 1994). FIM scores have also been correlated highly with Barthel Index scores in individuals with stroke (Fricke & Unsworth, 1996). In addition, Ottenbacher, Yungwen, Granger, and Fiedler (1996) examined the reliability of FIM by performing a meta-analysis and reported median correlations coefficients between total scores equal to 0.95 for interrater reliability, 0.95 for test retest reliability, and 0.92 for equivalence reliability.

Conclusion

Functional status may be difficult to measure due to the ambiguity in the interpretation of the concept. Despite many years of interest and numerous studies on functional status, the meaning, outcomes, and nature remain unclear. The most common definition found in the literature is the physical performance of ADLs by an individual. Yet many aspects of life, including psychological, social, spiritual, intellectual, and roles, influence the performance of ADLs by an individual. Therefore, the level of performance of an older adult may differ between individuals, due to the impact of various aspects present in their life. Further clarification of these particular aspects will help further the definition of functional status in the older adult.

References

- Barsevick, A. M., Dudley, W. N., & Beck, S. L. (2006). Cancer-related fatigue, depressive symptoms, and functional status: A mediation model. *Nursing Research*, 55, 366–372.
- Christensen, U., Stovring, N., Schultz-Larsen, K., Schroll, M., & Avlund, K. (2006). Functional ability at age 75: Is there an impact of physical inactivity from middle age to early old age? *Scandinavian Journal of Medicine & Science in Sports*, 16, 245–251.
- de Brito, T. R. & Pavarini, S. C. (2012). The relationship between social support and functional capacity in elderly persons with cognitive alterations. *Revista Latino-Americana de Enfermagem*, 20, 677–684.
- Fricke, J., & Unsworth, C. (1996). Inter-rater reliability of the original and modified Barthel Index, and a comparison with the Functional Independence Measure. *Australian Occupational Therapy Journal*, 43, 22–29.
- Functional. (2012). In *Merriam-Webster's online dictionary*. Retrieved from <http://www.merriam-webster.com/dictionary/functional?show=0&t=1355856528>
- Ganz, S., Peterson, M., Russo, P., & Guccione, A. (2007). Functional recovery after hip fracture in the subacute setting. *Humanity and Social Science Journal*, 3, 50–57.
- Heinemann, A., Linacre, J., Wright, B., Hamilton, B., & Granger, C. (1994). Measurement characteristics of the Functional Independence Measure. *Topics in Stroke Rehabilitation*, 1, 1–15.
- Hoogerduijn, J. G., Schuurmans, M. J., Duijnste, M. S., de Rooij, S. E., & Grypdonck, M. F. (2006). A systematic review of predictors and screening instruments to identify older hospitalized patients at risk for functional decline. *Journal of Clinical Nursing*, 16, 46–57.
- Hoogerduijn, J. G., Schuurmans, M. J., Korevaar, J. C., Buurman, B. M., & de Rooij, S. E. (2010). Identification of older hospitalized patients at risk for functional decline: A study

- to compare the predictive values of three screening instruments. *Journal of Clinical Nursing*, 19, 1219–1225.
- Katz, S., Down, T., Cash, H., & Grotz, R. (1970). Progress in the development of the index of ADL. *The Gerontologist*, 10(1), 20 – 30.
- Leidy, N. K. (1994). Functional status and the forward progress of merry-go-rounds: Toward a coherent analytical framework. *Nursing Research*, 43, 196–202.
- Lin, P., & Chang, S. (2004). Functional recovery among elderly people one year after hip fracture surgery. *Journal of Nursing Research*, 12, 72–81.
- Mackintosh, S. (2009). Functional Independence Measure. *Australian Journal of Physiotherapy*, 55, 65–66.
- Mahoney, F. & Barthel, D. (1965). Functional evaluation: The Barthel Index. *Maryland State Medical Journal*, 14, 56 – 61.
- Mullen, S. P., McAuley, E., Satariano, W. A., Kealey, M., & Prohaska, T. R. (2012). Physical activity and functional limitations in older adults: The influence of self-efficacy and functional performance. *Journals of Gerontology Series B: Psychological Sciences & Social Sciences*, 67B, 354–361.
- O’Sullivan, S., & Schmitz, T. (2007). *Physical rehabilitation* (5th ed.). Philadelphia, PA: F. A. Davis.
- Ottensbacher, K., Yungwen, H., Granger, C., & Fiedler, R. (1996). The reliability of the functional independence measure: A qualitative review. *Archives of Physical Medicine and Rehabilitation*, 77, 1226–1232.
- Status. (2012). In *Merriam-Webster’s online dictionary*. Retrieved from <http://www.merriam-webster.com/dictionary/status>
- Uniform Data System for Medical Rehabilitation (2013). *About the FIM system*. Retrieved from http://www.udsmr.org/WebModules/FIM/Fim_About.aspx

- Van Cleave, J. H., Egleston, B. L., & McCorkle, R. (2011). Factors affecting recovery of functional status in older adults after cancer surgery. *Journal of the American Geriatric Society*, 59, 34–43.
- Walker, L. O., & Avant, K. C. (2011). *Strategies for theory construction in nursing* (5th ed.). Boston, MA: Prentice Hall.
- Wallace, M., & Shelkey, M. (2007). Katz Index of Independence in Activities of Daily Living (ADL). *Annals of Long-Term Care*, Retrieved from <http://www.annalsoflongtermcare.com/article/6412>
- Wang, T. (2004). Concept analysis of functional status. *International Journal of Nursing Studies*, 41, 457–462.

CHAPTER III

ARTICLE THREE: FUNCTIONAL STATUS OF OLDER ADULTS AFTER HIP FRACTURE WHO RESIDE IN NURSING HOMES IN ILLINOIS: A SECONDARY ANALYSIS

Chapter three contains a data-based manuscript that will be submitted to the *Journal of the American Geriatrics Society*. This manuscript presents a secondary analysis of selected data from the 2011 Illinois Nursing Home Minimum Data Set 3.0.

Functional Status of Older Adults After Hip Fracture Who Reside in Nursing Homes in Illinois:

A Secondary Analysis

Christina L. Garcia, RN, MSN, Cindy Kerber, PhD, APRN, BC, MyoungJin Kim, PhD, Kim S.

Astroth, PhD, RN, and Wendy Woith, PhD, RN

Mennonite College of Nursing at Illinois State University

Abstract

Functional status of older adults after hip fracture can be impacted by many different factors, including cognitive status, the presence of depressive symptoms, the presence of various comorbidities, pain, age, and the presence of social support. The purpose of this secondary analysis of the 2011 Illinois Nursing Home Minimum Data Set (MDS) 3.0 (CMS, 2010b) was to examine the relationships of the factors as well as their impact on functional status of older adults who were admitted to a nursing home with the International Classification of Diseases book 9 (ICD-9) diagnostic code of aftercare for healing traumatic hip fracture. The sample consisted of 98 residents who met the following inclusion criteria: (a) complete annual assessment data for cognitive status, depressive symptoms, comorbidities, pain, age, marital status, family participation in assessment, and functional status; (b) residents aged 65 years or older; and (c) the resident must have performed the 10 ADLs three times or more according to the MDS 3.0 (CMS, 2010b). Pearson's correlation coefficients, Point-biserial correlation coefficients, and multiple linear regression were used to examine the relationships among the variables. The results indicated relationships between the following variables: (a) cognitive status and functional status; (b) cognitive status and age; (c) cognitive status and the diagnosis of Alzheimer's and/or dementia; (d) cognitive status and pain; (e) depressive symptoms and the diagnosis of Alzheimer's and/or dementia; (f) depressive symptoms and pain; (g) age and functional status; and (h) age and family participation. Cognitive status was found to predict functional status older adults after hip fracture ($p < .01$). Further research is needed to examine these variables more in depth and to determine appropriate prevention and detection of changes in functional status of older adults after hip fracture.

Keywords: MDS 3.0, functional status, nursing homes, hip fracture aftercare

Functional Status of Older Adults After Hip Fracture Who Reside in Nursing Homes in Illinois:

A Secondary Analysis

Introduction

Hip fracture is one of the most serious and debilitating injuries among older adults (Wilson, Chase, Chrischilles, & Wallace, 2006). According to Karantana et al. (2011), approximately 1.6 million hip fractures occur worldwide every year. This number will continue to rise as the number of adults living to older ages increases (Konnopka, Jerusel, & Konig, 2009). One of the consequences of hip fractures in older adults is increased mortality. Older adults with hip fractures have a 30% chance of dying within the first year after injury (Lapcevic, French, & Campbell, 2010). Some studies have shown an increase in long-term mortality in this population from two to ten years after the hip fracture (Haentjens, et al., 2010; Vestergaard, Rejnmark, & Mosekilde, 2007). According to Braithwaite, Col, and Wong (2003), the incidence of hip fracture reduced life expectancy of older adults by 1.8 years, or 25%, compared with an age-matched general population. Hip fracture survivors spend an average of 334 days in a nursing facility, or 17% of their remaining life (Braithwaite et al., 2003). In addition, the cost of treatment after a hip fracture can equate to approximately \$40,000 in the first year and \$5000 in subsequent years (Brauer, Coca-Perrailon, Cutler, & Rosen, 2009). The cost is directly related to the time spent in recovery after a hip fracture.

One year after an older adult sustains a hip fracture, the risk of impaired mobility and a decrease level of performance of activities of daily living (ADLs), or functional status, continues to be an issue (Martinez-Reig, Ahmad, & Duque, 2012). The inability to achieve prefracture functional status in older adults after a hip fracture continues to be a problem one year after surgery (Koval, Skovron, Aharonoff, Meadows, & Zuckerman, 1995; Young, German, Brant, Kenzora, & Magaziner, 1996; Beaupre et al., 2007). After a hip fracture, there may be functional limitations present that impact other medical conditions of the individual (Huang & Acton, 2009). An additional risk to self-induced immobility can occur if the psychological well-being of the

older adult is affected due to the loss of self-esteem as well as the fear of falling (Kong, Lee, Mackenzie, & Lee, 2002). Therefore, the examination of specific factors that may impact the return to prefracture functional status of the older adult after surgical repair of a hip fracture is imperative. The purpose of this study was to examine the impact of cognitive status, depressive symptoms, comorbidities, pain, age, and social support on functional status on the annual MDS 3.0 (CMS, 2010b) assessment of adults aged 65 and older who reside in a nursing home for care following surgical repair of a hip fracture.

Review of the Literature

Healthcare providers have focused on reducing the incidence and severity of hip fractures by initiating fall-prevention techniques and education for older adults, yet hip fractures continue to be a leading cause of increased morbidity and premature mortality among older adults (Haleem, Lutchman, Mayahi, Grice, & Parker, 2008; Parker & Johansen, 2006). Cognitive deficits and impaired functioning between the motor and sensory systems have been identified as factors that increase the risk of falling and fracturing a hip (Marks, 2010). Once an older adult falls and sustains a hip fracture, there is a substantial loss of function related to the ability to perform ADLs (Beaupre, Jones, Johnston, Wilson, & Majumdar, 2012). The examination of factors that may impact the loss of function in older adults after hip fracture is needed.

Cognitive Status

Cognitive status is defined as the intellectual process by which an individual perceives, registers, stores, retrieves, and uses information (Braes, Milisen, & Foreman, 2012; Kiatlaekakul, 2005). “Cognitive status embraces the quality of knowing, which includes all aspects of perception, recognition, conception, sensing, thinking, reasoning, remembering, and imagining” (Kiatlaekakul, 2005, p. 12). The impact of cognitive status on postoperative functional recovery has been examined in older adults with a hip fracture. According to Gruber-Baldini et al. (2003), adults who have suffered a hip fracture are at high risk for changes in cognitive status. The change in cognitive status could be from one of the following risk factors: (a) an exacerbation of

symptoms of dementia caused by hospitalization; (b) the stress of a hip fracture which may cause physiological disturbances impacting the central nervous system; (c) symptoms such as pain related to hip fracture; and (d) common comorbidities such as infections, cardiovascular disease or stroke (Gruber-Baldini et al., 2003).

Delirium is a cognitive alteration that may impact the return to prefracture functional status after a hip fracture. Delirium is considered one of the most common postoperative complications after hip fracture repair, with an incidence of up to 53.3% (Bruce, Ritchie, Blizzard, Lai, & Raven, 2007). Lee et al. (2011) compared the types and magnitude of preoperative and intraoperative predisposing factors for delirium in 425 individuals with acute hip fracture without delirium. The sample was preoperatively categorized into two groups: without dementia ($n = 284$) and with probable dementia ($n = 141$). The Confusion Assessment Method test (CAM) was used to identify individuals with delirium. Once delirium was ruled out, the Mini-Mental State Examination (MMSE) was used to identify individuals who scored less than 24 which indicated the individual had cognitive impairment. An individual was not eligible for the study if delirium was present. Results of this study indicated that the group with probable dementia had a higher incidence of delirium postoperatively (56%) than in the group without dementia (26%) ($p < .001$). In the group without dementia, age, male sex, body mass index, number of medical comorbidities, and the duration of surgery were associated with postoperative delirium.

As a result of impaired cognitive status, the ability to regain prefracture level of functional status may be challenged. Young, Xiong, and Pruzek (2010) compared functional recovery patterns at 2, 6, and 12 months postoperatively among cognitively impaired and non-impaired older adults who had hip fracture surgeries. The results of data collected from 231 participants indicated that cognitively impaired older adults experienced recovery in functional status level at 2 and 6 months but were unable to retain rehabilitation gains in locomotion, transfers, and self-care at one year following post-acute rehabilitation discharge (Young et al., 2011). In addition, these individuals still required care within their home from family or

healthcare providers at one year. According to Amieva et al. (2008), there is also a relationship between the progression of cognitive impairment and decline in functional status. Older adults with decreased cognitive status are less likely to be independent with ADLs. Lenze et al. (2004) identified a correlation between lower cognitive scores and less improvement in motor function and outcome. In addition, problems with cognitive status postoperatively were found to persist over 2 to 12 months, precipitating functional and social impairment (Gruber-Baldini et al., 2003).

Dementia and cognitive impairment have been associated with increased risk of mortality, infections, and impaired adaptive capacity resulting from the imbalance of neurohormonal systems, which may cause an increased vulnerability to adverse clinical events (Gruber-Baldini et al., 2003). The need to identify hip fracture patients with preoperative dementia and delirium is imperative to address risk factors related to postoperative complications in cognitive status as well as functional status changes.

Depressive Symptoms

Depressive symptoms are defined as symptoms such as the presence of sadness, feelings of guilt, suicidal thoughts, insomnia, weight loss, and a loss of interest in activities and that may cause depression (Lenze et al., 2007). Depressive symptoms have been found to play a role in functional status change in older adults after hip fracture (Lenze et al., 2007). Lenze et al. (2007) identified that the development of new major depressive disorder cases in adults 60 years and older who suffered a hip fracture was higher in the immediate postoperative period after a hip fracture. The results of a study by Shyu et al. (2009) supported this finding of increased incidence of depression after hip fracture ($n = 147$). Shyu et al. (2009) found the majority (57.8%) of older adults ($n = 85$) hospitalized with a hip fracture who were able to walk independently before the fracture were at risk for developing depressive symptoms before discharge. In addition, 35.6% of these older adults ($n = 52$) were at risk for depressive symptoms 12 months after discharge.

Comorbidities

Comorbidity is defined as the presence of more than one distinct medical condition in an individual (Valderas, Starfield, Sibbald, Salisbury, & Roland, 2009). The concept of comorbidity impacts patient-reported outcomes that include functioning (Valderas & Alonso, 2008).

Functional recovery of older adults after a hip fracture could be affected by specific comorbidities as well as the total burden of comorbidities (Miller et al., 2004). Miller et al. (2004) examined nine disabling medical conditions and functional status in older adults at baseline (n = 1,825) and 10 years later (n = 1,026). The prevalence of functional limitations ranged from 3.1% to 29.8% at baseline and increased to 15.1% to 32.4% at 10 years. Functional limitations were defined as difficulties bathing, walking up and down stairs, heavy household work, walking half a mile, toileting, and continence. The results indicated an association between an increase in comorbidities and a decreased level of functional status. Diabetes mellitus, stroke, and depressive symptoms were among the comorbidities that had the strongest adverse effect on recovery from functional limitations (Miller et al., 2004).

Pain

Pain in older adults after hip fracture is defined as discomfort in varying degrees of severity (Arinzon, Gepstein, Shabat, & Berner, 2007). The presence of pain after hip fracture significantly predicts outcomes in the postoperative period in older adults (Arinzon et al., 2007). Morrison et al. (2003) found that pain has a significant effect on functional outcome after hip fracture. Specifically, older adults with higher pain scores at rest had longer hospital stays and were more likely to have missed or shortened physical therapy sessions (Morrison et al., 2003). In addition, these individuals were significantly less likely to ambulate postoperative day three and had significantly lower locomotion scores at six months (Morrison et al., 2003). Covinsky, Lindquist, Dunlop, and Yelin (2009) found that pain was significantly related to functional limitations in individuals 50 years and older regardless of the presence of arthritis. Arinzon et al.

(2007) concluded that inadequate pain assessment and inappropriate treatment for pain can impact functional outcome of older adults after hip fracture.

There is limited information on pain specific to older adults who reside in a nursing home one-year postoperative hip fracture surgery. Salpakoski et al. (2011) conducted a study to examine physical activity and musculoskeletal pain in older adults ($n = 78$) with a history of hip fracture. Pain and physical inactivity were found to be associated with hip fracture in 33 (42%) community dwelling older adults three years after surgical repair of hip fracture (Salpakoski et al., 2011). Within the nursing home population, pain management in general is a particular problem and poses significant challenges to healthcare providers in terms of the ability to provide adequate treatment (Reisman, 2007). Many older adults who reside in the nursing home have cognitive or functional impairments that may impact the articulation of pain independently (Reisman, 2007). In addition, older adults do not want to be a bother and may be reluctant to express their level of pain to healthcare providers (Reisman, 2007). Pain in older adults after hip fracture who reside in a nursing home needs to be examined further.

Age

Age is defined as how long an individual has been alive in number of years. Hip fracture incidence rises exponentially with age, a key determinant in the seriousness of this problem in the future as the longevity of individuals continues to rise (Marks, 2010; Wilson & Wallace, 2007). Adults who reach the age of 85 years are 10 to 15 times more likely to fracture a hip than those adults younger than 85 years (Marks, 2010). In addition, function, muscle strength, endurance, and coordination are decreased to some extent by age-related changes (Miller, 2009). Joint function begins to decline during early adulthood and progresses to decreased range of motion, decreased hip and knee flexion, and decreased external rotation of the hip (Miller, 2009). These changes contribute to slowed performance of daily activities of older adults, which may include writing, eating, grooming, putting on shoes and socks, and difficulty climbing stairs and curbs

(Miller, 2009). The relationship of age and functional status after hip fracture in older adults is not apparent in the literature.

Social Support

Social support is defined as the amount of human contact and involvement of family as well as friends in an individual's life. Young and Resnick (2009) examined the perceptions of older adults regarding their functional recovery one year after hip fracture. The results indicated that social support was a factor that facilitated recovery, along with professional care, determination, spirituality, individualized care, lifestyle factors, goals, and the environment. Study participants reported that family and friend support was essential to recovery (Young & Resnick, 2009). In addition, participants indicated that the use of verbal encouragement from family and friends assisted in maintaining an optimistic attitude during rehabilitation (Young & Resnick, 2009). Despite the importance of adequate social support in the recovery of older adults after an illness, there is limited literature on the relationship of social support to functional status after hip fracture.

Conceptual Framework

The model of functional assessment (Katz & Stroud, 1989), social role theory (Leidy, 1994), and physiological model on functional capacity (Folta & Metzger, 1989) provided a basis to understand the impact of hip fracture in the older adult on functional status. Various factors from each model were combined to formulate the Functional Status Framework used for this study (Appendix A). The factors cognitive status, depressive symptoms, comorbidities, pain, age, and social support constitute the patient characteristics within the framework. These factors are proposed to impact the older adult by increasing or decreasing the ability to return to prefracture functional status. Prefracture functional status is defined as the ability to perform ADLs at the same level at which the older adult was capable of performing prior to hip fracture. If the older adult has a decrease in the ability to perform ADLS, the risk of a decline in prefracture functional status may be present.

Objectives/Research Questions

The purpose of this study was to examine the relationship and impact of cognitive status, depressive symptoms, comorbidities, pain, age, and social support on functional status on the annual Nursing Home MDS 3.0 (CMS, 2010b) assessment of adults aged 65 and older who reside in a nursing home for care following surgical repair of a hip fracture.

The research questions for this study are:

1. What is the relationship among and between cognitive status, depressive symptoms, comorbidities, pain, age, social support and functional status of adults aged 65 and older who reside in a nursing home for care following surgical repair of a hip fracture?
2. Which factors predict functional status of adults aged 65 and older who reside in a nursing home for care following surgical repair of a hip fracture?

Method

Design and Sample

A descriptive correlational design was used to conduct a secondary analysis of Nursing Home Minimum Data Set (MDS) 3.0 (CMS, 2010b) data from 777 nursing homes in Illinois collected between January 1, 2011, and December 31, 2011. The Centers for Medicare and Medicaid (CMS) provided assessment data for 97,943 residents who were admitted to the nursing home facility with the International Classification of Diseases book 9 (ICD-9) diagnosis code of aftercare for healing traumatic fracture of hip (V54.13).

The following criteria were used to determine inclusion in the study: (a) complete annual assessment data for functional status, cognitive status, depressive symptoms, comorbidities, pain, age, marital status, and family participation in assessment; (b) residents aged 65 years or older; and (c) the resident must have performed the 10 ADLs at various levels of assistance three times or more according to the MDS 3.0 (CMS, 2010b). Of the 97,943 resident assessments included in the sample, 98 resident assessments were used based on the inclusion criteria. Per post hoc power

analysis (G*power, 2009), a sample size of at least 98 yielded power of 75% to detect a medium effect size (0.15) when conducting multiple linear regression with eight predictor variables with an alpha of .05.

Measures

Nursing Home Minimum Data Set 3.0. The MDS 3.0 (CMS, 2010b) is a screening assessment tool used to evaluate the medical, mental, and social characteristics of nursing home residents and is mandated for all nursing homes who receive Medicare or Medicaid funding. When completed, the MDS 3.0 (CMS, 2010b) provides a foundation for the development of an individualized care plan for each resident within a nursing home (CMS, 2010a). The information in the MDS 3.0 (CMS, 2010b) is the primary component of the required State-Specified Resident Assessment Instrument (RAI) (CMS, 2010a). The MDS 3.0 (CMS, 2010b) assists in identifying actual or potential areas of concern in the nursing home population.

The revised MDS 3.0 (CMS, 2010b) was introduced in fall 2010 with the following goals: (a) advance assessment measures; (b) increase the clinical relevance of items; (c) improve accuracy and validity of the tool; (d) increase user satisfaction; and (e) increase the resident's voice by implementing more resident interview items (CMS, 2010a). MDS 3.0 (CMS, 2010b) assessments are completed by nurses in the nursing homes at admission and quarterly thereafter, as well as at the time of acute changes in clinical status and readmission from a hospital. The annual assessment is a comprehensive assessment for an existing resident that must be completed following the third quarterly assessment. The MDS 3.0 (CMS, 2010b) is divided into the following sections: (a) cognitive patterns; (b) communication and hearing patterns; (c) vision patterns; (d) physical functioning and structural problems; (e) continence; (f) psychosocial well-being; (g) mood and behavior patterns; (h) activity-pursuit patterns; (i) disease diagnoses; (j) health conditions; (k) nutritional status; (l) oral and dental status; (m) skin condition; (n) medication use; and (o) special treatments and procedures (CMS, 2010a).

A national study of the instrument, which included 71 community nursing homes (3,822 residents) and 19 Veterans Health Administration nursing homes (764 residents) regionally distributed throughout the United States, was conducted by CMS to create version 3.0 of the MDS (CMS, 2010b) (Saliba & Buchanan, 2008). The study directly examined agreement between assessors (reliability); validity of new cognitive, depression, and behavior items; response rates for interview items; user satisfaction and feedback on changes; and time to complete the assessment (Saliba & Buchanan, 2008). The results indicated excellent reliability of MDS 3.0 (CMS, 2010b) items when comparing research-nurse to facility-nurse assessments although no specific data are available. In addition, cognitive, depression, and behavior items were validated against criterion measures, the MDS 3.0 (CMS, 2010b) and performed better than the MDS 2.0 (Saliba & Buchanan, 2008). Currently, there have been no specific studies to determine the reliability and validity of the MDS 3.0 (CMS, 2010b) since implementation in October 2010. Specific subscales from the following sections of the MDS 3.0 (CMS, 2010b) were extracted by the CMS Chronic Condition Data Warehouse for use in this study: (a) Cognition; (b) Depression; (c) Comorbidities; (d) Pain; (e) Age; (f) Social Support – Sections A and Q; and (g) Functional Status.

Cognitive status. Cognitive status is operationally defined as the summary score of the Brief Interview for Mental Status (BIMS) within the MDS 3.0 (CMS, 2010b). The resident is asked to repeat the words *sock*, *blue*, and *bed*. The resident is assessed according to how many words he or she can repeat after the first attempt: (a) none; (b) one; (c) two; or (d) three. The BIMS (CMS, 2010b) also contains questions related to orientation to year, month, and day. The resident is asked to indicate what year it is, what month it is, and what day of the week it is. Finally, the resident is asked to repeat the three words that the interviewer asked in an earlier question. The scores from the items involving repetition, orientation, and recall are added together to comprise the summary score related to cognitive patterns of the resident. This

summary score can range from 0 to 15, with 15 indicating accuracy and no cues required for the questions (CMS, 2010b).

Depressive symptoms. The presence of depressive symptoms is operationally defined as the summary score of symptom frequency on the Patient Health Questionnaire (PHQ-9) within the MDS 3.0 (CMS, 2010b). The PHQ-9, which was developed by Pfizer Inc. is a nine-item instrument used to assess severity of depressive symptoms and functional impairment to assist primary care clinicians to make a depression diagnosis (Macarthur Initiative on Depression & Primary Care, 2009). The PHQ-9 assesses symptom frequency by having the resident state how often the particular symptom has occurred. The overall question is “Over the last 2 weeks, have you been bothered by any of the following problems?” (CMS, 2010b). The resident indicates the frequency of the following symptoms: (a) little interest or pleasure in doing things; (b) feeling down, depressed, or hopeless; (c) trouble falling or staying asleep, or sleeping too much; (d) feeling tired or having little energy; (e) poor appetite or overeating; (f) feeling bad about yourself, or feeling that you are a failure or have let yourself or your family down; (g) trouble concentrating on things, such as reading the newspaper or watching television; (h) moving or speaking so slowly that other people could have noticed, being fidgety or restless causing you to move around a lot more than usual; and (i) thoughts of hurting yourself or feeling that you would be better off dead (Macarthur Initiative on Depression & Primary Care, 2009). The possible answer selection and scores for each item included: (a) never or 1 day = 0; (b) 2 to 6 days = 1; (c) 7 to 11 days = 2; and (d) 12 to 14 days = 3. In order to use the summary score for analysis, each item was recoded (for example, never or 1 day was scored as 3 instead of 0; 2 to 6 days was scored as 2 instead of 1; 7 to 11 days was scored as 1 instead of 2; and 12 to 14 days was scored as 0 instead of 3) to ensure that high scores reflect relatively high levels of the attribute being measured. The summary score can range from 0 to 27, with 0 indicating that symptoms occur nearly every day. A lower summary score then indicated greater frequency of depressive symptoms, and a higher summary score indicated a lower frequency of symptoms.

Comorbidities. Comorbidities are operationally defined as the number of active diagnoses the residents have at the time of the annual assessment. The nurse completing the MDS 3.0 (CMS, 2010b) identified the most current and active diagnoses in the previous seven days by reviewing the medical record of each resident. The nurse then marked the corresponding box next to each active diagnosis, indicating the presence of this diagnosis in the resident who is being assessed. It was not possible to identify how many comorbidities each individual had at the time of the assessment. Therefore, a summary score of the number of comorbidities present for each individual was formulated to use as a predictor in the analysis. The summary score could range between 0 and 57. The data set was separated into two groups. One group included those residents who had an active diagnosis of dementia and/or Alzheimer's disease, and the other group included those residents who did not have dementia and/or Alzheimer's disease. This was done to determine if the presence of one or both of these cognitive impairment diagnoses had an impact on the other factors in the study.

Pain. Pain is operationally defined as asking the resident, "Have you had pain or hurting at any time in the last 5 days?" (CMS, 2010b). The possible answers included "no" or "yes". The measurement of pain within the MDS 3.0 (CMS, 2010b) is a general assessment of pain at the time of the annual assessment.

Age. Age is operationally defined as the length of time an individual has existed and is expressed in years. Age was reported by date of birth in the MDS 3.0 (CMS, 2010b) and converted into years for this study. Age was used in the analysis as a continuous variable.

Social support. Social support is operationally defined as the presence of family or significant other during the resident assessment. The MDS 3.0 (CMS, 2010b) does not include a specific section on social support. The participation of the family or significant other in the assessment was measured as "yes" or "no family or significant other."

Functional status. Functional status is operationally defined as the ability to perform 10 ADLs (bed mobility, transferring from a chair to a standing position, walking in the room,

walking in the corridor, locomotion on the unit, locomotion off the unit, dressing, eating, toileting, and personal hygiene) source?. These 10 ADLs are included in the functional status assessment section of the MDS 3.0 (CMS, 2010b). Each ADL was rated from 0, indicating independence, to 4, indicating dependence, when the activity occurred 3 or more times. In order to use the score for each ADL in the analysis, each item was recoded (for example, independent was scored as 4 instead of 0; supervision was scored as 3 instead of 1; limited assistance maintained a score of 2; extensive assistance was scored a 1 instead of 3; and total dependence was scored 0 instead of 4) to ensure that high scores reflect relatively high levels of the attribute being measured. Responses were not used in the analysis if the activity occurred 2 or fewer times since the focus of this study was on the performance of ADLs.

Statistical Analysis

All data were analyzed using the Statistical Package for the Social Sciences (SPSS) Version 20.0. Data were reviewed to address missing, duplicate, or incomplete data, identify outliers, and determine the normality of the data distribution. Descriptive statistics were also used to characterize the data distribution with means, median, frequencies, proportions, and graphs (histograms, box plots, and scatterplots) for all variables. Prior to addressing the proposed research questions, a principal component analysis (PCA) with oblique (promax) rotation was conducted on the 10 ADLs that constitute functional status in the MDS 3.0 (CMS, 2010b) to understand if shared variance between the ADL items was present. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, $KMO = .898$, and all individual item KMOs were $> .855$. Bartlett's test of sphericity, $\chi^2(80) = 6659.29$; $p < .000$, indicated correlations among items were sufficient for PCA. All of the ADLs loaded onto one factor with factor loading ranges of .400 to .903. The reliability coefficient using Cronbach's alpha of the scale was .95.

To answer research question 1, Pearson correlation coefficients were computed for cognitive status, depressive symptoms, comorbidities, and age, and point-biserial correlations

were computed for pain, and social support to describe the relationship between these variables and functional status of adults aged 65 and older who reside in a nursing home for care following surgical repair of a hip fracture. To answer research question 2, stepwise multiple linear regression was used to determine which variables predicted functional status of adults aged 65 and older who reside in a nursing home for care following surgical repair of a hip fracture. A level of significance of 0.05 was used for all analyses.

Results

Sample Description

The sample consisted of 98 residents who met the inclusion criteria. The mean age of the sample was 86 years ($SD = 8.0$). Twelve (12%) residents were between the ages of 65 and 75; 29 (30%) residents were between the ages of 76 and 85; 47 (48%) residents were between the ages of 86 and 95; and 10 (10%) residents were between the ages of 96 and 104 (Table 1). The majority of residents (62.9%) were widowed (Table 1).

Table 1

Characteristics of Sample

Characteristic	Cohort (n = 98)
Age, mean \pm SD	86 \pm 8.0
Age, %	
65–75	12 (12.2%)
76–85	29 (29.6%)
86–95	47 (48%)
96–104	10 (10.1%)
Marital Status	
Never Married	10 (10.3%)
Married	18 (18.6%)
Widowed	61 (62.9%)
Divorced	8 (8.2%)

Examining functional status of the sample studied shows that 33% of the residents needed extensive assistance with bed mobility and transferring, limited assistance with walking in the corridor, and were independent with locomotion on the unit. Thirty percent of residents needed limited assistance with walking in the room, and were independent with locomotion off the unit. More residents needed extensive assistance with dressing (46%), toileting (41%), personal hygiene (48%) and supervision with eating (45%) (Table 2).

Table 2

Frequencies and Percentages of Functional Status Levels

ADL	Total Dependence	Extensive Assistance	Limited Assistance	Supervision	Independent
Bed Mobility	0%	32 (32.7%)	22 (22.4%)	15 (15.3%)	29 (29.6%)
Transfer	1 (1.0%)	32 (32.7%)	26 (26.5%)	16 (16.3%)	23 (23.5%)
Walk in room	0%	22 (22.4%)	29 (29.6%)	20 (20.4%)	27 (27.6%)
Walk in corridor	0%	22 (22.4%)	32 (32.7%)	23 (23.5%)	21 (21.4%)
Locomotion on unit	4 (4.1%)	22 (22.4%)	17 (17.3%)	23 (23.5%)	32 (32.7%)
Locomotion off unit	11 (11.2%)	21 (21.4%)	14 (14.3%)	23 (23.5%)	29 (29.6%)
Dressing	1 (1.0%)	45 (45.9%)	27 (27.6%)	9 (9.2%)	16 (16.3%)
Eating	0%	2 (2.0%)	9 (9.2%)	44 (44.9%)	43 (43.9%)
Toilet use	1 (1.0%)	40 (40.8%)	22 (22.4%)	17 (17.3%)	18 (18.4%)
Personal hygiene	1 (1.0%)	47 (48.0%)	23 (23.5%)	10 (10.2%)	17 (17.3%)

There were 57 different comorbidities identified. Table 3 depicts the frequency of these comorbidities in the sample. The three most common comorbidities included hypertension (76.5%), depression (55.1%), and dementia (48.0%). The comorbidities that did not have any responses were not included.

Table 3

Frequencies and Percentages of Comorbidities

Type	N (%)	Type	N (%)
Hypertension	75 (76.5)	Peripheral Vascular Disease	8 (8.2)
Depression	54 (55.1)	Hip Fracture	8 (8.2)
Dementia	47 (48.0)	Alzheimer's Disease	8 (8.2)
Anemia	39 (39.8)	Parkinson's Disease	8 (8.2)
Hyperlipidemia	32 (32.7)	Manic Depression	6 (6.1)
Gastroesophageal Reflux Disease	32 (32.7)	Seizure	5 (5.1)
Congestive Heart Failure	30 (30.6)	Hemiplegia	4 (4.1)
Coronary Artery Disease	27 (27.6)	Deep Vein Thrombosis	4 (4.1)
Anxiety Disorder	26 (26.5)	Benign Prostatic Hyperplasia	4 (4.1)
Arthritis	26 (26.5)	Cancer	3 (3.1)
Dysrhythmia	23 (23.5)	Other Fracture	3 (3.1)
Diabetes Mellitus	22 (22.4)	Pneumonia	3 (3.1)
Osteoporosis	22 (22.4)	Schizophrenia	3 (3.1)
Asthma, COPD, Chronic Lung Disease	22 (22.4)	Hypotension	2 (2.0)
Cataracts, Glaucoma, or Macular Degeneration	18 (18.4)	Aphasia	1 (1.0)
Thyroid	18 (18.4)	Multi-drug Resistant Drug Organism	1 (1.0)
Urinary Tract Infection	12 (12.2)	Obstructive Uropathy	1 (1.0)
End Stage Renal Disease	10 (10.2)	Neurogenic Bladder	1 (1.0)
CVA or TIA or Stroke	10 (10.2)	Cirrhosis	1 (1.0)
Psychotic	10 (10.2)		

Note. The comorbidities that did not have any responses were not included.

Research Question 1

Pearson product moment correlation coefficients and point-biserial correlation coefficients were computed to determine the relationship among and between independent variables and the dependent variable of functional status. Cognitive status and functional status were significantly correlated ($r = .34, p = .001$), indicating that as cognitive status increases or improves, functional status also improves. Cognitive status and age were significantly and negatively correlated ($r = -.30, p = .003$), describing the decline in cognitive status as one ages. Cognitive status was significantly and negatively correlated to the diagnosis of Alzheimer's

and/or dementia ($r = -.56, p = .003$) indicating an individual has a greater likelihood of having the diagnosis of Alzheimer's or dementia if cognitively impaired. Cognitive status was significantly related to pain ($r = .24, p = .016$) indicating the presence of pain increases as cognitive status levels increase. The presence of depressive symptoms was significantly correlated to having a diagnosis of Alzheimer's and/or dementia ($r = .23, p = .021$). The presence of depressive symptoms was marginally significant and negatively correlated to pain ($r = -.18, p = .052$), indicating the presence of pain increases as the presence of depressive symptoms decreases. Age and functional status were significantly and negatively correlated ($r = -.28, p = .005$), indicating functional status declines as an individual ages. Family participation and age were significantly and negatively correlated ($r = -.19, p = .041$) indicating that as adults age, less participation from the family occurs. The presence of comorbidities was not related to any of the variables.

Table 4

Correlations Among Predictor Variables and Between Predictor Variables With Functional Status

Var	CS	FS	Age	AlzDe	Pain	Dep	Fam Part	Com
CS		.337**	-.303**	-.561***	.238*	-.163	.002	.090
FS			-.280**	-.073	.151	.033	-.063	-.039
Age				.156	-.015	.106	-.194*	-.103
AlzDe					.051	.226*	.029	.043
Pain						-.181*	-.177	-.001
Dep							-.007	-.090
Fam Part								.076
Com								

Note. FS = Functional Status;; CS = Cognitive Status; Dep = Depressive Symptoms; FamPart = Participation of family or significant other in assessment; AlzDe = Alzheimer's and Dementia; Com = Number of comorbidities

* $p \leq .05$. ** $p < .01$. *** $p < .001$.

Research Question 2

Stepwise multiple linear regression was used to test if cognitive status, depressive symptoms, comorbidities, pain, age, and social support predicted functional status of adults aged 65 and older who reside in a nursing home for care following surgical repair of hip fracture. The

results of the regression indicated that cognitive status was a predictor, $\beta = .34$, $t(3.205)$, $p < .01$ with significant proportion of variation in functional status, $R^2 = .11$, $F(1, 80) = 10.3$, $p < .01$. The less severe the cognitive impairment of the older adult, the less functional decline will be apparent. The presence of depressive symptoms, comorbidities, pain, age, and social support did not predict changes in functional status of older adults after hip fracture. In addition, the diagnoses of Alzheimer's and/or dementia were not identified as predictors of changes in functional status.

Discussion

This study is one of the first to use the MDS 3.0 (CMS, 2010b) data set in a secondary analysis. The use of this instrument in examining factors that impact functional status of older adults residing in a nursing home also has not been done before. The results tie in with the Functional Status Model used for this study. There were relationships between various factors that impact the older adult after hip fracture. Yet, the model proposed that each factor would be a predictor of functional status in the older adult after hip fracture. In the end, the only significant predictor of functional status was found to be cognitive status. A longitudinal study may be more useful in predicting changes in functional status related to the factors in the model.

Research Question 1

Age was significantly related to functional status in this study. Many age-related factors occur in individuals that increase the risk of fractures and may impact the return to prefracture functional status. Similarly, Young, Fried, and Kuo (2010) found a decrease in performance of ADLs in older women with hip fractures. In addition, the level of vitamin D continues to fall as adults age (Morley, 2008), predisposing to osteoporosis (Institute of Medicine, Food and Nutrition Board, 2010).

Age was significantly and negatively correlated to the participation of the family or significant other during the annual MDS 3.0 (CMS, 2010b) assessment suggesting that family members or friends are less involved in care as an older adult increases in age. The literature is

limited related to the impact of age of the individual and the participation of family. The participation of family or friends in the care of older adults is important and may lead to decreased depression, improved quality of life, and the enhancement of cognitive functioning (Winningham & Pike, 2007). Improved cognitive functioning may impact functional status positively which may produce better outcomes in older adults after surgical repair of a hip fracture.

Cognitive status and functional status were significantly correlated indicating as the level of cognitive status increases, the level of functional status increases as well. Soderqvist, Miedel, Ponzer, and Tidermark (2006) examined the use of the Short Portable Mental Status Questionnaire was useful to identify patients with a hip fracture who have severe cognitive dysfunction upon admission. According to Soderqvist et al. (2006), “a thorough understanding of the ability of a patient with a hip fracture to cooperate and follow postoperative regimens is crucial in the planning of the surgical treatment and the postoperative rehabilitation.” There are many adults that exercise regularly in their 70s, 80s, and 90s. The assumption can be made then that those individuals have a high level of cognitive status.

Cognitive status was also found to be significantly related to age. The results are similar to findings by Mitnitski, Fallah, Rockwood, and Rockwood (2011) who found that older adults have an increased risk of cognitive decline. Aging is commonly associated with a decline of cognitive abilities (O’Sullivan et al., 2001). There is evidence that white matter tract disruption occurs in normal aging in addition to maximal changes in anterior white matter (O’Sullivan et al., 2001). These changes constitute the loss of executive functions in cognition of older adults.

The presence of pain at the time of the assessment was also significantly related to cognitive status. Cognitive impairment of the older adult may interfere with adequate pain assessment by healthcare providers (Marino et al., 2009). Cognitively impaired older adults may not be able to anticipate the need for pain medication before engaging in ADLs (Feldt & Oh, 2000). In addition, the amount of pain medication ordered by healthcare providers may be

impacted by the concern of opioid administration precipitating cognitive status changes in the older adult (Marino et al., 2009). Effective pain management is important to investigate further in older adults after hip fracture.

The presence of pain and depressive symptoms were marginally significant and correlated in this study. Abou-Setta et al. (2011) found that undertreated pain increased the risk for delirium and depression in older adults. In the older adult who has suffered a hip fracture, this traumatic event may influence the ability to perform ADLs at a level similar to population studied? (Mavandadi et al., 2007). Chronic pain and the presence of depressive prefracture due to the increase in pain postoperatively, which may precipitate depressive symptoms indirectly. The presence of depressive symptoms may increase perceptions of pain symptoms have been found to predict each other (Chou, 2007). It is possible that pain would have demonstrated a more significant correlation with functional status if the sample had been larger.

Alzheimer's disease and/or dementia were found to have a significant relationship with cognitive status and depressive symptoms in this study. Givens, Sanft, and Marcantonio (2008) also found an association between cognitive impairment and depressive symptoms in older adults who had a hip fracture. According to Mossey, Knott, and Craik (1990), older adults that present with few depressive symptoms are three times as likely to walk independently. When depression is associated with a hip fracture in older adults, the level of functional outcome significantly decreases (Givens et al., 2008).

Research Question 2

The findings of this study indicate cognitive status is a significant predictor of functional status of the older adult one year after undergoing surgery for a hip fracture. This finding is supported by Sieber, Mears, Lee and Gottschalk (2011) who found that individuals are more likely to have cognitive impairment following a hip fracture. Changes in cognitive status have been found to impact long-term care of older adults after hip fracture. Specifically, Young et al. (2010) examined the recovery patterns of hip fracture patients who were cognitively impaired as

well as cognitively non-impaired. The results indicated that older adults with cognitive impairment had poorer rehabilitation outcomes one year following hip fracture (Young et al., 2010). These individuals had more difficulty with locomotion, transfers, self-care, and sphincter control.

When examining the annual assessment of the MDS 3.0 (CMS, 2010b), it was difficult to determine if the impaired cognitive status was related to delirium or dementia. Since delirium is characterized by acute onset and a fluctuating course of inattention (Bisschop, de Rooij, Zwinderman, van Oosten, & van Munster, 2011), the annual assessment may capture only changes in cognitive status that occur shortly before the assessment. In addition, with the older adult who resides in a nursing home, the impact of the environmental characteristics of long-term care as well as the use of medications may influence the onset of delirium. It may be difficult to delineate delirium based on the symptoms presented by the older adult.

Limitations

When using large data sets for research, limitations that must be considered include data preparation, management, and analysis. In this particular study, a small sample was extracted from the large data set to specifically address the research questions. A study using a small sample size may produce inconclusive results and lack generalizability. The lack of involvement of the researcher in data collection may decrease insight on the limitations of the measures or instruments used.

An additional limitation to this study would include any inconsistencies in the way registered nurses completed the MDS 3.0 (CMS, 2010b). Concerns related to varying resources and education available to nurses completing the MDS 3.0 (CMS, 2010b) may introduce random errors and bias (Lum, Lin, & Kane, 2005). Another limitation is the lack of specificity of the pain assessment in the MDS 3.0 (CMS, 2010b) made it difficult to interpret the results of the study. The assessment of pain did not delineate what type of pain the resident was experiencing. It was not possible to determine if the pain was acute or chronic in nature. In addition, variables such as

gender and delirium, which were not included in the data set that was requested, may have been useful in analysis.

Even though cognitive status was found to be significantly related to functional status of older adults after hip fracture, instruments used to assess cognitive status in institutions other than the nursing home may vary. The measurement tool within the MDS 3.0 (CMS, 2010b) may not adequately capture the actual cognitive status of the resident. The three areas that are assessed by the Brief Interview for Mental Status (BIMS)(CMS, 2010b) include repetition of three words, temporal orientation, and recall. Data were not requested on delirium due to the focus of the study on cognitive status changes.

It is important for the researcher to understand the MDS 3.0 (CMS, 2010b) and specific information that is assessed using this instrument. The researcher needs to become familiar with the MDS 3.0 (CMS, 2010b) since there are other assessment tools embedded within the instrument. It may be useful for the researcher to attend MDS 3.0 (CMS, 2010b) workshops to learn more about the instrument and the scoring of the instrument.

In addition, the process of acquiring data from CMS was more challenging than anticipated. The process is very lengthy and involves the formulation of a very detailed data management plan. There is information in the literature related to the use of large data sets. Yet, information on the process of obtaining data from CMS is very limited. Large data sets may also be very costly for the researcher. Securing funding would be advisable to prepare for the expense of purchasing data needed to conduct a secondary analysis.

Finally, the inability to extract specific timeframes from the data was a limitation of this study. The quarterly assessment included in the MDS 3.0 (CMS, 2010b) data did not delineate between three-month, six-month, and nine-month assessments. It may have been useful to compare the functional status at those time periods to the annual assessment. The quarterly assessments of residents may have differed compared to the annual assessments of residents in terms of functional status.

Conclusions

Recommendations

The relationship between cognitive status and functional status needs to be further examined in older adults after hip fracture. Since this was not an intervention study, more research is needed to examine innovative models of care for older adults who are cognitively impaired to assist in improving functional status. Specifically, the rehabilitation regimens of nursing home residents must be examined further to determine if there is a lack of identification, prevention, and treatment of specific individuals at risk for cognitive impairment.

The examination of multiple factors that impact functional status of older adults after hip fracture also needs further examination. The use of the MDS 3.0 (CMS, 2010b) may not be sufficient to determine the predictors of changes in functional status after hip fracture in the older adult population and lacks the ability to capture the constructs very well. Finally, a study that includes data from one month after hip fracture as well as six months after hip fracture may be beneficial to identify trends of changes between the factors identified that may impact functional status after hip fracture in older adults.

Nursing Implications

As identified previously, the need for earlier detection, prevention, and treatment of cognitive status impairments is necessary to assist older adults after hip fracture in attaining prefracture functional status. More attention to rehabilitation needs of those with cognitive impairments is needed. Activities that promote brain health need to be encouraged in the older adult population. Staying physically active, adopting a brain-healthy diet, and remaining socially active are all important aspects of maintaining a healthy brain (Alzheimer's Association, 2013). Healthcare providers need to be aware of resources available to older adults that promote healthy brain activities.

References

- Abou-Setta, A., Beaupre, L., Rashid, S., Dryden, D., Hamm, M., Sadowski, C., . . . Jones, C. (2011). Comparative effectiveness of pain management interventions for hip fracture: A systematic review. *Annals of Internal Medicine*, 155, 234–245.
- Alzheimer's Association. (2013). Brain health. Retrieved from http://www.alz.org/we_can_help_brain_health_maintain_your_brain.asp
- Amieva, H., Le Goff, M., Millet, X., Orgogozo, J., Peres, K., Barberger-Gateau, P., . . . Dartiques, J. (2008). Prodromal Alzheimer's disease: Successive emergence of the clinical symptoms. *Annals of Neurology*, 64, 492–498.
- Arinzon, Z., Gepstein, R., Shabat, S., & Berner, Y. (2007). Pain perception during the rehabilitation phase following traumatic hip fracture in the elderly is an important prognostic factor and treatment tool. *Disability and Rehabilitation*, 29, 651–658.
- Beaupre, L., Cinats, J., Jones, C., Scharfenberger, A., Johnston, W., Senthilselvan, A., & Saunders, L. (2007). Does functional recovery in elderly hip fracture patients differ between patients admitted from long-term care and the community? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 62(10), 1127–1133.
- Beaupre, L., Jones, A., Johnston, W., Wilson, D., & Majumdar, S. (2012). Recovery of function following a hip fracture in geriatric ambulatory persons living in nursing homes: Prospective cohort study. *Journal of the American Geriatrics Society*, 60, 1268–1273.
- Bellelli, G., Frisoni, G., Turco, R., & Trabucchi, M. (2008). Depressive symptoms combined with dementia affect 12-months survival in elderly patients after rehabilitation post-hip fracture surgery. *International Journal of Geriatric Psychiatry*, 23, 1073–1077.
- Bisschop, P., de Rooij, S., Zwinderman, A., van Oosten, H., & van Munster, B. (2011). Cortisol, insulin, and glucose and the risk of delirium in older adults with hip fracture. *Journal of the American Geriatrics Society*, 59, 1692–1696.

- Braes, T., Milisen, K., & Foreman, M. (2012). Assessing cognitive function. Retrieved on March 18, 2013, from http://consultgerirn.org/topics/assessing_cognitive_function/want_to_know_more
- Braithwaite, R., Col, N., & Wong, J. (2003). Estimating hip fracture morbidity, mortality, and costs. *Journal of the American Geriatrics Society*, 51, 364–370.
- Brauer, C., Coca-Perrillon, M., Cutler, D., & Rosen, A. (2009). Incidence and mortality of hip fractures in the United States. *Journal of the American Medical Association*, 302, 1573–1579.
- Bruce, A., Ritchie, C., Blizard, R., Lai, R., & Raven, P. (2007). The incidence of delirium associated with orthopedic surgery: A meta-analytic review. *International Psychogeriatric*, 19, 197–214.
- Centers for Medicare & Medicaid Services [CMS]. (2010a). CMS's RAI version 3.0 manual. Retrieved from <http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/NHQIMDS30-ArchivedRAIManuals.html>
- Centers for Medicare & Medicaid Services [CMS]. (2010b). Minimum Data Set (MDS) – Version 3.0. Retrieved from http://www2.illinois.gov/nursinghomesafety/documents/mds3.0_all_item%20listing_v1.00.2.pdf
- Chou, K. (2007). Reciprocal relationship between pain and depression in older adults: Evidence from the English Longitudinal Study of Ageing. *Journal of Affective Disorders*, 102, 115–123.
- Covinsky, K., Lindquist, K., Dunlop, D., & Yelin, E. (2009). Pain, functional limitations, and aging. *Journal of the American Geriatrics Society*, 57, 1556–1561.
- Feldt, K. & Oh, H. (2000). Pain and hip fracture outcomes for older adults. *Orthopaedic Nursing*, 19(6), 35 – 44.

- Folden, S., & Tappen, R. (2007). Factors influencing function and recovery following hip repair surgery. *Orthopaedic Nursing*, 26, 234–241.
- Folta, A., & Metzger, B. (1989). Exercise and functional capacity after myocardial infarction. *Image Journal of Nursing Scholarship*, 21, 215–219.
- Francisco, J., Cuenca, F., Azana, S., Torres, J., Lopez, J., Castillo, J., & Duarte, L. (2012). Impact of incident comorbidity on functional loss in elderly chronic kidney disease patients undergoing hemodialysis. *Canadian Association of Nephrology Nurses and Technologists Journal*, 22, 25–29.
- Fredman, L., Hawkes, W., Black, S., Bertrand, R., & Magaziner, J. (2006). Elderly patients with hip fracture with positive affect have better functional recovery over 2 years. *Journal of the American Geriatrics Society*, 54, 1074 – 1081.
- Givens, J., Sanft, J. & Marcantonio, E. (2007). Functional recovery after hip fracture: The combined effects of depressive symptoms, cognitive impairment, and delirium. *Journal of the American Geriatrics Society*, 56, 1075 – 1079.
- Gruber-Baldini, A., Zimmerman, S., Morrison, S., Grattan, L., Hebel, J., Dolan, M., . . . Magaziner, J. (2003). Cognitive impairment in hip fracture patients: Timing of detection and longitudinal follow-up. *Journal of the American Geriatrics Society*, 51, 1227–1236.
- Haentjens, P., Magaziner, J., Colon-Emeric, C., Vanderschueren, D., Milisen, K., Velkeniers, B., & Boonen, S. (2010). Meta-analysis: Excess mortality after hip fracture among older women and men. *Annals of Internal Medicine*, 152, 380–390.
- Haleem, S., Lutchman, L., Mayahi, R., Grice, J., & Parker, M. (2008). Mortality following hip fracture: Trends and geographical variations over the last 40 years. *International Journal of the Care of the Injured*, 39, 1157–1163.
- Herrick, C., Steger-May, K., Sinacore, D., Brown, M., Schechtman, K., & Binder, E. (2004). Persistent pain in frail older adults after hip fracture repair. *Journal of the American Geriatrics Society*, 52, 2062–2068.

- Huang, T., & Acton, G. (2009). Ways to maintain independence among Taiwanese elderly adults with hip fractures: A qualitative study. *Geriatric Nursing, 30*, 28–35.
- Institute of Medicine, Food and Nutrition Board. (2010). *Dietary reference intakes for calcium and vitamin D*. Washington, DC: National Academy Press.
- Karantana, A., Boulton, C., Bouliotis, G., Shu, K., Scammell, B., & Moran, C. (2011). Epidemiology and outcome of fracture of the hip in women aged 65 years and under: A cohort study. *Journal of Bone & Joint Surgery, 93*, 658–664.
- Karlamangla, A., Tinetti, M., Guralnik, J., Studenski, S., Wetle, T., & Reuben, D. (2007). Comorbidity in older adults: Nosology of impairment, diseases, and conditions. *Journal of Gerontology Series A: Biological Sciences and Medical Sciences, 62*, 296–300.
- Katz, S., & Stroud, M. (1989). Functional assessment in geriatrics: A review of progress and directions. *Journal of the American Geriatrics Society, 37*, 267–271.
- Kiatlaekakul, S. (2005). Factors related to cognitive status among the elderly in Natawee District, Songkhla Province (Master's thesis). Retrieved from <http://kb.psu.ac.th/psukb/handle/2553/1430>. (64008).
- Kong, K., Lee, F., Mackenzie, A., & Lee, D. (2002). Psychosocial consequences of falling: The perspective of older Hong Kong Chinese who had experienced recent falls. *Journal of Advanced Nursing, 37*, 234 – 242.
- Konnopka, A., Jerusel, N., & Konig, H. (2009). The health and economic consequences of osteopenia- and osteoporosis-attributable hip fractures in Germany: Estimation for 2002 and projection until 2050. *Osteoporosis International, 20*, 1117–1129.
- Koval, K., Skovron, M., Aharonoff, G., Meadows, S., & Zuckerman, J. (1995). Ambulatory ability after hip fracture. A prospective study in geriatric patients. *Clinical Orthopaedics and Related Research, Jan(310)*, 150 – 159.

- Lapcevic, W., French, D., & Campbell, R. (2010). All-cause mortality rates of hip fractures treated in the VHA: Do they differ from Medicare facilities? *Journal of the American Medical Directors Association, 11*, 116–119.
- Larson, E., Wang, L., Bowen, J., McCormick, W., Teri, L., Crane, P., & Kukull, W. (2006). Exercise is associated with reduced risk for incident dementia among persons 65 years of age and older. *Annals of Internal Medicine, 144*(2), 73–81.
- Lee, H., Mears, S., Roseberg, P., Leoutsakos, S., Gottschalk, A., & Sieber, F. (2011). Predisposing factors for postoperative delirium after hip fracture repair in individuals with and without dementia. *Journal of American Geriatrics Society, 59*, 2306–2313.
- Leidy, N. (1994). Functional status and the forward progress of merry-go-rounds: Toward a coherent analytical framework. *Nursing Research, 43*, 196–202.
- Lenze, E., Munin, M., Dew, M., Rogers, J., Seligman, K., Mulsant, B., & Reynolds, C. (2004). Adverse effects of depression and cognitive impairment on rehabilitation participation and recovery from hip fracture. *International Journal of Geriatric Psychiatry, 19*, 472–478.
- Lenze, E., Munin, M., Skidmore, E., Dew, M., Rogers, J., Whyte, E., . . . Reynolds, C. (2007). Onset of depression in elderly persons after hip fracture: Implications for prevention and early intervention of late-life depression. *Journal of American Geriatrics Society, 55*, 81–86.
- Lucchi, E., Magnifico, F., Bellelli, G., & Trabucchi, M. (2004). Mood, behavior, and memory. *Archives of Gerontology and Geriatrics Supplement, 9*, 265–270.
- Lum, T., Lin, W., & Kane, R. (2005). Use of proxy respondents and accuracy of minimum dataset assessments of activities of daily living. *Journals of Gerontology Series A, Biological Sciences and Medical Sciences, 60*, 654–659.

Macarthur Initiative on Depression & Primary Care. (2009). Patient Health Questionnaire.

Retrieved from <http://www.depression-primarycare.org/clinicians/toolkits/materials/forms/phq9/>

Marino, J., Russo, J., Kenny, M., Herenstein, R., Livote, E., & Chelly, J. (2009). Continuous lumbar plexus block for postoperative pain control after total hip arthroplasty: A randomized controlled trial. *Journal of Bone and Joint Surgery American Edition*, 91, 29–37.

Marks, R. (2010). Hip fracture epidemiological trends, outcomes, and risk factors, 1970–2009. *International Journal of General Medicine*, 3, 1–17.

Martinez-Reig, M., Ahmad, L., & Duque, G. (2012). The orthogeriatrics model of care: Systematic review of predictors of institutionalization and mortality in post-hip fracture patients and evidence for interventions. *Journal of the American Medical Directors Association*, 13, 770–777.

Mavandadi, S., Have, T., Katz, I., Durai, U., Krahn, D., Llorente, M., . . . Oslin, D. (2007). Effect of depression treatment on depressive symptoms in older adulthood: The moderating role of pain. *Journal of the American Geriatrics Society*, 55, 202–211.

Miller, C. (2009). *Nursing for wellness in older adults*. Philadelphia, PA: Lippincott Williams & Wilkins.

Miller, R., Zhang, Y., Silliman, R., Hayes, M., Leveille, S., Murabito, J., . . . Felson, D. (2004). Effect of medical conditions on improvement in self-reported and observed functional performance of elders. *Journal of the American Geriatrics Society*, 52, 217–223.

Mitnitski, A., Fallah, N., Rockwood, M., & Rockwood, K. (2011). Transitions in cognitive status in relation to frailty in older adults: A comparison of three frailty measures. *Journal of Nutrition Health and Aging*, 15, 863–867.

Morley, J. (2008). The magic of exercise. *Journal of the American Medical Directors Association*, 9, 375–377.

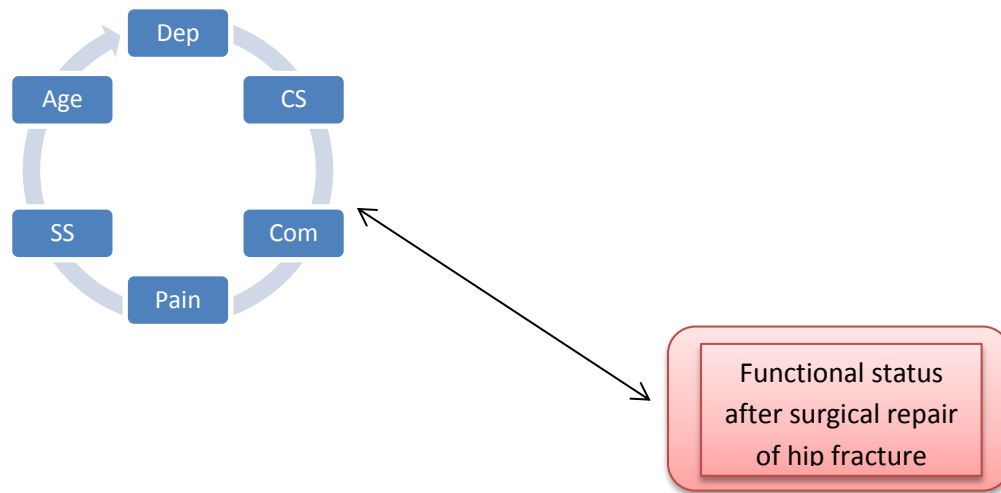
- Morrison, R., Magaziner, J., McLaughlin, M., Orosz, G., Silberzweig, S., Koval, K., & Siu, A. (2003). The impact of postoperative pain on outcomes following hip fracture. *Pain, 103*, 303–311.
- Mossey, J., Knott, K., & Craik, R. (1990). The effects of persistent depressive symptoms on hip fracture recovery. *Journal of Gerontology, 45*(5), 163 – 168.
- O’Sullivan, M., Jones, D., Summers, P., Morris, R., Williams, S., & Markus, H. (2001). Evidence for cortical “disconnection” as a mechanism of age-related cognitive decline. *Neurology, 57*, 632–638.
- Parker, M., & Johansen, A. (2006). Hip fracture. *British Medical Journal, 333*, 27–30.
- Reisman, M. (2007). The problem of pain management in nursing homes. *Pharmacy & Therapeutics, 32*, 494–495.
- Saliba, D., & Buchanan, J. (2008). *Development & validation of a revised nursing home assessment tool: MDS 3.0*. Santa Monica, CA: Rand Health Corporation.
- Salpakoski, A., Portegijs, E., Kallinen, M., Sihvonen, S., Kiviranta, I., Alen, M., . . . Sipila, S. (2011). Physical inactivity and pain in older men and women with hip fracture history. *Gerontology, 57*, 19–27.
- Shyu, Y., Cheng, H., Teng, H., Chen, M., Wu, C., & Tsai, W. (2009). Older people with hip fracture: Depression in the postoperative first year. *Journal of Advanced Nursing, 65*, 2514–2522.
- Sieber, F., Mears, S., Lee, H., & Gottschalk, A. (2011). Postoperative opioid consumption and its relationship to cognitive function in older adults with hip fracture. *Journal of the American Geriatrics Society, 59*, 2256–2262.
- Soderqvist, A., Miedel, R., Ponzer, S., & Tidermark, J. (2006). The influence of cognitive function on outcome after a hip fracture. *Journal of Bone & Joint Surgery, 88*, 2115–2123.

- Valderas, J., & Alonso, J. (2008). Patient reported outcome measures: A model-based classification system for research and clinical practice. *Quality of Life Research*, 17, 1125–1135.
- Valderas, J., Starfield, M., Sibbald, B., Salisbury, C., & Roland, M. (2009). Defining comorbidity: Implications for understanding health and health services. *Annals of Family Medicine*, 7(4), 357 – 363.
- Vestergaard, P., Rejnmark, L., & Mosekilde, L. (2007). Increased mortality in patients with a hip fracture-effect of pre-morbid conditions and post-fracture complications. *Osteoporosis International*, 18, 1583–1593.
- Wilson, R., Chase, G., Chrischilles, E., & Wallace, R. (2006). Hip fracture risk among community-dwelling elderly people in the United States: A prospective study of physical, cognitive, and socioeconomic indicators. *American Journal of Public Health*, 96, 1210–1218.
- Wilson, R., & Wallace, R. (2007). Trends in hip fracture incidence in young and older adults. *American Journal of Public Health*, 97, 1734–1735.
- Winningham, R. & Pike, N. (2007). A cognitive intervention to enhance institutionalized older adults ‘social support networks and decrease loneliness. *Aging & Mental Health*, 11(6), 716 – 721.
- Young, Y., Fried, L. P., & Kuo, Y-H. (2010). Hip fractures among elderly women: Longitudinal comparison of physiological function changes and health care utilization. *Journal of the American Medical Directors Association*, 11, 100–105.
- Young, Y., German, P., Brant, L., Kenzora, J., & Magaziner, J. (1996). The predictors of surgical procedure and the effects on functional recovery in elderly with subcapital fractures. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 51(4), M158 – M164.

- Young, Y., & Resnick, B. (2009). Don't worry and be positive: What helps the most in functional recovery one year after hip fracture? An exit interview. *Rehabilitation Nursing, 34*(3), 110–117.
- Young, Y., Xiong, K., & Pruzek, R. (2011). Longitudinal functional recovery after postacute rehabilitation in older hip fracture patients: The role of cognitive impairment and implications for long-term care. *Journal of the American Medical Directors Association, 12*, 431–438.

APPENDIX

Functional Status Model



Dep = Depression
CS = Cognitive Status
Com = Comorbidities
SS = Social Support