INTENSITY OF REHABILITATION INTERVENTIONS AS A PREDICTOR OF OUTCOMES IN SKILLED NURSING FACILITY RESIDENTS

by

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Stroke is the leading cause of disability among adults in the United States. Research that continues to unpack the 'black box' of rehabilitation services specific to diagnostic groups (such as stroke) will contribute to the development of evidence-based clinical best practices for rehabilitation service provision to improve functional outcomes.

The purpose of this study was to describe the types of rehabilitation interventions implemented (impairment-based and function-based as derived from Current Procedural Terminology billing codes) and intensity of these interventions (measured in minutes) as they are administered to skilled nursing facility residents admitted with a diagnosis of stroke, at two time points (5-day and 30-day reporting periods). In addition, this study examined what types of rehabilitation interventions at what level of intensity contributed most to a change in the level of activities of daily living disability (ADL end-split) between these two time points.

At the 5-day and 30-day time points, the proportion of impairment-based and function-based interventions differed significantly, with the greatest proportion of time focused on function-based interventions at both time points. Function-based interventions decreased in proportion from 5 to 30 days and the impairment-based interventions increasing in proportion from 5 to 30 days.

Function-based occupational therapy interventions were significant predictors of positive changes in functional outcomes (ADL end-split), however, in subsequent models, when other

significant predictors of a change in functional outcomes entered (bed mobility and the presence of fecal incontinence), the unique contribution of occupational therapy was no longer significant. Results of this study also indicated strong and significant associations between both impairment-based and function-based interventions and the presence of urinary incontinence and fecal incontinence, dependence in toilet use, and the presence of an active discharge plan to return to the community.

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PREFACE

I would like to express my gratitude to Dr. Joan C. Rogers, PhD, OTR/L, chair of my dissertation committee and Dr. Margo B. Holm, PhD, OTR/L for so willingly providing me with the opportunity to complete my doctorate. Dr. Rogers and Dr. Holm have been extremely generous with their time, their mentorship, their knowledge and have freely shared their wealth of experience with me to provide me with every opportunity for success in completing this dissertation. I am so very thankful to have had the experience of their mentorship and the humble honor of being their student.

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This completed work is dedicated, with love, to my brother, Robert Murray Novalis.

1.0 INTRODUCTION

Since the passage of the Omnibus Reconciliation Act (OBRA) 1987 and its associated Resident Assessment Instrument (RAI), the availability of information for research related to rehabilitation services occurring within the skilled nursing facility (SNF) setting began to emerge. Additionally, with the revisions to the Medicare payment structure in 1998, namely, the SNF Prospective Payment System (SNF PPS), many studies have examined the presence or lack of trends in the amount of time (i.e., days, minutes, and/or hours) of rehabilitation provided to residents (Angelini, Wilber, & Myrtle, 2000; Buchanan, Rumpel, & Hoenig, 1996; Grabowski, Afendulis, & McGuire, 2011; Hutt et al., 2001; Latham, Jette, Ngo, Soukup, & Iezzoni, 2008; Leach, Yip, Myrtle, & Wilber, 2001; Warren, Wirtalla, & Leibensberger, 2001; White, 2003; Wodchis, 2004). Researchers began to link a description of rehabilitation "intensity" with the time values of days, minutes, and hours. Further examination of the intensity of rehabilitation services led to studies on related outcomes.

Although research has been published related to trends in SNF-based rehabilitation service provision, intensity, and outcomes, there is a lack of identification of the discipline-specific interventions occurring within those minutes, hours, or days recorded. This descriptive, retrospective study will examine the minutes of discipline-specific rehabilitation service provided and the discipline-specific interventions occurring within those minutes of SNF-based

rehabilitation services provided to residents with an active Minimum Data Set (MDS) diagnosis of cerebrovascular accident (CVA), transient ischemic attack (TIA), or stroke. Additionally, this study will examine the patterns in utilization of types of interventions, specifically impairment-based and function-based, and their ability to predict functional outcomes of residents.

The focused literature review in Chapter 2 examines the research related to patterns in rehabilitation services delivered, types of rehabilitation services delivered, and the impact on rehabilitation utilization and outcome. A synthesis of the variables presented in previous research is provided for comparison, as well as to establish a foundation for prediction model variable selection in this study.

In Chapter 3, the methodology and results of this descriptive secondary data analysis are described. The basis for inclusion of variables is discussed and the data analytic methods for correlating, comparing, and predicting relationships and differences between the types and intensities of rehabilitation services and functional outcomes is presented.

Chapter 4 provides the results of the analyses, including the descriptive analysis of demographic, clinical and therapy variables. Additionally, the relationships, comparisons and associations among specific variables are presented using correlations, ANOVA, and logistic regression procedures.

In Chapter 5, the implications of the results on the patterns of rehabilitation services and functional outcomes are discussed. Additional characteristics that are potential predictors of positive functional outcomes are addressed, as are limitations of the study.

Chapter 6 summarizes the study, reviewing the study aims and hypotheses and primary results. Recommendations for further research are provided based upon specific findings of this study.

2.0 FOCUSED REVIEW OF THE LITERATURE

2.1 BACKGROUND

In 1987, President Ronald Reagan signed into law the Omnibus Reconciliation Act (OBRA). A key component of OBRA was the inclusion of the Nursing Home Reform Act which addresses the quality of care provided in the nursing home setting (PL 100-203, 4201a.4211a). This portion of the legislation contains guidelines related to residents' rights, which are linked to the "highest practicable level of wellbeing" of the individual. A large portion of the guidelines focused on provision of services to SNF residents to maintain and/or promote their health, quality of life, and happiness.

With the implementation of OBRA, federally mandated tracking and measurement of the resident's condition, the scope of care provided, and the resources utilized to provide quality care were instituted. The Resident Assessment Instrument (RAI) was developed to address the need for tracking and measurement. One of the three components of the RAI is the Minimum Data Set. The Minimum Data Set (MDS) presented common language, definition and coding categories which provided (and continues to provide) a foundation for standardization in communicating resident condition and services provided within the SNF (Centers for Medicare and Medicaid Services, 2012b). The MDS contains resident-specific information that is directly linked to indicators of quality of care provided by healthcare staff and the quality of life

experienced by SNF residents. Additionally, functional measures are included and labeled as quality indicators. These include, but are not limited to, use of restraints, decline in activities of daily living, decline in mobility, weight loss, fall events, decline in range of motion and presence of pressure ulcers. Such indicators provide a means of monitoring compliance with the OBRA regulation mandating appropriate care delivery to assure that resident status does not deteriorate unless such decline is unavoidable secondary to the clinical condition (Centers for Medicare and Medicaid Services, 2012b).

The MDS serves as the functional portion of the RAI and is used not only for tracking and measurement purposes (Hawes et al., 1997), but also as a primary tool in the Medicare Skilled Nursing Facility Prospective Payment System (SNF PPS). MDS assessments, and their documentation, are required for residents participating in a Medicare Part A skilled nursing home stay. MDS assessments primarily occur at 5-day, 14-day, 30-day, 60-day, and 90-day intervals for residents covered under the Medicare Part A benefit (skilled stay). At each of these intervals, an assessment reference period is outlined, and an assessment reference date (ARD) is selected. There is a 7-day look-back period allocated to each ARD in which all assessment items associated with the scheduled MDS are completed and subsequently, submitted to the Centers for Medicare and Medicaid Services (CMS). CMS has made provision for other non-scheduled MDS assessments, such as the Other Medicare Required Assessment (OMRA) or Significant Change in Status Assessment (SCSA). CMS also requires MDS assessments for residents who are not covered by Medicare Part A (skilled stay); at a minimum these are to occur quarterly.

Thus, the MDS includes items that are reflective of the documented services (or resources) that are being utilized to provide care, and items that serve as indicators of quality of care. At the conclusion of the assessment, with all entered information being considered, the

resident is classified into a Resource Utilization Grouping (RUG). There have been revisions to the SNF PPS since its inception in 1998. The most recent revision occurred in October 2011 at which time RUG-IV was introduced as a 66-group hierarchical classification system (Centers for Medicare and Medicaid Services, 2012b). The RUG category would indicate the provision of rehabilitation (therapy) services and/or skilled nursing services. There are 8 RUG categories in total (Rehabilitation Plus Extensive Services, Rehabilitation, Extensive Services, Special Care High, Special Care Low, Clinically Complex, Behavioral Symptoms and Cognitive Performance, and Reduced Physical Function). There are also levels within each category which further clarify the requirements associated with the RUG. Table 2.1 provides an overview of the two categories relevant to this study: Rehabilitation Plus Extensive Services and Rehabilitation.

The MDS requires coding of information regarding a variety of functional status items: bed mobility, transfer status, walking in room/corridor, locomotion on unit/off unit, dressing, eating, toilet use, personal hygiene, bathing, balance, range of motion, and use of mobility devices. For SNF PPS purposes, a score associated with activities of daily living (ADL) is drawn from the items of bed mobility, eating, transfers, and toileting. This score is comprised of the resident's performance of the task and the support provided to the resident to complete the task. The result of the combined scoring of resident performance and support provided is referred to as the ADL end-split. Table 2.2 provides the method of calculating the RUG-IV ADL score. The lowest ADL end-split is a score of zero (0) and indicates no need of staff support and/or highest level of independent function. The highest ADL end-split is a score of 16 and indicates a resident's dependence on others to perform the selected ADLs. The first two characters of the RUG provide information related to provision of skilled therapy and/or nursing

Table 2.1 RUG-IV Classification Table

Category	ADL Index	RUGIV Code	Reimbursement Rate
Rehabilitation Plus Extensive Services			
Ultra High: Therapy: 720 minutes a week minimum with at least 2 disciplines, 1st at least 5 calendar days a week, 2nd at least 3 calendar days a week; AND ≥ 1 of the following: Tracheostomy care while resident; Ventilator/respirator while resident; Infection isolation while resident;	11-16	RUX	747.84
	2-10	RUL	655.86
Very High: Therapy: 500 minutes a week minimum with at least 1 discipline for 5 calendar days a week; AND ≥ 1 of the following: Tracheostomy care while resident; Ventilator/respirator while resident; Infection isolation while resident;	11-16	RVX	566.34
	2-10	RVL	525.63
High: Therapy: 325 minutes a week minimum with at least 1 discipline for 5 calendar days a week; AND ≥ 1 of the following: Tracheostomy care while resident; Ventilator/respirator while resident; Infection isolation while resident;	11-16	RHX	479.31
	2-10	RHL	467.24
Medium: Therapy: 150 minutes a week minimum 5 days across 1, 2, or 3 disciplines; AND ≥ 1 of the following: Tracheostomy care while resident; Ventilator/respirator while resident; Infection isolation while resident;	11-16	RMX	550.99
	2-10	RML	505.76
Low: Therapy: 45 minutes a week minimum of 3 days; Restorative Nursing: 6 days in at least 2 activities AND ≥ 1 of the following: Tracheostomy care while resident; Ventilator/respirator while resident; Infection isolation while resident;	2-16	RLX	388.28
Rehabilitation			
Ultra High: 720 minutes a week minimum with at least 2 disciplines; 1st at least 5 calendar days a week, 2nd at least 3 calendar days a week;	11-16	RUC	633.24
	6-10	RUB	575.94
	0-5	RUA	548.80
Very High: 500 minutes a week minimum with at least 1 discipline 5 calendar days a week;	11-16	RVC	506.03
	6-10	RVB	480.39
	0-5	RVA	430.63
High: 325 minutes a week minimum with at least 1 discipline 5 calendar days a week;	11-16	RHC	440.10
	6-10	RHB	418.99
	0-5	RHA	388.83
Medium: 150 minutes a week minimum; 5 days across 1, 2, or 3 disciplines;	11-16	RMC	404.73
	6-10	RMB	392.66
	0-5	RMA	383.62
Low: 45 minutes a week minimum; 3 days; Restorative nursing 6 days in at least 2 activities;	11-16	RLB	355.10
	0-10	RLA	300.82

(Centers for Medicare and Medicaid Services, 2012b; Department of Health and Human Services, 2010)

Table 2.2 RUG-IV Calculation of ADL score for bed mobility, eating, transfers, and toileting

ADL Self-Performance (Resident Performed)	ADL Support Provided
Activity Occurred 3 or More Times: **0.** Independent: no help or staff oversight at any time. **1.** Supervision: oversight, encouragement or cueing. **2.** Limited assistance: resident highly involved in activity; staff provide guided maneuvering of limbs or other non-weight-bearing assistance. **3.** Extensive assistance: resident involved in activity, staff provide weight-bearing support. **4.** Total dependence: full staff performance every time during entire 7-day period. Activity Occurred 2 or Fewer Times: **7.** Activity occurred only once or twice: activity did occur but only once or twice. **8.** Activity did not occur: activity (or any part of the ADL) was not performed by resident or staff at all over the entire 7-day period.	Most support provided over all shifts; coded regardless of resident's self-performance classification: Coding: **0.** No set up or physical help from staff **1.** Setup help only **2.** One person physical assist **3.** Two+ persons physical assist **8.** ADL activity itself did not occur during entire period.

Bed Mobility, Transfers & Toilet Use:

Self-Performance		Staff Support		ADL Score
-, 0, 1, 7, or 8	and	any number	=	**0**
2	and	any number	=	**1**
3	and	-, 0, 1, or 2	=	**2**
4	and	-, 0, 1, or 2	=	**3**
3 or 4	and	3	=	**4**

Bed Mobility ____+ Transfers _____+ Toilet Use _____= (Subtotal)

Eating:

Self-Performance		Staff Support		ADL Score
-, 0, 1, 2, 7, or 8	and	-, 0, 1, or 8	=	**0**
-, 0, 1, 2, 7, or 8	and	2 or 3	=	**2**
3 or 4	and	-, 0, or 1	=	**2**
3	and	2 or 3	=	**3**
4	and	2 or 3	=	**4**

Eating = _____

(Subtotal) + Eating Score= Total RUG-IV ADL Score:

(Centers for Medicare and Medicaid Services, 2010)

(e.g., RU, RV). The third character indicates the functional performance status, extensive services, and resources that are used to assist a resident in completion of the components of the ADL end-split (bed mobility, transfers, toilet use, and eating) (e.g., RUX, RVL).

According to the SNF PPS, the final RUG classification specifies a reimbursement amount to the facility for the resources provided for care of the resident. Utilization of skilled nursing and skilled rehabilitation services generally results in more reimbursement to the facility providing service. The ADL end-split also impacts the reimbursement rate, as a resident with greater levels of dependence on staff assistance would require greater amounts of resource utilization. Though there are differences in the actual reimbursement rates based upon geographic location, Table 2.1 provides an illustration of the reimbursement levels associated with the RUG classification. The impact of the ADL end-split on reimbursement rates becomes apparent. With the mandated implementation of the federal legislation of OBRA and the reporting of the information via the MDS, the environment within the nursing home began to shift and the need for rehabilitation services within the SNF became established. However, with the various revisions to the SNF PPS, the actual provision of rehabilitation services fluctuated (Grabowski et al., 2011; Hutt et al., 2011; Latham et al., 2008; White, 2003, Wodchis, 2004). Within the current version of the SNF PPS, reimbursement remains dependent upon the MDS-resultant RUG. There are requirements for additional assessments (OMRAs) if the days and/or minutes of rehabilitation services do not remain consistent with the MDS-RUG determined reimbursement rate. Nonetheless, if provision of rehabilitation services occurs within the assessment reference period, the days and minutes of therapy must be recorded on the MDS assessment.

Given the impetus for improving quality of care and functional outcomes for residents in SNF, and the high incidence and prevalence of stroke, we have chosen to focus our analyses on the type and intensity of rehabilitation interventions for residents in SNF who have a diagnosis of stroke, and to examine the impact of type and intensity of these interventions on functional outcomes.

2.2 LITERATURE SEARCH STRATEGY

A focused literature search was conducted from January 1987 to March 2013 using the electronic databases of PubMed/MEDLINE, CINAHL, and Ovid/MEDLINE. The purpose of the literature review was to ascertain the types of rehabilitation interventions common to SNF residents with stroke, and their intensity, as well as their ability to predict change in functional status. Though implemented in 1991, the OBRA legislation was drafted in 1987, and therefore, the year of 1987 was chosen as the dated foundational bookend for the focused literature search. Search terms included a combination of: skilled nursing facilities, long term care, therapy services, rehabilitation services, intensity, levels, interventions, 'black box' and taxonomy. The search terms were then expanded to allow inclusion of additional sites of rehabilitation services such as hospital-based, in-patient rehabilitation, and outpatient settings. This approach to the literature review provided a basis for a broad perspective on definitions of 'intensity' of rehabilitation services, and a more refined approach to the variables to consider in this study specific to rehabilitation services provided in the skilled nursing facility setting. The abstracts were reviewed and full text articles were retrieved. Additional articles were obtained by reviewing the

bibliographies of obtained articles. As the results of the bibliographic reviews became repetitive, or where articles cited were previously identified in the literature search, the focused literature review was completed.

This focused literature review initially yielded 59 articles. Of those 59, 35 articles contained specific reference to rehabilitation services provided in the SNF setting. Tables 2.3 and 2.4 (continuation of authors by alphabet) provide an overview of the variables examined in each study.

2.2.1 Focused Literature Review Summary Results

Although research regarding SNF-based rehabilitation services has been initiated, it lacks uniformity in its definition of "intensity." Though usage of the term "intensity" does associate time values [minutes; days; hours; hours/week; hours of therapy divided by the length of stay (LOS)], there is no consistent measure of time used across the research reviewed (Angelini et al., 2000; Chen, Heinemann, Granger & Linn, 2002; DeJong et al., 2009; Grabowski et al., 2011; Jette, Warren, & Wirtalla, 2004; Leach et al., 2001; Warren et al., 2001). Additional uses of the term "intensity" were visits over time, duration of visits (Hutt et al., 2001), number of sessions (DeJong et al., 2009), and number of residents receiving rehabilitation services (Angelini et al., 2000; Chen et al., 2002; Deutsch et al., 2006; Harada, Chun, Chiu, & Pakalniskis, 2000; Hutt et al., 2001; Jette, Warren, & Wirtalla, 2005; Murray, Singer, Dawson, Thomas, & Cebul, 2003; Wodchis et al., 2005). Also, studies have utilized the rehabilitation RUG classifications to indicate intensity (Keith, Wilson & Gutierrez, 1995; Grabowski et al., 2011; Wodchis et al., 2005). Several studies have included the aforementioned descriptors (LOS, minutes, hours,

days, visits, or sessions) within texts or as outcome measures (Munin et al., 2005; Munin et al., 2010; Murray et al., 2003).

Research involving outcomes in SNF-based rehabilitation services has included a number of variables (see Tables 2.3 and 2.4) with discharge destination and Functional Independence Measure (FIM) scores being the two most common measures indicated (Angelini et al., 2000; Berkowitz et al., 2011; Buntin, Colla, Deb, Sood, & Escarce, 2010; Chen et al., 2002; DeJong et al., 2009; Deutsch et al., 2006; Freburger et al., 2011; Harada et al., 2000; Jette et al., 2004; Jette et al., 2005; Keith et al, 1995; Murray et al., 2003; Pruchno & Rose, 2000; Silverstein, Findlay, & Bode, 2006; Warren et al., 2001;Wodchis et al., 2005; Munin et al., 2010; Munin et al., 2005).

Research involving other health care/rehabilitation settings (hospital, inpatient rehabilitation facilities (IRF), and outpatient rehabilitation settings does provide information related to the aforementioned items of intensity of rehabilitation service and outcomes (Ballinger, Ashburn, Low & Roderick, 1999; Brodie, Holm, & Tomlin, 1994; Hatfield et al., 2005; Horn et al., 2005; Johnston, Wood, & Fielder, 2003; Karges & Smallfield, 2009; Kwakkel, Kollen, & Wagenaar, 2002; Maulden, Gassaway, Horn, Smout, & DeJong, 2005). Ballinger et al. (1999) presented information on the variability in the intensity of categories of rehabilitation services provided. Johnston et al. (2003) also identified variability in intensity and staffing availability in rehabilitation services, and therefore questioned their impact on functional outcomes. Brodie et al. (1994) identified predictive values in disability scores obtained in the initial occupational therapy evaluation relative to discharge outcomes. This study (Brodie et al., 1994) also presented positive discharge outcomes relative to greater number of units documented for occupational therapy assessment. Horn et al. (2005), Hatfield et al. (2005), and Karges and Smallfield (2009) results indicated that greater intensities (minutes) of higher level, function-

Table 2.3 Variables Considered in Articles Related to SNF

	Angelini, Wilber, & Myrtle (2000)	Berkowitz et al. (2011)	Buchanon, Rumpel, & Hoenig (1996)	Buntin et al. (2010)	Chen et al. (2002)	Coster et al. (2007)	DeJong et al. (2009)	Deutsch et al. (2006)	Freburger et al. (2011)	Grabowski, Afenduis, & McGuire (2011)	Harada et al. (2000)	Hutt et al. (2001)	Jette Warren, & Wirtalla (2004)	Jette, Warren, & Wirtalla (2005)	Keith, Wilson, & Gutierrez (1995)	Kochersberger, Hielema, & Westlund (1994)	Latham et al. (2008)
Admission Date	X				X												
Age	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
AM-PAC						X											
Barthel Index												X					
BMI							X										
Case Mix Index		X					X	X				X					
CES-D																	
Cognitive Performance Scale		X															
Co-morbidity	X			X				X	X			X	X	X			
Comprehensive Severity Index							X										
Contract vs. in-house																X	
D/C destination	X	X		X	X			X	X		X		X		X		
Days to Admission	X				X									X			

Table 2.3 (continued)

	Angelini, Wilber, & Myrtle (2000)	Berkowitz et al. (2011)	Buchanon, Rumpel, & Hoenig (1996)	Buntin et al. (2010)	Chen et al. (2002)	Coster et al. (2007)	DeJong et al. (2009)	Deutsch et al. (2006)	Freburger et al. (2011)	Grabowski, Afenduis, & McGuire (2011)	Harada et al. (2000)	Hutt et al. (2001)	Jette Warren, & Wirtalla (2004)	Jette, Warren, & Wirtalla (2005)	Keith, Wilson, & Gutierrez (1995)	Kochersberger, Hielema, & Westlund (1994)	Latham et al. (2008)
Days to therapy	X						X	X					X	X			
Delirium Rating																	
Depression Scale																	
Diagnosis: Amputation			X														
Diagnosis: Cardio/ pulmonary			X										X	X			X
Diagnosis: Complex Medical Condition						X							X				
Diagnosis: Debility/Mobility					X												X
Diagnosis: Neurological disorder			X			X							X				
Diagnosis: Ortho			X	X	X	X	X				X		X	X			X

Table 2.3 (continued)

	Angelini, Wilber, & Myrtle (2000)	Berkowitz et al. (2011)	Buchanon, Rumpel, & Hoenig (1996)	Buntin et al. (2010)	Chen et al. (2002)	Coster et al. (2007)	DeJong et al. (2009)	Deutsch et al. (2006)	Freburger et al. (2011)	Grabowski, Afenduis, & McGuire (2011)	Harada et al. (2000)	Hutt et al. (2001)	Jette Warren, & Wirtalla (2004)	Jette, Warren, & Wirtalla (2005)	Keith, Wilson, & Gutierrez (1995)	Kochersberger, Hielema, & Westlund (1994)	Latham et al. (2008)
Diagnosis: SCI			X										X				
Diagnosis: Stroke			X	X	X			X	X				X	X	X		X
Education Status						X	X			X							
Ethnicity		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Facility Characteristics							X		X	X	X	X	X				
FIM admission					X		X	X					X	X	X		
FIM discharge					X		X	X					X	X	X		
FIM detail					X		X	X					X	X	X		
FIM gains					X		X						X	X	X		
Gender	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Geographic Comparison							X					X	X				
HAMD																	
ICD-9	X								X		X						
Intensity	X				X		X			X		X	X	X	X		
LOS rehab	X						X				X	X		X			

Table 2.3 (continued)

	Angelini, Wilber, & Myrtle (2000)	Berkowitz et al. (2011)	Buchanon, Rumpel, & Hoenig (1996)	Buntin et al. (2010)	Chen et al. (2002)	Coster et al. (2007)	DeJong et al. (2009)	Deutsch et al. (2006)	Freburger et al. (2011)	Grabowski, Afenduis, & McGuire (2011)	Harada et al. (2000)	Hutt et al. (2001)	Jette Warren, & Wirtalla (2004)	Jette, Warren, & Wirtalla (2005)	Keith, Wilson, & Gutierrez (1995)	Kochersberger, Hielema, & Westlund (1994)	Latham et al. (2008)
LOS total		X			X		X	X	X	X	X	X	X	X			
MAI																	
Marital Status	X							X									
MDS		X		X						X	X	X					
MDS-ADL portion		X								X							
MHI-5						X											
MMSE																	
Mortality	X	X		X													
Number of pts receiving therapy	X	X	X		X			X			X	X		X		X	X
Nursing hrs													X			X	
OSCAR									X								
OT days					X		X						X				
OT min/hrs					X		X						X	X	X		
OT sessions							X										
OT units	X				X												X
OT visits												X					
Pain Index		X															

Table 2.3 (continued)

	Angelini, Wilber, & Myrtle (2000)	Berkowitz et al. (2011)	Buchanon, Rumpel, & Hoenig (1996)	Buntin et al. (2010)	Chen et al. (2002)	Coster et al. (2007)	DeJong et al. (2009)	Deutsch et al. (2006)	Freburger et al. (2011)	Grabowski, Afenduis, & McGuire (2011)	Harada et al. (2000)	Hutt et al. (2001)	Jette Warren, & Wirtalla (2004)	Jette, Warren, & Wirtalla (2005)	Keith, Wilson, & Gutierrez (1995)	Kochersberger, Hielema, & Westlund (1994)	Latham et al. (2008)
PaymentClaims			X	X				X		X			X	X	X	X	X
Payment/ Medicare	X			X	X		X	X	X	X			X	X	X	X	X
Payment-HMO	X				X		X		X	X					X		
Payment-Other					X		X		X	X					X		
Prior Living Arrangements				X	X		X					X	X				X
PT days					X		X						X				
PT min/hrs					X		X						X	X	X		
PT sessions							X										
PT units	X				X												X
PT visits												X					
Quality Indicator Quality Measure																	
RAI																	
Resource Utilization Groups (RUGS)										X							

Table 2.3 (continued)

	Angelini, Wilber, & Myrtle (2000)	Berkowitz et al. (2011)	Buchanon, Rumpel, & Hoenig (1996)	Buntin et al. (2010)	Chen et al. (2002)	Coster et al. (2007)	DeJong et al. (2009)	Deutsch et al. (2006)	Freburger et al. (2011)	Grabowski, Afenduis, & McGuire (2011)	Harada et al. (2000)	Hutt et al. (2001)	Jette Warren, & Wirtalla (2004)	Jette, Warren, & Wirtalla (2005)	Keith, Wilson, & Gutierrez (1995)	Kochersberger, Hielema, & Westlund (1994)	Latham et al. (2008)
Revenue Codes			X														
Range of Motion	X																
SF-36																	
SIP																	
Socioeconomic Status									X								
ST days					X								X				
ST min/hrs					X								X	X	X		
ST sessions																	
ST units					X												
Study specific tool							X										
Therapy charges			X							X					X		
Therapy days													X				
Therapy min/hrs										X			X		X		

Table 2.3 (continued)

	Angelini, Wilber, & Myrtle (2000)	Berkowitz et al. (2011)	Buchanon, Rumpel, & Hoenig (1996)	Buntin et al. (2010)	Chen et al. (2002)	Coster et al. (2007)	DeJong et al. (2009)	Deutsch et al. (2006)	Freburger et al. (2011)	Grabowski, Afenduis, & McGuire (2011)	Harada et al. (2000)	Hutt et al. (2001)	Jette Warren, & Wirtalla (2004)	Jette, Warren, & Wirtalla (2005)	Keith, Wilson, & Gutierrez (1995)	Kochersberger, Hielema, & Westlund (1994)	Latham et al. (2008)
Therapy sessions																	
Therapy staffing: number/ availability							X		X							X	
Therapy staffing: type																X	
Therapy treatment focus	X	X					X										
Therapy units																	X
USDMR					X			X									

Note: AM-PAC= Activity Measure for Post-Acute Care; BMI=Body Mass Index; CES-D=Center for Epidemiology Scale-Depression; D/C=Discharge; Ortho=Orthopedic diagnosis; SCI=Spinal Cord Injury; FIM=Functional Independence Measure; HAMD=Hamilton Depression Scale; ICD-9=International Classification of Diseases, Version 9; LOS=Length of Stay; MAI=Multilevel Assessment Instrument; MHI=Mental Health Inventory; MDS=Minimum Data Set; MDS-ADL=MDS Activities of Daily Living; MMSE= Mini-Mental Status Examination; OSCAR=Online Survey, Certification and Reporting**;** OT=Occupational Therapy; HMO=Health Maintenance Organization; PT=Physical Therapy; QI/QM=Quality Indicators/Quality Measures; RAI=Resident Assessment Instrument; SF-36=Short Form-36; SIP=Sickness Impact Profile; ST=Speech Therapy; UDSMR=Uniform Data System for Medical Rehabilitation

Table 2.4 Variables Considered in Articles Related to SNF

	Leach et al. (2001)	Munin et al. (2010)	Munin et al. (2005)	Murray et al. (2003)	Pruchno, & Rose (2000)	Silverstein, Findlay, & Bode (2006)	Warren, Wirtalla, & Leibensberger (2001)	White (2003)	Wodchis et al. (2005)	Wodchis (2004)							
Admission Date																	
Age	X	X	X	X	X		X		X	X							
Barthel Index																	
BMI		X		X													
Case Mix Index								X									
CES-D					X												
Co-morbidity	X			X					X	X							
Comprehensive Severity Index		X															
D/C destination				X	X	X	X		X								
Days Admission to Rehab		X					X										
Delirium Rating Scale			X														
Diagnosis: Cardio/pulmonary				X													
Diagnosis: Debility/Mobility				X													

Table 2.4 (continued)

	Leach et al. (2001)	Munin et al. (2010)	Munin et al. (2005)	Murray et al. (2003)	Pruchno, & Rose (2000)	Silverstein, Findlay, & Bode (2006)	Warren, Wirtalla, & Leibensberger (2001)	White (2003)	Wodchis et al. (2005)	Wodchis (2004)							
Diagnosis: Ortho		X	X	X													
Diagnosis: Stroke				X													
Education Status	X	X			X												
Ethnicity	X	X	X	X	X												
Facility Characteristics		X	X		X												
Functional Independence Measure (FIM) admission		X	X	X			X										
FIM discharge		X	X	X			X										
FIM detail		X	X	X		X											
FIM gains		X	X	X			X										
Gender	X	X	X	X	X				X	X							

Table 2.4 (continued)

	Leach et al. (2001)	Munin et al. (2010)	Munin et al. (2005)	Murray et al. (2003)	Pruchno, & Rose (2000)	Silverstein, Findlay, & Bode (2006)	Warren, Wirtalla, & Leibensberger (2001)	White (2003)	Wodchis et al. (2005)	Wodchis (2004)							
Geographic Comparison									X								
HAMD			X														
Intensity	X	X	X	X					X								
LOS rehab	X	X	X														
LOS total	X	X	X		X		X		X								
MAI					X												
Marital Status	X				X				X	X							
MDS						X			X	X							
MMSE			X		X												
Mortality				X	X												
Number of patients receiving therapy	X	X		X					X	X							
OT days	X	X															
OT min/hrs	X	X															
OT sessions		X															
Payment Claims	X						X	X	X	X							

Table 2.4 (continued)

	Leach et al. (2001)	Munin et al. (2010)	Munin et al. (2005)	Murray et al. (2003)	Pruchno, & Rose (2000)	Silverstein, Findlay, & Bode (2006)	Warren, Wirtalla, & Leibensberger (2001)	White (2003)	Wodchis et al. (2005)	Wodchis (2004)							
Payment/Medicare	X	X					X	X	X	X							
Payment-HMO	X	X					X			X							
Payment-Other		X					X			X							
Prior Living Arrangements	X	X		X					X	X							
PT days	X	X															
PT min/hrs	X	X															
PT sessions		X															
QI/QM						X											
Resource Utilization Groups (RUGS)							X	X	X	X							
SF-36	X																
SIP	X																
Socioeconomic Status					X												

Table 2.4 (continued)

	Leach et al. (2001)	Munin et al. (2010)	Munin et al. (2005)	Murray et al. (2003)	Pruchno, & Rose (2000)	Silverstein, Findlay, & Bode (2006)	Warren, Wirtalla, & Leibensberger (2001)	White (2003)	Wodchis et al. (2005)	Wodchis (2004)							
Therapy days	X						X	X									
Therapy min/hrs	X			X			X	X	X	X							
Therapy intervention focus		X															

Note: AM-PAC= Activity Measure for Post-Acute Care; BMI=Body Mass Index; CES-D=Center for Epidemiology Scale-Depression; D/C=Discharge; Ortho=Orthopedic diagnosis; SCI=Spinal Cord Injury; FIM=Functional Independence Measure; HAMD=Hamilton Depression Scale; ICD-9=International Classification of Diseases, Version 9; LOS=Length of Stay; MAI=Multilevel Assessment Instrument; MHI=Mental Health Inventory; MDS=Minimum Data Set; MDS-ADL=MDS Activities of Daily Living; MMSE= Mini-Mental Status Examination; OSCAR=Online Survey, Certification and Reporting**;** OT=Occupational Therapy; HMO=Health Maintenance Organization; PT=Physical Therapy; QI/QM=Quality Indicators/Quality Measures; RAI=Resident Assessment Instrument; SF-36=Short Form-36; SIP=Sickness Impact Profile; ST=Speech Therapy; UDSMR=Uniform Data System for Medical Rehabilitation

based interventions, led to greater discharge outcomes as measured by related FIM scores. Research by Horn et al. (2005) and Maulden et al. (2005) indicated that earlier provision of rehabilitation services contributed to greater discharge outcomes as measured by related FIM scores. Maulden et al. (2005) also linked earlier provision of rehabilitation services with shorter lengths of stay.

Several studies involving health care/rehabilitation settings other than SNF also began an examination of the contents of the interventions provided either through an examination of billing/interventions codes, documentation abstraction, or study-specific tools (Ballinger et al., 1999; Brodie et al., 1994; DeJong et al., 2009; Hatfield et al., 2005; Horn et al., 2005; Munin et al., 2010; Richards et al., 2005). Brodie et al. (1994) provided further information related to the greater portion of time (units: 15 minute increments) in provision of occupational therapy (OT) in impairment-based interventions versus function-based interventions. Richards et al. (2005) also found that a higher percentage of OT time (minutes) was spent in impairment-focused activities, though their findings also indicated that greater success in terms of functional outcomes was associated with time spent in higher level, function-based activities.

An integral part of the studies by DeJong et al. (2009), Hatfield,et al. (2005), Horn et al. (2005), and Munin et al. (2010) was the development of a taxonomy of rehabilitation service as a means to provide details of the actual contents of the rehabilitation interventions being provided. More pointedly, Hatfield et al. (2005) and Horn et al. (2005) reported higher level activities and higher level tasks leading to better functional outcomes. DeJong et al. (2009) and Munin et al., (2010) included SNF-based rehabilitation services in their studies comparing rehabilitation settings (SNF versus IRF; tertiary care hospital, IRF and SNF). Both of these studies focused on the rehabilitation services provided to patients with hip fracture, hip replacement or knee

replacement. Both studies indicated a high percentage of time (minutes/hours) of rehabilitation service was spent in exercise regardless of setting.

2.3 SIGNIFICANCE

Stroke is the third leading cause of death, the leading cause of disability among older adults in the United States, and 26% of stroke victims require care in a nursing home or other long term care facility (National Stroke Association, 2012). The estimated direct costs associated with medical care and rehabilitation services for the estimated 795,000 reported stroke attacks are $73.7 billion per year. Therefore, this study focuses on intensity of rehabilitation interventions for stroke as a predictor of outcomes in skilled nursing residents.

As the Centers for Medicare and Medicaid Services (CMS) moves towards pay-for-performance reimbursement models, there is an urgent need to provide information that identifies and substantiates the effectiveness of intervention processes resulting in functional outcomes and reduction in caregiver burden. Practice-based evidence may provide such data. It can identify interventions in greater detail and along with their related outcomes may lead to established clinical best practices and quality of care improvements (Horn, 2006).

As DeJong, Horn, Gassaway, Slavin, and Dijkers (2004) suggested, the existing research provides information about rehabilitation service and outcomes (primarily Functional Independence Measure [FIM] data and length of stay [LOS]), as well as descriptors of time (minutes, hours, days), sessions, visits, and type of rehabilitation service delivered but is largely without examination or characterization of the content of the interventions provided.

Research that continues to unpack the 'black box' of rehabilitation services specific to diagnostic groups (such as stroke) will contribute to the development of clinical best practices and will further the development of the association of rehabilitation service provision with evidence-based processes leading to improved resident/functional outcomes.

2.3.1 Aims of the Study

This study had two aims:

Aim 1 was to describe the type of rehabilitation interventions (impairment-based vs. function-based) implemented and the intensity of these interventions (measured in minutes) as they were provided to SNF residents admitted with a diagnosis of stroke at the 5-day and 30-day reporting periods.

Aim 1: Hypothesis 1: From the 5-day to the 30-day reporting periods, the proportion of minutes of impairment-based interventions will decrease.

Aim 1: Hypothesis 2: From the 5-day to the 30-day reporting periods, the proportion of minutes of function-based interventions will increase.

Aim 2 was to examine what types of rehabilitation interventions at what level of intensity predicted change in the ADL end-split between the 5-day and the 30-day MDS reporting periods.

3.0 METHODS

This study was a descriptive, retrospective secondary data analysis utilizing MDS data, billing data, and coding data from 134 centers throughout the United States provided by a national SNF-based rehabilitation service provider during the period of October 1, 2011 through December 31, 2011.

MDS data for the 5-day and 30-day scheduled PPS assessments for Medicare or Managed Care Part A covered residents admitted as of October 1, 2011 with MDS item A14500 (Active diagnosis of CVA, TIA, or Stroke) were included. Only resident files that contained both a 5-day and 30-day assessment were included. Non-scheduled MDS assessments (OMRAs and/or SCSAs) were not included. The MDS data was linked to the billing and coding data for the respective source-residents and time periods. Specifically, the minutes allocated to the specific CPT codes were linked to the associated total minutes reported on the respective MDS. Upon completion of linking each of the items to the resident-specific data, all identifiers were removed. The de-identified data were then made accessible for statistical analysis solely for the purposes of this study.

3.1 PARTICIPANTS

All participants were residents admitted into the SNF setting between October 1, 2011 and December 31, 2011 with an active diagnosis of CVA, TIA, or Stroke as indicated by MDS item A14500. Both the 5-day and 30-day assessments were required to be available on each of the participants in order to have comparative data. Those cases that did not have both assessments available, or where therapy was not represented, were not included in this study. Figure 3.1 provides the overview of the participant selection process.

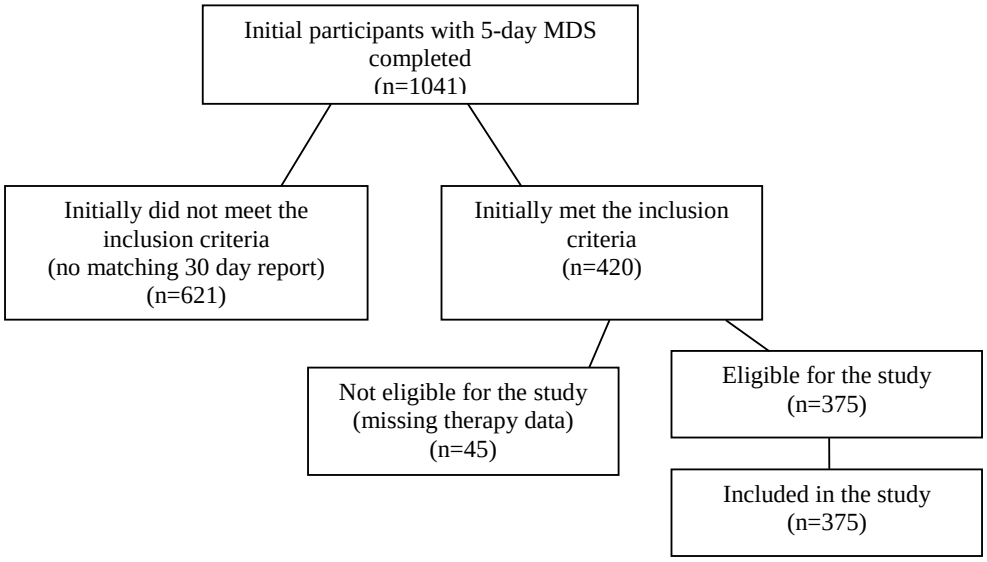

Figure 3.1 Steps Performed in Participant Selection

3.2 MEASURES

3.2.1 Minimum Data Set Assessment Data for this Study

The MDS consists of 477 assessment items that are rated by staff and residents, usually on a nominal or ordinal scale. The 477 items are categorized into 20 subheadings which are listed in Table 3.1.

Table 3.2 provides a listing of the variables that were extracted from the MDS assessments for initial consideration in this study based upon potential impact to participation in rehabilitation services and related outcomes.

Table 3.1 MDS Section Titles and Descriptors

Section	Section Title	Descriptor
A	Identification Information	Resident identification, demographics, assessment type
B	Hearing, Speech and Vision	Hearing, speech and vision abilities/adaptations/devices; communication abilities
C	Cognitive Patterns	Attention, orientation, memory, delirium, mental status changes
D	Mood	Resident mood and safety
E	Behavior	Behavior, behavioral symptoms and presence of impact
F	Preferences for Customary Routine and Activities	Daily preferences and activity preferences
G	Functional Status	ADLs; range of motion; mobility devices; perceived rehabilitation potential
H	Bladder and Bowel	Continence; toileting patterns and programs; toileting appliances
I	Active Diagnoses	Medical diagnoses active within the last 7 days
J	Health Conditions	Pain assessment; shortness of breath; tobacco usage; prognosis; other identified problem conditions; falls history
K	Swallowing/Nutritional Status	Swallowing disorders; height, weight, weight loss; nutritional approaches and intake

Table 3.1 (continued)

Section	Section Title	Descriptor
L	Oral/Dental Status	Status of natural or artificial dentition
M	Skin Conditions	Pressure ulcer risk and assessment; presence, stage, types of wounds; wound treatments
N	Medications	Types of medications
O	Special Treatments, Procedures, and Programs	Types of treatments, vaccinations, therapies, restorative nursing programs, physician examinations and order changes
P	Restraints	Location of restraint and area of use (bed/chair)
Q	Participation in Assessment and Goal Setting	Resident's participation in assessment, expectations, discharge plans/planning
V	Care Area Assessment Summary	Care areas that trigger for care plans
X	Correction Request	Completed for any type of correction/modification to previously completed/submitted MDS
Z	Assessment Administration	Billing information and required signatures

(Centers for Medicare and Medicaid Services, 2010).

Table 3.2 MDS Variables Extracted from the Dataset

Section	Section Title	Detail
A	Identification Information	Gender; Age; Race/Ethnicity; Marital Status; Entered from (living arrangement); Discharge Status
C	Cognitive Patterns	Mental Status; Delirium;
D	Mood	Resident mood
E	Behavior	Behavior, behavioral symptoms
G	Functional Status	ADLs; range of motion; mobility devices; perceived rehabilitation potential
H	Bladder and Bowel	Continence; toileting patterns and programs; toileting appliances
I	Active Diagnoses	Medical diagnoses active within the last 7 days: Cancer, Heart/Circulation, Gastronintestinal, Genitourinary, Infections, Metabolic, Musculoskeletal, Neurological, Nutritional, Psychiatric/Mood Disorder, Pulmonary, Vision, Other Identified

Table 3.2 (continued)

Section	Section Title	Detail
J	Health Conditions	Pain assessment; shortness of breath; tobacco usage; prognosis; other identified problem conditions; falls history
K	Swallowing/Nutritional Status	Swallowing disorders; height, weight, weight loss; nutritional approaches and intake
M	Skin Conditions	Pressure ulcer risk and assessment; presence, stage, types of wounds; wound treatments
N	Medications	Types of medications
O	Special Treatments, Procedures, and Programs	Types, days and minutes of therapies, restorative nursing programs, physician examinations and order changes
P	Restraints	Location of restraint and area of use (bed/chair)
Q	Participation in Assessment and Goal Setting	Resident's participation in assessment, expectations, discharge plans/planning
V	Care Area Assessment Summary	Care areas that trigger for care plans
Z	Assessment Administration	Resultant RUG

(Centers for Medicare and Medicaid Services, 2010).

3.2.2 Rehabilitation Services Billing and Coding Data

Discipline-specific, namely physical therapy, occupational therapy, and speech therapy (PT/OT/ST) days and minutes of service were dissected by minutes assigned to specific Current Procedure Terminology (CPT) code(s). Table 3.3 provides a brief description of these codes. The CPT codes were also categorized as impairment-based or function-based interventions based upon the National Government Services (NGS) descriptors/definitions of CPT code(s) (National Government Services, 2011).

Table 3.3 CPT Codes and Descriptors

CPT Code	Descriptor	Category
97018	Paraffin	Impairment
97024	Diathermy	Impairment
97032	E-Stim	Impairment
97035	Ultrasound	Impairment
97110	Therapeutic Exercise	Impairment
97112	Neuro-muscular Re-education	Impairment
97124	Massage	Impairment
97140	Manual Therapy	Impairment
97532	Cognitive Skills Development	Impairment
97533	Sensory Integration Training	Impairment
97760	Orthotic Management	Impairment
97761	Prosthetic Training	Impairment
G0281	E-Stim (wound care)	Impairment
G0283	E-Stim (unattended)	Impairment
97116	Gait Training	Function
97530	Therapeutic Activities	Function
97535	ADL Retraining	Function
97542	Wheelchair Management	Function
92507	Speech/Language/Voice/Communication Disorder Treatment	Function
92526	Swallowing Dysfunction Treatment	Function

Note: E-Stim = electrical stimulation; ADL = activities of daily living;
(National Government Services, 2011).

3.2.3 ADL End-split

The ADL end-split was utilized as an indicator of functional status of the resident. The ADL end-split was coded based upon the RUG category (e.g., RUX, RUL, RVL, RMB, and so on). In as much as the ADL end-split is recognized by Medicare as an indicator of function (or more specifically, an indicator of required additional resource utilization), this study employed the ADL end-split as an indicator of functional status of the resident.

3.2.4 Intensity

Though the existing research contains a variety of definitions of rehabilitation service intensity, for the purposes of this study, intensity was defined as the total number of rehabilitation service minutes within the 7-day look back as recorded on the 5-day and 30-day MDS (MDS 3.0; Section O: O0400.A-C) as well as the application of those discipline-specific minutes to the specific CPT codes.

3.2.5 Procedures

All data and measures were formatted into Excel spreadsheets in preparation for statistical analysis. Minutes from the billing records were totaled by CPT by discipline and entered into the Excel spreadsheets in preparation for entry into SPSS. Payer type was retrieved from the billing records, coded, and entered into SPSS. ADL scores were calculated based upon raw scores in bed mobility, transfers, toileting and feeding according to the MDS calculation formula for obtaining the ADL end-split. The ADL scores were entered into Excel and then entered into SPSS.

3.2.6 Data Analyses

Data analyses consisted of exploratory data analyses to ensure that item coding was within the item parameters, and that data parameters met the assumptions for each statistical test.

3.2.6.1 Descriptives

Descriptive statistics were utilized to provide information related to the sample demographics (age, gender, marital status, ethnicity), clinical characteristics (co-morbidities), and CPT code/minute distributions (discipline-specific).

3.2.6.2 Comparisons

Paired sample *t*-tests were utilized to compare means (5-day and 30-day reporting period) of the CPT code variables (combined impairment-based and combined function-based) and the ADL end-split scores, as well as the proportions of impairment-based and function-based interventions within and between the 5 day and 30 day reporting periods. Bonferroni adjustments were used for all comparisons, using an alpha of $p < .05$. Effect sizes for impairment-based and function-based interventions were calculated using the following formula:

$$ES = \bar{X}_{post} - \bar{X}_{pre} / SD_{pre.}$$

According to Cohen (1992), 0.10 is a small effect size, 0.30 is a moderate effect and 0.50 is a large effect size.

3.2.6.3 Correlations

Non-parametric correlations were selected within SPSS utilizing the Spearman's rho calculations to examine the magnitude and direction of the relationships between demographic and clinical variables, discipline-specific and combinations of minutes of PT, OT, and ST CPT codes (impairment-based or function-based). These were run only for the 5-day reporting period in preparation for selecting the most significant variable for the prediction model.

3.2.6.4 Associations

To examine which variables were mostly strongly associated with changes in the ADL end-split from Day 5 to Day 30, Chi-square and Spearman's rho analyses were used to identify those variables that were significantly ($p<.05$) associated with the target variable ADL end-split. Significant variables were then entered into a stepwise logistic regression model after three variables were forced into the equation: PT function-based intervention minutes, OT function-based intervention minutes, and ST function-based intervention minutes. These three variables were forced, because function-based interventions were significantly greater than impairment-based interventions, and the combination of PT, OT, and ST minutes and proportion of PT, OT, and ST minutes combined were significantly associated with the ADL end-split. Thus, by entering each discipline separately, we sought to identify the specific contributions of each discipline.

4.0 RESULTS

4.1 SAMPLE DEMOGRAPHICS

Three hundred seventy-five cases met the inclusion/exclusion criteria. The mean age of the sample was 78.29 years. More than half of the sample was female, and either married or widowed. The race/ethnic majority of this sample was identified as White (see Table 4.1).

Table 4.1 Sample Demographics

Variables (N=375)	Mean *(SD)*	n	%	Range
Age in years	78.29 (*11.220)*			35-101
Gender:				
Male		155	41.3	
Female		220	58.7	
Marital Status:				
Married		129	38.4	
Never Married		53	15.8	
Widowed		107	31.8	
Separated		6	1.8	
Divorced		41	12.2	
Marital Status Missing		39	10.4	
Ethnicity:				
American Indian/Alaska Native		1	0.3	
Asian		1	0.3	
Black/African American		30	8.0	
Hispanic/Latino		3	0.8	
Native Hawaiian/Other Pacific Islander		0	0.0	
White		324	86.4	

4.2 CLINICAL CHARACTERISTICS

The predominant clinical characteristics included active heart/circulation-related diagnoses (primarily hypertension, coronary artery disease, a-fibrillation), and metabolic diagnoses (diabetes mellitus and hyperlipidemia). Of the psychiatric/mood disorders, 43.7% of the sample was identified as having active depression. Additionally, of the diagnoses within the neurological classification, 31.2% had hemiplegia/hemiparesis and 29.1% had dementia (see Table 4.2).

Table 4.2 Sample Clinical Characteristics/Co-Morbidities (N = 375)

Variables	n	%
Active Diagnoses at 5-day		
Cancer (n=322)	29	7.7
Heart/Circulation:		
Anemia	106	28.3
A-Fib/Other Dysrhythmias (n=322)	95	29.5
Coronary Artery Disease (n=322)	114	35.4
Deep Venous Thrombosis (n=322)	7	1.9
Heart Failure	78	20.8
Hypertension	313	83.5
Orthostatic Hypotension	4	1.1
Peripheral Vascular Disease (n=322)	38	11.8
Gastrointestinal:		
Cirrhosis (n=322)	1	0.3
GERD or Ulcer (n=322)	94	29.2
Ulcerative Colitis, Crohn's Disease, Inflammatory Bowel Disease (n=322)	4	1.2
Genitourinary:		
Benign Prostatic Hyperplasia (n=322)	35	10.9
Renal Insufficiency, Failure, or End-Stage Renal Disease (n=322)	36	11.2
Neurogenic Bladder	6	1.6
Obstructive Uropathy	3	0.8
Infections:		
Multidrug-Resistant Organism	7	1.9
Pneumonia	49	13.1
Septicemia	13	3.5
Tuberculosis	1	0.3

Table 4.2 (continued)

Variables	n	%
Urinary Tract Infection (last 30 days)	66	17.6
Viral Hepatitis	4	1.1
Wound Infection	7	1.9
Metabolic:		
Diabetes Mellitus	162	43.2
Hyponatremia	5	1.3
Hyperkalemia	2	0.5
Hyperlipidemia	184	49.1
Thyroid Disorder	71	22.0
Musculoskeletal:		
Arthritis (n=322)	86	26.7
Osteoporosis	35	10.9
Hip Fracture	23	6.1
Other Fracture	24	6.4
Neurological:		
Alzheimer's Disease	25	6.7
Aphasia	28	7.5
Cerebral Palsy	0	0.0
Cerebrovascular Accident, Transient Ischemic Attack, Stroke	375	100.0
Dementia	109	29.1
Hemiplegia/Hemiparesis	117	31.2
Paraplegia	1	0.3
Quadriplegia	0	0.0
Multiple Sclerosis	3	0.8
Huntington's Disease	0	0.0
Parkinson's Disease	19	5.1
Tourette's Syndrome (n=322)	0	0.0
Seizure Disorder or Epilepsy	42	11.2
Traumatic Brain Injury	7	1.9
Nutritional:		
Malnutrition	8	2.1
Psychiatric/Mood Disorder:		
Anxiety Disorder	73	19.5
Depression	164	43.7
Manic Depression	8	2.1
Psychotic Disorder	14	3.7
Schizophrenia	9	2.4
Post-Traumatic Stress Disorder	0	0.0
Pulmonary:		
Asthma, Chronic Obstructive Pulmonary Disease, Chronic Lung Disease	97	25.9
Respiratory Failure	11	2.9
Vision:		
Cataracts, Glaucoma, or Macular Degeneration (n=322)	35	10.9

4.3 SAMPLE (CPT) CODES AT 5 DAYS AND 30 DAYS

The mean number of therapy minutes, by CPT code, for the 7-day look back period was calculated for impairment-based and function-based interventions. For impairment-based interventions by both physical and occupational therapy, the greatest number of minutes during a 7-day look back was for therapeutic exercise followed by neuro-muscular re-education at both the 5 and 30 day reporting periods. However, there were variations between the physical therapy and occupational therapy impairment-based interventions for the lowest number of minutes for the 5 and 30 day reporting periods. For physical therapy, prosthetic training and E-stimulation for wounds CPT codes were not billed during the 5 day reporting period. At the 30 day reporting period, minutes for CPT codes billed were lowest for E-stimulation for wounds (M=0.04), followed by ultrasound (M=0.26) and prosthetic training (M=0.31). For occupational therapy, the lowest impairment-based means for the 5 day reporting period were paraffin and massage (M=0; M=0). Paraffin and massage increased slightly at the 30 day reporting period (M= 0.08; M= 0.16). For speech therapy, only one impairment-based code, cognitive skills development was used, which decreased slightly at the 30 day reporting period (M=28.96) compared to the 5 day (M=29.07) (see Table 4.3).

Physical therapy function-based CPT codes billed in the 7-day look back, for both the 5 and 30 day reporting periods, were greatest for therapeutic activities followed by gait training, with a slight increase in gait training at the 30 day reporting period (M=50.70) over the 5 day reporting and period (M=46.79). A slight decrease was also noted in therapeutic activity at the 30 day reporting period (M=66.64) compared to the 5 day (M=84.25). The physical therapy function-based CPT codes which had the least number of minutes billed during the 7-day look

back of the 5 day and 30 day reporting periods were ADL retraining (*M*=0.25; *M*=0.21) and wheelchair management (*M*=1.29; *M*=1.36) (see Table 4.3).

Occupational therapy function-based CPT codes billed in the 7-day look back of the 5 and 30 day reporting periods were greatest for ADL retraining, followed by therapeutic activities, with a decrease in both at the 30 day reporting period (*M*=67.88; *M*=66.95) compared to the 5 day reporting period (*M*=91.81; *M*=73.91). The wheelchair management CPT code was the remaining occupational therapy function-based code billed and had the lowest number of minutes billed among the function-based grouping at the 5 day reporting period (*M*=4.07) with a decrease at the 30 day reporting period (*M*=2.09) (see Table 4.3).

Speech therapy had only two function-based CPT codes and both were billed in the 7-day look back of the 5 and 30 day reporting periods. Minutes were greatest for dysphagia treatment and the least for communication disorders treatment. Dysphagia treatment had a slight decrease at the 30 day reporting period (*M*=53.75) compared to the 5 day reporting period (*M*=55.83). A slight increase was noted in communication disorders treatment at the 30 day reporting period (*M*=36.04) over the 5 day reporting period (*M*=35.20) (see Table 4.3).

Table 4.3 Sample CPT Codes, by Mean Minutes of Therapy, Per Reporting Period

Variables (N=375)	5-day Mean *(SD)*	5-day Range	30-day Mean *(SD)*	30-day Range
Physical Therapy Impairment:				
97024 (Diathermy)	1.05 *(8.86)*	0-95	0.70 *(5.40)*	0-70
97032 (E-Stim)	1.18 *(7.29)*	0-73	1.51 *(9.93)*	0-115
97035 (Ultrasound)	0.49 *(5.69)*	0-85	0.26 *(3.58)*	0-66
97110 (Ther Ex)	109.49 *(50.95)*	0-233	102.60 *(55.22)*	0-325
97112 (Neuro-ms Re-ed)	33.16 *(34.25)*	0-177	33.49 *(36.94)*	0-191
97140 (Manual Therapy)	0.40 *(3.37)*	0-38	1.35 *(10.62)*	0-167
97760 (Orthotics Mgt)	0.09 *(1.21)*	0-18	0.66 *(5.86)*	0-84
97761 (Prosthetic Tr)	0.00 *(0.00)*	0	0.31 *(5.94)*	0-115
G0281 (E-Stim: wounds)	0.00 *(0.00)*	0	0.04 *(0.77)*	0-15
G0283 (E-Stim: ua)	4.08 *(14.86)*	0-103	5.17 *(18.59)*	0-175
Physical Therapy Function:				
97116 (Gait Training)	46.79 *(45.45)*	0-216	50.70 *(44.83)*	0-195
97530 (Ther Act)	84.25 *(47.48)*	0-232	66.64 *(48.18)*	0-233
97535 (ADL Retraining)	0.25 *(3.05)*	0-47	0.21 *(2.06)*	0-25
97542 (W/C Mgt)	1.29 *(5.61)*	0-50	1.36 *(9.05)*	0-115
Occupational Therapy Impairment:				
97018 (Paraffin)	0.00 *(0.00)*	0	0.08 *(1.55)*	0-30
97024 (Diathermy)	0.65 *(5.16)*	0-60	2.04 *(12.18)*	0-125
97032 (E-Stim)	0.93 *(6.00)*	0-70	1.43 *(10.73)*	0-125
97035 (Ultrasound)	0.42 *(4.66)*	0-69	0.43 *(3.85)*	0-56
97110 (Ther Ex)	73.58 *(54.01)*	0-270	83.90 *(58.91)*	0-310
97112 (Neuro-Re-ed)	22.82 *(36.60)*	0-300	25.59 *(39.93)*	0-245
97124 (Massage)	0.00 *(0.00)*	0	0.16 *(3.10)*	0-60
97140 (Manual Therapy)	0.53 *(5.72)*	0-90	0.49 *(5.04)*	0-86
97532 (Cog Skills Dev)	4.14 *(14.09)*	0-110	4.12 *(17.61)*	0-210
97533 (Sensory Int)	0.04 *(0.77)*	0-15	0.04 *(0.78)*	0-15
97760 (Orthotics Mgt)	0.24 *(2.09)*	0-195	0.69 *(5.71)*	0-69
G0283 (E-Stim: ua)	2.21 *(13.11)*	0-195	3.32 *(15.36)*	0-150
Occupational Therapy Function:				
97530 (Ther Act)	73.91 *(51.41)*	0-291	66.95 *(54.09)*	0-265
97535 (ADL Retraining)	91.81 *(60.50)*	0-310	67.88 *(56.72)*	0-260
97542 (W/C Mgt)	4.07 *(11.50)*	0-75	2.19 *(9.98)*	0-102
Speech Therapy Impairment:				
97532 (Cog Skills Dev)	29.07 *(57.73)*	0-277	28.96 *(57.39)*	0-246
Speech Therapy Function:				
92507 (Com Tx)	35.20 *(62.20)*	0-283	36.04 *(68.41)*	0-269
92526 (Dysphagia Tx)	55.83 *(75.07)*	0-293	53.75 *(77.78)*	0-375

Note: Stim = stimulation; Ex = exercise; Re-ed = re-education; Mgt = management; Tr = training; ua = unattended; Ther = therapeutic; Act = activities; ADL = activities of daily living; W/C = wheelchair; Cog = cognitive; Dev = development; Int = integration; Com = communication; Tx = treatment.

4.4 CHANGES IN IMPAIRMENT AND FUNCTION BASED INTERVENTIONS OVER TIME

Because the proportions of impairment-based interventions and function-based interventions equaled 100 percent, and therefore were always inverse to each other, an ANOVA could not run, and therefore paired t-tests were used to measure change from the 5-day to the 30 day reporting period. (see Table 4.4 and Figure 4.1). Therefore, remaining analyses will primarily focus on function-based interventions, with the knowledge that impairment-based interventions are the inverse.

Table 4.4 Comparisons of Proportion of Impairment-based and Function-based Interventions at 5 and 30 Days

Interventions	5 day Means	30 day Means	*t*	*df*	Significance
Within Time					
Impairment-based Function-based	.417 .583		*-11.240*	374	.000
Impairment-based Function-based		.459 .542	*-5.230*	374	.000
Between Times					
Impairment-based	.417	.459	*-5.940*	374	.000
Function-based	.583	.542	*5.940*	374	.000

*With the Bonferroni adjustment, an alpha of p <.05/4 = p <. 0125.

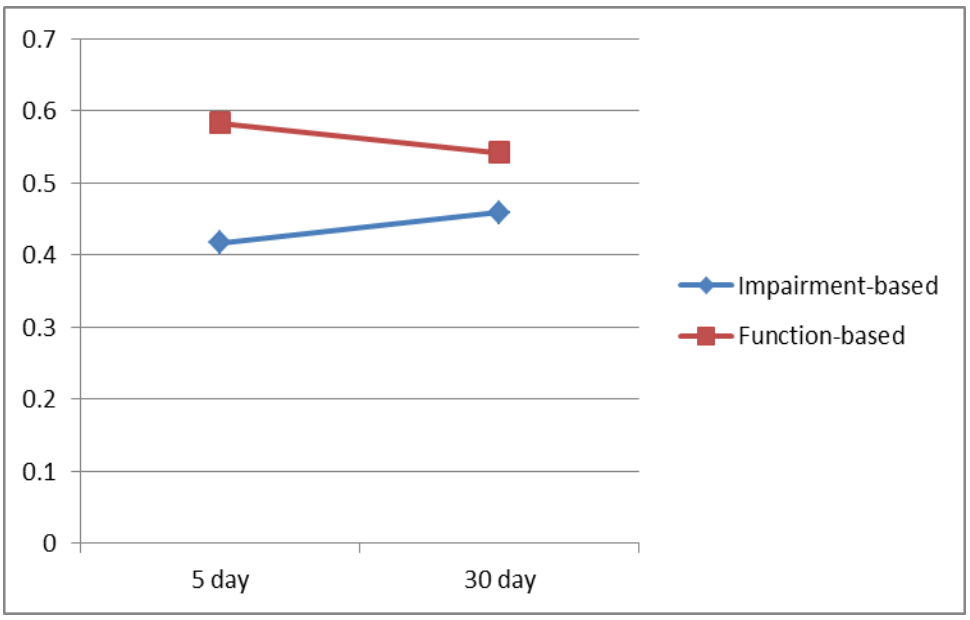

Figure 4.1 Illustrated Proportion of Means for Impairment-based and Function-based Interventions

Analyses indicated that at the 5 day and 30 day time points, the proportion of impairment-based and function-based interventions for the combined therapies differed significantly, with the greatest proportion of time focused on function-based interventions at both time points (*M*=.583; *M*= .542) (see Table 4.4).

When proportion of impairment-based and function-based intervention minutes were compared, by discipline, after the Bonferroni adjustments, only the OT function-based intervention minutes changed significantly between the 5 day and 30 day reporting periods. OT

impairment-based intervention minutes increased significantly, and OT function-based intervention minutes decreased significantly (see Table 4.5)

Table 4.5 Comparison of Proportions of Impairment-based and Function-based Interventions at 5 and 30 days, by Discipline

Intervention Proportions	5 day Means	30 day Means	*t*	*df*	Significance*
Between Times					
PT Function-based	.473	.453	*2.158*	360	.032
OT Function-based	.619	.532	*7.318*	359	.000
ST Function-based	.782	.749	*2.299*	213	.022

Note: PT = physical therapy; OT = occupational therapy; ST = speech therapy. *With the Bonferroni adjustment, an alpha of $p < .05/3 = p < .016$.

When the proportion of function based intervention minutes within each reporting period were compared among disciplines, even with the Bonferroni adjustment, all comparisons were statistically significant. Within the 5 day reporting period, the proportion of ST function-based intervention minutes was significantly greater than either OT or PT, and the proportion of OT function-based intervention minutes were significantly greater than PT. The pattern for the 30 day reporting period was exactly the same as the 5 day reporting period (see Table 4.6)

Table 4.6 Comparison of Proportions of Function-based Interventions within 5 day and 30 day Reporting Periods, by Discipline

Intervention Proportions	PT	OT	ST	*t*	*df*	Significance*
Within 5 day reporting period						
Function-based interventions	.473	.624		*13.162*	362	.000
	.482		.746	*-10.311*	242	.000
		.634	.751	*4.484*	246	.000
Within 30 day reporting period						
Function-based interventions	.450	.534		*6.169*	347	.000
	.461		.743	*-9.987*	225	.000
		.536	.746	*7.172*	223	.000

Note: PT = physical therapy; OT = occupational therapy; ST = speech therapy. *With the Bonferroni adjustment, an alpha of $p < .05/6 = p < .008$.

Effect sizes, or the magnitude of changes from Day 5 to Day 30, were moderate for impairment-based interventions, function-based interventions, and ADL end-splits (see Table 4.7).

Table 4.7 Effect Sizes of Impairment-based, Function-based and ADL End-Splits

Interventions	$\bar{X}_{post}$	$\bar{X}_{pre}$	SD_{pre}	*ES*
Impairment-based	.459	.417	.143	.294
Function-based	.542	.583	.143	- .287
ADL End-Splits	10.020	11.480	3.616	- .404

Note: $\bar{X}_{post}$ = 30 Days; $\bar{X}_{pre}$ = 5 Days; SD = standard deviation; ES = effect size

4.5 RELATIONSHIPS AMONG SELECTED DEMOGRAPHIC, CLINICAL AND THERAPY VARIABLES AT THE 5-DAY REPORTING PERIOD

4.5.1 Demographic Variable Relationships

Examining first order correlations among demographic (age, gender) and remaining variables, the two strongest relationships were age and the clinical variable of dementia (r_s = .27, p < .001), and age and the therapy variables of PT, OT, and ST function-based minutes combined (r_s = .22, p < .001), and these both were relatively weak relationships. (See Table 4.8).

4.5.2 Clinical Variable Relationships

The presence of an active neurological diagnosis of TIA, CVA, or stroke was most strongly and significantly related to a co-morbid diagnosis of dementia (r_s = .49, p < .001), and co-morbid diagnoses of urinary and fecal incontinence were strongly and significantly related (r_s = .73, p< .001). The next strongest relationships for urinary and fecal incontinence were with dependent toilet use (r_s = .42, p < .001, r_s = .35, p < .001), respectively. Dependence in bed mobility was also significantly related to dependence in toilet use (r_s = .58, p< .001), as well as urinary incontinence (r_s = .43, p < .001), and fecal incontinence (r_s = .35, p < .001) (see Table 4.9).

4.5.3 Therapy Variable Relationships

PT impairment-based minutes were significantly related to OT impairment-based minutes (r_s = .39, p < .001), and PT function-based minutes were significantly related OT function-based minutes (r_s = .26, p < .001) (see Table 4.9).

As indicated, OT impairment-based minutes were significantly related to PT impairment-based minutes (r_s = .39, p < .001) as well as two clinical variables, urinary incontinence (r_s = -.21, p < .001 and fecal incontinence (r_s = -.24, p < .001).

Minutes of ST impairment-based minutes were significantly related to the clinical variable of fecal incontinence (r_s = .28, p < .001) whereas ST function-based minutes were significantly related to the clinical variable of urinary incontinence (r_s = .30, p < .001) (see Table 4.8).

The variables most strongly related to the combination of PT, OT, and ST impairment-based intervention minutes were the discipline-specific minutes of PT and OT impairment-based interventions (r_s = .70, p < .001, r_s = .73 p < .001, respectively). ST impairment-based interventions were less strongly related to total minutes (r_s = .33, p < .001). The variables most strongly related to the combination of PT, OT, and ST function-based intervention minutes were the discipline-specific minutes of PT, OT, and ST function-based interventions (r_s = .44, p < .001, r_s = .57, p < .001 r_s = .61, p < .001, respectively) (see Table 4.8).

The relationships among the proportion of combined PT, OT, and ST impairment-based minutes were inversely related to the proportion of combined PT, OT and ST function-based intervention minutes. The strongest significant relationships for proportion of combined PT, OT, and ST impairment-based interventions were the discipline-specific minutes of OT and PT impairment-based interventions (r_s = .67, p < .001, r_s = .53, p < .001, respectively) and the minutes of ST function-based interventions (r_s = -.50, p < .001). Additionally, as urinary and fecal incontinence of residents decreased the proportion of combined minutes of PT, OT, and ST impairment–based interventions increased at the 5-day reporting period (r_s = -.24, p < .001, r_s = -.23, p < .001, respectively). (see Table 4.8)

The strongest significant relationships with the proportion of combined minutes of PT, OT, and ST function-based interventions were again the discipline-specific minutes of OT and PT impairment-based interventions (r_s = -.67, p < .001, r_s = -.53, p < .001, respectively) and the minutes of ST function-based interventions (r_s = .50, p < .001). Also, as urinary and fecal incontinence increased, the proportion of combined minutes that residents participated in PT, OT, and ST function–based interventions also increased at the 5-day reporting period (r_s = .24, p < .001, r_s = .23, p < .001, respectively) (see Table 4.8)

The presence of an active discharge plan to return to the community was also significantly and negatively related to the presence of urinary and fecal incontinence (r_s = -.22, p < .001, r_s = -.18, p < .001, respectively). Similarly, the presence of neurological diagnoses was also significantly and negatively related to the presence of an active discharge plan to return to community (r_s = -.20, p < .001) (see Table 4.8).

Table 4.8 Correlations Among Selected Demographic, Clinical and Therapy Variables

	Age	Gender	Neuro Dx_5	Dementia Dx_5	Urinary Inc_5	Fecal Inc_5	Bed Mob_5	Toilet Use_5	PT Imp_5	PT Fx_5	OT Imp_5	OT Fx_5	ST Imp_5	ST Fx_5	Combo Imp_5	Combo Fx_5	PropImp_5	PropFx_5	Discharge Plan	ADL End Split
Age	1.00																			
Gender	-.01	1.00																		
Neuro Dx_5	.02	-.02	1.00																	
Dementia	-.27***	-.05	.49***	1.00																
Urinary Inc_5	.02	.10	.15***	.19***	1.00															
Fecal Inc_5	.06	.07	.18***	.15**	.73***	1.00														
Bed Mob_5	-.01	.10*	.08	-.04	.43***	.35***	1.00													
Toilet Use_5	-.03	.09	.17***	.13*	.42***	.35***	.58***	1.00												
PT Imp_5	-.09	.00	.03	-.07	-.16**	-.17***	-.10	-.11*	1.00											
PT Fx_5	.09	-.01	-.06	.02	-.15**	-.16**	-.09	-.09	.04	1.00										
OT Imp_5	-.12*	-.01	.03	-.06	-.21***	-.24***	-.11*	-.10*	.39***	.07	1.00									
OT Fx_5	.14**	-.00	-.12*	-.05	-.04	-.07	-.01	.01	.14**	.26***	-.28***	1.00								
ST Imp_5	.01	-.07	.02	-.01	.05	.28***	.03	.08	-.14**	-.06	-.07	.00	1.00							
ST Fx_5	.12*	.04	.17***	.07	.30***	.06	.16**	.15**	-.20***	-.16**	-.16**	-.10	-.02	1.00						
ComboImp_5	-.14**	-.04	.02	-.07	-.20***	-.24***	-.11*	-.08	.70***	.03	.73***	-.09	.33***	-.28***	1.00					
ComboFx_5	.22***	.02	.02	.05	.13*	.11*	.06	.06	-.05	.44***	-.26***	.57***	-.07	.61***	-.27***	1.00				
PropImp_5	-.19***	-.06	-.01	-.08	-.24***	-.23***	-.15**	-.11*	.53***	-.19***	.67***	-.34***	.25***	-.50***	.84***	-.65***	1.00			
PropFx_5	.19***	.06	.01	.08	.24***	.23***	.15**	.11*	-.53***	.19***	-.67***	.34***	-.25***	.50***	-.84***	.65***	-1.00	1.00		
Discharge Plan	-.00	-.03	-.20***	-.16**	-.22***	-.18***	-.02	-.05	.12*	.11*	.15**	.10*	.05	-.04	.16**	.05	.08	-.08	1.00	
ADL End Split	.02	-.32	-.02	-.09	-.06	-.13*	.18***	.15**	.01	.03	.09	.10	.00	.00	.07	.07	.01	-.01	.11*	1.00

Note. Neuro=Neurological; Dx=Diagnosis; Inc=Incontinence; Mob=Mobility; PT=Physical Therapy; Imp=Impairment; Fx=Function; OT=Occupational Therapy; ST=Speech Therapy; Combo=Combination; Prop=Proportion; ADL=Activities of Daily Living

4.6 CLINICAL AND THERAPY PREDICTORS OF CHANGE IN THE ADL END-SPLIT

To determine the variables that comprised the best set of predictors related to a change in the ADL end-split, a stepwise logistic regression analysis was conducted. There were 56 variables that were screened for inclusion into the regression equation. Eighteen of the variables were CPT code/billing-related and the remaining 28 variables were derived from MDS data. The variables screened are listed in Tables 4.9 and 4.10. The variables that were significant in the chi-square analyses and Spearman's rho were then entered into a forward selection process. Fundamentally, the purpose of the forward selection process is to construct a model for the regression analysis that would contain the best set of predictors. Initially the model contains no predictors (Step 0). Variables are added into the model beginning with the one that would yield the greatest significance in improvement of the prediction (Step 1). The next variable of significance is added to the model containing the variable added in Step 1, initiating Step 2. This process continues until none of the remaining variables would significantly improve the prediction. However, because none of the function-based minutes variables (PT, OT, ST) entered the model, we "forced" them into the model because of the greater proportion of function-based intervention minutes at both the 5-day and 30-day reporting periods.

Table 4.9 CPT Code-based Variables* Considered in the Forward Selection Process for the Stepwise Logistic Regression Equation

Variable
Occupational Therapy Function-based CPTs
Occupational Therapy Impairment-based CPTs
Occupational Therapy Evaluation
Occupational Therapy Group
Physical Therapy Function-based CPTs
Physical Therapy Impairment-based CPTs
Physical Therapy Evaluation
Physical Therapy Group
Speech Therapy Function-based CPTs
Speech Therapy Impairment-based CPTs
Speech Therapy Evaluation
Combination of PT/OT/ST Function-based CPTs
Combination of PT/OT/ST Impairment-based CPTs
Combination of PT/OT/ST Evaluation
Combination of PT/OT/ST Group
Combination Total of Impairment and Function-based CPTs
Proportion of Impairment-based PT/OT/ST CPTs
Proportion of Function-based PT/OT/ST CPTs

*Grouping of billed minutes reported for the 5-day MDS reporting period

Table 4.10 Variables (MDS-extracted) Considered in the Forward Selection Process for the Stepwise Logistic Regression Equation

Variable
Age
Gender
Marital Status
Ethnicity/Race
Pre-Admission Living Arrangement
Brief Interview for Mental Status (BIMS) Summary Score
Acute Onset Mental Status Change
Presence and Frequency of Rejection of Care
Functional Rehabilitation Potential (resident-perceived)
Functional Rehabilitation Potential (direct care staff-perceived)
Functional Status (Self-Performance/Support Score):
Bed Mobility
Transfers
Eating
Toilet Use
Weight Loss
Presence of Pressure Ulcer Stage 1 or greater
Presence of Unhealed Pressure Ulcer Stage 1 or higher
Number of Stage 1 Pressure Ulcers
Number of Stage 2 Pressure Ulcers
Number of Stage 3 Pressure Ulcers
Number of Stage 4 Pressure Ulcers
Active Discharge Plan for Resident to Return to the Community
Determination of Feasibility of Discharge Plan by Resident and Care Planning Team

Table 4.10 (continued)

Variable
Active Diagnoses based upon 5-day MDS data:
Cancer
Heart/Circulation
Gastrointestinal
Genitourinary
Infections
Metabolic
Musculoskeletal
Neurological
Nutritional
Psychiatric/Mood Disorder
Pulmonary
Vision
Other
Dementia
Depression

After running the chi-square and Spearman's rho analyses, there were 8 remaining variables that were statistically significant at the screening phase, which is the factor we used to determine inclusion in the model: gender, age, combination of PT/OT/ST function-based CPT code-specific minutes, proportion of total combined PT, OT and ST function-based CPT code minutes, speech therapy function-based CPT code minutes, OT function-based CPT code minutes, bed mobility, and fecal incontinence. See Table 4.11 for an example of variables considered for inclusion in the model, and which analyses were used.

These variables were entered into the stepwise logistic regression, which yielded two models (See Table 4.12). In Model 1, the variables in order of contribution as predictors of change in the ADL end-split, were bed mobility at the 5 day reporting period and OT function-based CPT code-specific minutes at the 5 day reporting period. In Model 2, the variables in order of contribution as predictors of change in the ADL end-split, were bed mobility at the 5

day reporting period, presence of fecal incontinence, and OT function-based CPT code-specific minutes at the 5 day reporting period.

Table 4.11 Examples of Screened Variables and Screening Analyses

Examples of methods used to screen variables	X^2	r_s	
Age		x	
Gender	x		
Depression	x		
Dementia	x		
Resident functional rehab potential	x		
COMBO (PT, OT, ST) Min. Function-based Intervention		x	
Proportions of Combined (PT, OT, ST) Function-based		x	
PT Function-based		x	
OT Function-based		x	
ST Function-based		x	
Bed Mobility		x	
Fecal Incontinence	x		
Urinary Incontinence	x		
PT Function-based			NS
OT Function-based			SIG
ST Function-based			NS
X = Method Used; NS = Non-significant; SIG = Significant)			

COMBO = Combination; PT = physical therapy; OT = occupational therapy; ST = speech therapy

In Models 1 and 2, for participants who received OT function-based interventions, the odds of improvement in the ADL end-split were 1.004 times greater than those who did not receive OT function-based interventions. However, in applying Model 2, participants in this

study with a lower score (i.e., greater independence in performance) for bed mobility were 1.392 times more likely to demonstrate an improvement in the ADL end-split. In applying Model 3, participants in this study with a lower score (i.e., greater independence in performance) for bed mobility were 1.722 times more likely to demonstrate an improvement/remain the same in the ADL end-split. For participants who received OT function-based interventions, the odds of improvement in the ADL end-split were 1.004 times greater than those who did not receive OT function-based interventions, but this was no longer a significant contribution. For participants with fecal incontinence, the odds of a having reported improvement or same ADL end-split at the 30 day were less (.608) than for those who did not have fecal incontinence (See Tables 4.12 and 4.13).

Table 4.12 Stepwise Logistic Regression Models: Best Set of Predictors to Change in ADL End-Split

Model	Variable	*B*	*SE*	Significance	*Exp B (*OR*)*
Model 1	OT function	.004	.002	.031	1.004
Model 2	OT function	.004	.002	.040	1.004
	Bed mobility	.331	.116	.004	1.392
Model 3	OT function	.004	.002	.069	1.004
	Bed mobility	.544	.138	.000	1.722
	Fecal incontinence	- .497	.147	.001	0.608

Table 4.13 Significance of Logistic Regression Models

Model	Chi-square	*df*	Significance
1	4.752	1	.029
2	12.567	2	.002
3	24.974	3	.000

5.0 DISCUSSION

The purpose of this study was to describe the type of rehabilitation interventions (impairment-based and function-based) implemented and their intensity provided to SNF residents admitted with a diagnosis of stroke at the 5-day and 30-day reporting periods, and to examine what types of rehabilitation interventions at what level of intensity of minutes contributed most to a change in the ADL end-split between the 5-day and the 30-day MDS reporting periods. We hypothesized that from the 5-day to the 30-day reporting periods, the proportion of minutes of impairment-based interventions would decrease, and that from the 5-day to the 30-day reporting periods, the proportion of minutes of function-based interventions would increase. Neither of the hypotheses were supported.

5.1 DIFFERENCES IN FUNCTION-BASED VERSUS IMPAIRMENT-BASED INTERVENTIONS

The proportion of function-based interventions was significantly greater than the proportion of impairment-based interventions at both the 5-day and the 30-day reporting periods. Likewise, Bode, Heinemann, Semik and Mallinson (2004a) found that for those in acute, subacute and SNF rehabilitation facilities, who had a 4-week LOS, the residents had a greater proportion of

function-based interventions by PT, OT and ST among those residents with greater impairment. For less impaired residents, PT and ST had a greater proportion of function-based interventions, however, OT provided a greater proportion of impairment-based interventions. Similarly, other studies specific to OT that noted a higher percentage of time in OT interventions that were impairment-based (Brodie et al., 1994; Richards et al., 2005). DeJong et al., (2009) and Munin et al., (2010) also reported results indicating a higher percentage of rehabilitation service (inpatient and SNF) minutes overall were spent in exercise (i.e., impairment-based intervention). Also of note is that in our study function-based interventions steadily decreased over the 4 week LOS and impairment-based interventions steadily increased, whereas in the study by Bode et al. (2004a) impairment-based interventions peaked at week 2 and then declined for all three disciplines and for more and lesser impaired residents.

Even though residents received more function-based interventions at both the 5 day and 30 day reporting periods, the proportion of minutes spent on function-based interventions between 5 and 30 days did not increase significantly for either PT or ST. In contrast, for OT the change in proportion of minutes spent on function-based interventions decreased significantly from the 5 to the 30 day reporting period. Compared to the 5 day reporting period, OT therapeutic activities and ADL retraining (function-based interventions) decreased at the 30 day reporting period and therapeutic exercise and neuromuscular re-education increased (impairment-based). Although it is unclear why this change occurred it could be that as residents improved their overall function that OT interventions refocused on exercise and re-education to assist with strengthening or refinement of functional movements prior to discharge. This explanation is consistent with a study by Horn et al. (2005), of inpatient rehabilitation patients that found better discharge outcomes and rates of discharge to home were consistent with a

greater proportion of OT time spent on upper extremity control. In the same period, the greatest number of PT function-based intervention minutes was spent in therapeutic activities.

When we compared the proportion of function-based minutes among the three disciplines, an artifact related to the proportion of available interventions occurred. Because ST had only two function-based interventions (dysphagia-related interventions [CPT 92526]; communication-related interventions [92507]), the proportion of ST function-based interventions at both reporting periods was significantly greater than for PT or OT. At both the 5 and 30 day periods the proportion of OT function-based interventions was significantly greater than PT, which is consistent with the scope of practice for both disciplines and related literature from inpatient and home-based rehabilitation (Ballinger, 1999; Horn et al., 2005, Munin et al., 2010: initial days of their stay), and skilled nursing facilities (DeJong et al., 2009). Specifically for OT, the greatest proportion of function-based interventions was spent in ADL retraining (CPT 97535) and therapeutic activities (CPT 97530), whereas for PT it was spent in therapeutic activities (CPT 97530) and gait training. (CPT 97116).

Our findings add to the body of knowledge because our sample of 375 was comprised of SNF residents only and were not separated by level of impairment. Additionally, our data were derived from the MDS, which include bed mobility a task not included in the FIM, the tool used in most other studies reviewed (Bode et al., 2004a; Bode et al., 2004b; DeJong et al., 2009; Jette et al., 2004; Jette et al., 2005; Keith et al., 1995; Munin et al., 2005; Munin et al., 2010). Furthermore, bed mobility emerged as the strongest predictor of change in the ADL end-split outcome. Moreover, our study focused only on residents with an MDS diagnosis of CVA, TIA, or stroke, and used CPT codes and billing to delineate the types and intensities of the therapy

interventions provided, which extends what is known based on mixed SNF samples, mixed SNF and IRF samples, and samples of residents with orthopedic diagnoses.

Although we hypothesized that the proportion of minutes of impairment-based interventions would decrease from the 5-day to the 30-day reporting periods and that the proportion of minutes of function-based interventions would increase, this did not happen. Munin et al. (2010), in a study of rehabilitation and SNF settings combined, found a greater emphasis on impairment-based interventions by both PT and OT, with exercise being the primary intervention of both disciplines in the first 8 days of rehabilitation. Likewise, in the current study, the greatest number of impairment-based intervention minutes provided by PT and OT was in therapeutic exercise (CPT 97110). Although this result is consistent with other studies (Richards et al., 2005), the findings of this study indicate that there was substantially more time spent in therapeutic exercise than in neuromuscular re-education (CPT 97112), which is noteworthy given the inclusion criteria of an active diagnosis of a CVA, TIA or stroke. By definition, therapeutic exercise would focus on development of strength, endurance, range of motion, and flexibility, whereas neuromuscular re-education would focus on movement, balance, coordination, kinesthetic sense, posture, and or proprioception for sitting and/or standing (National Government Services, 2011). Given that the overall greater proportion of minutes were in function-based interventions, it is possible that the components of neuromuscular function were addressed within a specific function-based intervention. For example, therapeutic activities (CPT code 97530), is a function-based code that involves the use of dynamic activities to improve functional performance due to an impairment of mobility, strength, balance or coordination.

The use of physical agent modalities (PAMS) such as diathermy, e-stim, ultrasound, and paraffin accounted for only a small percentage of the total impairment-based interventions provided. This could, in part, be based upon application of a Medicare billing regulation which stipulates that only the skilled portion of a modality-based intervention can be reported as a billable service (National Government Services, 2011). Generally, this would include any portion of the modality-based intervention that, based on the condition of the patient, requires the unique skills of a therapist because of the level of complexity and sophistication of the intervention. Additionally, modalities are typically considered an adjunct to other types of therapeutic intervention, especially for OT. In 2008, the American Occupational Therapy Association released a position paper that further delineated the use of PAMS by OT practitioners as an adjunct only intervention, stating that utilization of PAMS as the sole intervention did not meet the definition of OT (McPhee, Bracciano & Rose, 2008).

Unlike for OT and PT, the CPT codes for speech therapy do not provide many choices for impairment-based interventions associated with function. For example, oral motor exercises necessary for successful oral intake (swallowing), are not identified with an impairment-based CPT code for ST. Thus, the proportion of minutes of ST function-based interventions was greater than ST impairment-based minutes (i.e., cognitive skills development [CPT 97532]). It should also be noted that the CPT code representative of cognitive skills development does have some restrictions among different therapy providers, who limit the use of this CPT code to residents with traumatic brain injury (not including stroke).

Of interest, however, is the relationship between ST interventions and the presence of urinary and/or fecal incontinence. Of the three disciplines (PT, OT, and ST), ST was the only discipline in this study that had a strong and significant positive correlation between minutes of

ST impairment-based interventions and fecal incontinence, as well as minutes of ST function-based interventions and urinary incontinence, indicating that ST minutes increased as resident incontinence increased at the 5 day reporting period – perhaps reflecting a caseload of residents with greater illness severity and an inability to communicate the need for bowel and bladder assistance (Brittain, Peet, & Castleden, 1998; Hatfield et al., 2005) The strong positive ST relationship with urinary and fecal incontinence may have also influenced the proportion of combined PT, OT, and ST minutes and urinary and fecal incontinence, which was again positive and significant. In contrast, PT and OT impairment-based interventions, and PT function-based interventions significantly and negatively associated with urinary and fecal incontinence, indicating that therapy minutes increased as incontinence decreased.

5.2 PREDICTION OF ADL END-SPLITS

Stepwise logistic regression analysis identified the best set of predictors that contributed to a change in the ADL end-split between the 5-day and 30-day MDS reporting periods. The predictors were bed mobility status, the presence of fecal incontinence, and minutes of occupational therapy function-based interventions. Previous research related to the intensity of therapy interventions and functional gains is consistent with our results. Keith et al., (1995) indicated that greater intensities of therapy led to better functional outcomes. Likewise, studies by Hatfield et al., (2005) and Horn et al., (2005) indicated that greater amounts of time spent in function-based, higher level activities and tasks led to better functional outcomes. Although Richards et al., (2005) found that a higher percentage of OT time was spent in impairment-based

interventions, they also found that it was the function-based interventions that led to better functional outcomes, which is consistent with the findings of this study. Bode, Heinemann, Semik, and Mallinson (2004b) also found that greater intensity in function-based interventions led to greater functional outcomes, although the greater intensity of OT interventions were impairment-based. Brodie et al. (1994) noted that time spent in OT assessment was strongly related to a positive discharge outcome. It is possible that a thorough assessment can lead to a specific treatment plan that directly targets the functional strengths, needs and deficits of the resident, and therefore, impacting the types of interventions (impairment- or function-based) provided by the clinician.

The findings of this study related to the predictive value of fecal incontinence for ADL independence are consistent with previous studies that have documented fecal incontinence (Dam et al., 1993) upon admission to a rehabilitation facility as a predictor of poorer outcomes. Brittain et al. (1998) also note that urinary and fecal incontinence among stroke patients is associated with poorer discharge outcomes, disability, and mortality within 6 months of the stroke. The presence of fecal incontinence in our residents may be an indication that the residents had greater clinical complexities that impeded positive responses to interventions. The relationship of decreasing fecal and urinary incontinence and increasing minutes of PT and OT interventions would be consistent with that explanation.

Our findings also indicated positive relationships between the functional activities of bed mobility and toilet use with urinary and fecal incontinence. Brittain et al. (1998) also noted that functional mobility was correlated with incontinence. Interventions related to mobility and incontinence are within the PT and OT scopes of practice (American Physical Therapy Association, 2011; American Occupational Therapy Association, 2002). It is unclear whether

any of the therapy interventions specifically targeted the presence of incontinence, either via neuromuscular re-education, functional mobility or compensatory self-care strategies, or if the presence of fecal incontinence was a marker of clinical complexity that precluded a reasonable expectation of progress as required by federal and numerous state regulations (National Government Services, 2011). This study further documented that there is a strong and significant association between the presence of incontinence and a diminished likelihood of an active discharge plan for the resident to return to the community, which is also consistent with previous literature (Brittain et al., 1998; Dam et al., 1993).

5.3 CLINICAL IMPLICATIONS

The results of this study have clinical significance. Horn et al., (2005) called attention to the need to challenge clinical assumptions and fundamental theories that direct clinical pathways that begin with intervention at the level of impairment. As Horn et al. (2005) assert, fundamental theories within rehabilitation services that encourage establishing component strengths, such as 'proximal stability', developmental processes, or sequence of motor recovery, are consistent with a logic of treating impairment first and function later. However, this study, as well as others (Horn et al., 2005; DeJong et al., 2004; Hatfield et al., 2005; Horn, 2006; Munin et al., 2005) provides compelling results which indicate that the intensity of rehabilitation services should be focused on function-based interventions. Studies by Horn et al. (2005) and Hatfield et al. (2005)

further indicate that those function-based, higher level tasks should be introduced in the initial phases of therapeutic interventions.

As we move toward functional reporting, which will be required initially for Medicare claims for services provided to outpatients covered by Part B therapy benefits and for those who receive services in a Comprehensive Outpatient Rehabilitation Facility (CORF) (Centers for Medicare and Medicaid Services, 2012a), it will be important to monitor the effect of this trend on long-term care reporting requirements. Therapy functional reporting will require therapists to apply a 'G-code' which will represent a specific functional limitation. Selection of a modifier will also be required that will indicate the severity or complexity of the functional limitation. Moreover, Medicare will also require updates via specified reporting periods of resident progress based upon therapy assessment/re-assessment. Moreover, insurance providers, in addition to Medicare, will require updates related to functional status, the progress towards a functional goal, but not specifically the components that make such functional abilities possible (e.g., postural control vs. lower body dressing).

5.3.1 Limitations

Although this study does contribute to the body of knowledge related to the intensity of rehabilitation services provided in the skilled nursing facility setting and the related functional outcomes as indicated by the ADL end-split, there are several limitations to be considered.

The initial database for this study included 1,041 participants from 134 centers and 12 states, under the umbrella of a single rehabilitation provider. The provider requires the use of common clinical guidelines and protocols in all facilities, and personnel are trained and followed

up to prevent protocol drift. Also, our study included only one MDS diagnostic item (CVA, TIA, or stroke) thus limiting the generalizability of the results to other diagnoses. Moreover, because no separate analyses were conducted as a part of this study for facility or geographic variation, this also limits the generalizability of the results.

The limitations associated with the MDS are not limitations of the MDS itself. However, when using the MDS for research, unique wording and coding of items as well as data manipulation, presented challenges to the construction of the methodology and analysis of the MDS data.

Due to the wording of some items within the MDS, such as item K0300 Weight Loss, it was not possible to differentiate between an instance of no weight loss (code = 0) from the presence of a weight loss being "unknown" (code = 0), and thus such items could not be included. There are also items within the MDS that are representative of a standardized assessment (e.g., the Brief Interview for Mental Status (BIMS), and if a resident is unable to participate in the BIMS, a staff assessment for mental status is utilized which is based upon staff perception of relative cognitive skills. Also, there is no summary score associated with the staff assessment for mental status.

Portions of the data required manual manipulation in order to prepare it for statistical analysis. This manipulation required manual calculation of an individual component of the ADL end-split (bed mobility, transfers, toilet use, and eating), which could have included errors. Finally, re-coding of variables for analysis to make them dichotomous (ADL end-split score versus ADL end-split indicative of same/better, or worse) could change the sensitivity of some items.

Because this was a secondary data analysis of Minimum Data Set (MDS) items, the first limitation is common to secondary data analyses: the coding of the MDS as well as the selection of time increments and CPT code selection are reliant upon the clinicians' (nurse and/or therapist/therapy assistant) entry of accurate information. Both the MDS and the therapy billing require documentation that supports the scoring or billing entered, but the interpretation of CPT codes can also be a matter of therapist and nurse interpretation, especially for items that require staff judgment. Because this study used a de-identified data set we could not review the medical record or rehabilitation service documentation, but outliers were identified during exploratory data analysis and left as blank, or the case was deleted

5.3.2 Recommendations

Recommendations for future studies include the isolation of those specific MDS items that have a resident-completed versus staff-completed components (such as the resident-completed BIMS versus staff completed assessment for mental status). The potential of the method used to obtain such information impacting key MDS items (e.g., mental status) could have implications for the change in the ADL end-split over time.

Although the ADL end-split is an indicator of the functional status of a resident, it is recommended that further research should include other items not contributing to the ADL end-split score such as resident's ability to walk in the room, walk in the corridor, locomotion on/off the unit, dressing, personal hygiene, and/or bathing and their relative associations with the types and intensities of rehabilitation services and discharge dispositions. Additionally, because the MDS does not include assessment data on the more complex instrumental activities of daily

living (IADL), necessary for community dwelling, these data need to be collected by therapy staff and also used in research.

6.0 SUMMARY

The purpose of this study was to describe the type of rehabilitation interventions (impairment-based versus function-based) implemented and the intensity provided to SNF residents admitted with a diagnosis of stroke at the 5-day and 30-day reporting periods, and to examine what types of rehabilitation interventions at what level of intensity of minutes contributed most to a change in the ADL end-split between the 5-day and the 30-day MDS reporting periods.

Our sample was drawn from a single provider source, and the initial database included 1,041 participants from 134 centers and 12 states. Three hundred seventy-five cases met the inclusion/exclusion criteria. The mean age of the sample was 78.29 years, and the majority were White females.

The hypotheses (impairment-based interventions would decrease at the 30 day reporting period compared to the 5-day reporting period and function-based interventions would increase at the 30-day reporting period compared to the 5-day reporting period), were not substantiated. This study, however, did document a greater proportion of function-based rehabilitation service interventions at both the 5- and the 30-day reporting periods.

Our findings extend what is known about SNF rehabilitation because our sample of 375 was comprised of SNF residents with an MDS diagnosis item of CVA, TIA or stroke, compared to previous studies which included mixed SNF samples, mixed SNF and IRF samples, and

samples of residents with orthopedic diagnoses. Moreover, the data for our study came constituted all residents from the 5-day reporting period to the 30-day reporting period of all SNFs in a provider system, versus single or multiple SNFs from various providers. Also, because our data were derived from the MDS, the bed mobility item (a task not included in the FIM -- a common tool used in rehabilitation outcomes studies), emerged as the strongest predictor of positive change in the ADL end-split outcome.

The findings from this study also affirmed the significant impact of function-based OT interventions (ADL retraining, therapeutic activities, wheelchair management) on positive changes in functional outcomes (ADL end-split). In addition to bed mobility and function-based OT as significant predictors of change in functional outcomes, the presence of fecal incontinence also emerged as a predictor of negative change in functional outcomes. Further research is needed to explore the use of targeted impairment- and function-based interventions that are directly linked to bed mobility, fecal incontinence and resultant outcomes.

Results of this study also indicated significant associations between both impairment- and function-based interventions and the presence of urinary incontinence, fecal incontinence, and dependence in bed mobility and toilet use. Incontinence was also associated with the lack of a discharge plan to return to the community. Further research should focus on delineating the intensities and proportions of both types of interventions and their impact on clinical variables as well as discharge planning.

As a result of the mandate for functional reporting versus impairment reporting, which will require the need to establish functional limitations and their severity or complexity, further research is needed to examine the impact of impairment-based and function-based interventions on functional outcomes. Concomitantly, the findings of Brodie et al. (1994), which indicated that

a greater proportion of time spent in occupational therapy assessment was the best predictor of positive discharge outcomes, proportion of assessment time should be examined for each discipline (PT, OT, ST), as well as for the combined interdisciplinary team.

Given the trend toward functional reporting, the data generated by functional reporting should be incorporated into a replication of this study, using the categories of impairment, function and severity of illness as predictors of patterns of outcomes. A later study could build on the data generated by the above study, but examine the patterns of service associated with the patterns of outcomes.

In reference to the types and intensities of various rehabilitation interventions, further studies are recommended that would include standardized assessments (including IADL), intervention protocols associated with each CPT code, and documentation reviews to rate level of adherence to standardizations, protocols and CPT code definitions.

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