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Inpatient Stroke rehabilitation: Ethnic and Psychosocial Predictors of Recovery Outcome

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Inpatient Stroke Rehabilitation: Ethnic and Psychosocial Predictors of Recovery Outcome

by

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Each person whose signature appears below certifies that this dissertation in his/her opinion is adequate, in scope and quality, as a dissertation for the degree Doctor of Philosophy.

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ABBREVIATIONS

CDC	Center for Disease Control
CVA	Cerebrovascular Accident
NCHS	National Center for Health Statistics
AHA	American Heart Association
HSS	Health and Human Services
U.S. DHHS	United States Department of Health and Human Services
LLUMC	Loma Linda University Medical Center
FIM	Functional Independence Measurement
UDSMR	Uniform Data System for Medical Rehabilitation
ADL	Activities of Daily Living
LOS	Length of Stay
PSROP	Post Stroke Rehabilitation Outcomes Project
HMO	Health Maintenance Organization
SES	Socioeconomic Status
DHCS	Department of Health Care Services
FFS	Fee-For-Service
IRF	Inpatient Rehabilitation Facilities
IRF-PPS	Inpatient Rehabilitation Facilities- Prospective Payment System
PPS	Prospective Payment System
MMSE	Mini-Mental State Examination
ANOVA	Analysis of Variance
MANOVA	Multivariate Analysis of Variance

SDA	Seventh-Day Adventist
SPSS	Statistical Package for the Social Sciences
SQRT	Square Root
$\underline{M}$	Mean
HIPPS	Health Insurance Prospective Payment System

ABSTRACT

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by

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As the new focus on preventative medicine has emerged, research continues to expand on diseases that impact physical and cognitive functioning, lead to long-term disability, and increase the risk of mortality. Stroke or cerebral vascular accident (CVA) has been identified as one of such diseases by the Centers for Disease Control (2007). Past literature has identified disparities between ethnicity, socioeconomic status, and other diseases in the recovery of stroke.

The aim of the current study was to investigate the effects of ethnicity and psychosocial factors on stroke recovery during inpatient rehabilitation. The study included 446 patients who had suffered an ischemic and/or hemorrhagic stroke and were admitted into inpatient rehabilitation for stroke recovery at Loma Linda Rehabilitation Institute from January 1005 through August 2009. Functional Independence Measurement (FIM) scores were used to measure change in overall functioning and cognitive functioning between the ethnic groups, type of insurance, marital status, and socioeconomic status. Supporting past stroke literature, ethnic differences between Caucasians, African Americans, and Hispanics were predicted to emerge in cognitive and

overall improvement, time delay from onset of stroke to admission into inpatient rehabilitation, and length of stay. It was further predicted that overall improvement would be associated with the patient's type of insurance, marital status, and socioeconomic status.

In contrary to the predictions, significant differences in overall and cognitive functioning, time delay and length of stay did not emerge between the Caucasian, African American, and Hispanic ethnic groups. Overall improvement was not associated with marital status or socioeconomic status. However, significant differences in overall improvement did emerge between the group of patients who had private insurance and those who had Medicare plus medical insurance. The patients with private insurance had better overall improvement. No significant differences were found between private insurance patients and those with Medicare or MediCal alone.

The results suggest that the margin on ethnic and socioeconomic status disparities may be closing in at one facility, as every patient regardless of the socioeconomic status, race/ethnicity, type of insurance, or marital status is treated with the same highest quality of care.

CHAPTER ONE

INTRODUCTION

As we enter the second decade of the twenty-first century, a number of new developments in the medical and health fields have had a significant impact on our lives. As one evidenced result, a person's lifespan has increased to longer than ever before. In the United States, the average lifespan has moved from 76.5 years as of 1997 to 78.1 years as of 2008 (Center for Disease Control; CDC, June 2009). A new focus on preventative medicine has also emerged. Research continues to expand on diseases that: 1) impact physical and cognitive functioning, 2) contribute to other diseases, 3) lead to long-term disability, and 4) increase the risk of mortality. Stroke or cerebral vascular accident (CVA) – an event that occurs when blood supply is blocked to part of the brain or when there is a rupture to an artery or blood vessel in or around the brain and results in temporary or permanent damage to part of the brain – has been identified as one such disease by the Centers for Disease Control (CDC) (Heron, Hoyt, Murphy, Xu, Kochanek, & Tejada-Vera, 2009). When considered separately from other cardiovascular diseases, stroke ranks No. 3 among all causes of death, behind diseases of the heart and cancer (Heron, Hoyt, Murphy, Xu, Kochanek, & Tejada-Vera, 2009). Stroke is also a leading cause of serious, long-term disability in the United States (Heron, Hoyt, Murphy, Xu, Kochanek, & Tejada-Vera, 2009). According to the American Heart Association, the estimated cost of direct and indirect cost of stroke for 2010 was $73.7 billion.

Given our increased life spans, the long-term impact of stroke is only likely to grow. This is likely to be further compounded by the increased survivability from stroke. According to the American Heart Association (Lloyd-Jones, Adams, Carnethon et al.,

2009) during the period between 1996 through 2006, the stroke death rate fell 33.5 percent and the actual number of stroke deaths fell 18.4 percent. Although there has been a decline in stroke death rates in recent years, stroke statistics in the United States remain high. Among adults age 20 and older, the estimated prevalence of stroke in 2006 was 6,400,000 (about 2,500,000 males and 3,900,000 females) (Lloyd-Jones, Adams, Carnethon et al., 2009). Every year about 795,000 people experience a new or recurrent stroke. About 610,000 of these are first attacks, and 185,000 are recurrent attacks (Lloyd-Jones, Adams, Carnethon et al., 2009).

Stroke incidence, prevalence, mortality, and long-term disability is not uniform with respect to gender, age or ethnicity. Increasingly, awareness and attention of health disparities between minorities is beginning to emerge. There has also been a corresponding growing appreciation that disparities are complex. Momentum is building and recent years have brought some improvement in health disparities and increasing funds dedicated to their reduction. As one recent example, on April 08, 2011 the United States government and Health and Human Services (HSS) released a report recommending the steps to reduce health disparities in minority populations. Included in the HHS plans is the promotion of new studies comparing which treatments work best for diabetes, asthma, arthritis and heart disease in minority populations, creating an online registry of certified interpreters that doctors or hospitals can use for patients who do not speak English, and developing reimbursement incentives to improve the quality of care for minority populations, such as better prevention of heart disease and stroke.

The objective in the following sections of the introduction to the current study will be to provide the reader with a better understanding of the gravity of stroke and the

recovery process. We will start by reviewing the prevalence and mortality in stroke. Next, we will review how ethnic disparities have been examined and included in past stroke research. Then, the inpatient rehabilitation method of stroke recovery treatment and the method to measure functional improvement will be discussed. Next we will discuss the common psychosocial factors that were suggested to assist or impede with stroke rehabilitation and recovery in past studies, followed by a look at how cognitive functioning fits in the process of stroke rehabilitation. We will see what past research has suggested regarding overall improvement in stroke rehabilitation. Finally, the psychosocial factors and the hypotheses examined in the current study will be introduced.

Disparities in Incidence, Prevalence, & Mortality

Although stroke can occur at any age, according to current acturial data, approximately 75% of all strokes occur in those who are over age 65 (CDC, 2009). In addition, a 55-year-old person's risk of having a stroke more than doubles every decade. According to the CDC, when controlling for age, ethnic differences were observed in stroke mortality, with a higher death rate among the African-Americans than among Caucasians. As several examples supporting the CDC, Jones et al. (2000) found similar ethnic differences in racial variation in initial stroke severity, with African-Americans experiencing a higher in-hospital mortality rate than Caucasians among those hospitalized for stroke. Additionally, Lloyd-Jones, Adams, Carnethon et al., (2009) reported that 70.5% of all males who died from stroke were African-American, and 60.7% of all female stroke deaths were among African-American females. Moreover, in the North Manhattan Study, White et al. (2005) examined ischemic stroke subtype incidence among

Caucasians, African-Americans, and Hispanics. Controlling for age, Hispanics and African-Americans were found to have a higher rate of all ischemic stroke subtypes than Caucasians. The authors found that hypertension, smoking, diabetes, and hypercholesterolemia were significantly more common behaviors endorsed among African-Americans and Hispanics than Caucasians; they suggested that this and genetic susceptibility possibly attributed to the racial disparities. Similar findings were reported by Schneider et al. (2004). These differences also occur at younger ages. African-American children have relative risk of 2.12 compared to Caucasian children, and Hispanic and Asian children have a lower risk of 0.76 (Neurology, 2003).

In addition to stroke-related health disparities between minority groups, gender differences also exist. The risk of stroke is more than double for women between the ages of 45 and 54 than their male counterparts, and four times greater than for women between ages 35 to 44 (CDC, June 2009). Ayala et al. (2002) found that stroke deaths were lower for females between the ages of 25 to 64, but higher among women aged $\geq$ 65, than their male counterparts. Geographic differences have also been observed, with the highest stroke mortality rates in the country being found in southeastern United States.

For a better perspective of stroke prevalence in the United States, stroke statistics for ethnic groups are shown as follow:

The prevalence of stroke for persons 20-years and older in the U.S. (U.S. DHHS, 2000)

Males		Females	
Caucasian	2.2 %	Caucasian	1.5 %
African-American	2.5 %	African-American	3.2 %

Mexican American 2.3 % Mexican American 1.3 %

The percentage of deaths one year after a first-stroke:

Age 70 and older:

Caucasian	Men = 24%	Women = 27%
African-American	Men = 25%	Women = 22 %

Age 40 to 69:

Caucasian	Men = 14%	Women = 20%
African-American	Men = 19%	Women = 19%

Stroke Death Statistics for 2005 per 100,000:

Caucasian	Men = 44.7	Women = 44.0
African-American	Men = 70.5	Women = 60.7
Hispanic/Latino	Men = 38.0	Women = 33.5
Asian/Pacific Islander	Men = 41.5	Women = 36.3
Nav. Indian/Alaska Native	Men = 31.3	Women = 37.1

(NCHS, CDC. Compressed Mortality File: Underlying Cause of Death from: http://wonder.cdc.gov/mortSQL.html).

Although ethnic/racial disparities are already included in health reports by the U.S. Government, it has only been recently that there has been more formal focus on the reduction of these disparities. According to the U. S. Department of Health and Human Services (U.S.DHHS, 2000), two goals were introduced in their presentation of Healthy People 2010. In Goal 2, the U.S. government committed to eliminating health disparities in gender, ethnicity and race, education, income, geographic location, disability, and

sexual orientation, with the explanation that race and ethnic health disparities are outcomes of multifaceted interactions between genetic variations, particular health behaviors, and environmental factors. In keeping with the proposal of the U. S. Government to eliminate ethnic/racial health disparities, it is only logical to examine the specific racial/ethnic disparities that may appear in stroke recovery. The information that is attained can only better serve to reduce the ethnic differences in this arena of health. To examine ethnicity as a variable in the current study, it is important to first obtain a better appreciation of possible explanations for why ethnic/racial health disparities exist. Thus, common models used to interpret racial/ethnic health disparities are reviewed in the next segment.

Ethnic/Racial Health Disparities Models

Several models have been developed to explain the possible cause(s) for ethnic/racial health disparities, including the Racial-Genetic Model (Dressler, Oths, & Gravlee, 2005), Health-Behavioral Mode (Bassett et al., 2002), Socioeconomic Mode (Dressler, Oths, & Gravlee, 2005), Psychosocial Stress Model (Dressler, Oths, & Gravlee, 2005; Jonas and Lando, 2000); Knox, Hausdorff, & Markovitz, 2002), General Stress Model (Dressler, Oths, & Gravlee, 2005;Schum et al., 2003; James et al., 1983; Dressler et al., 1998; Levenstein et al., 2001; Markovitz et al., 2004; Oths et al., 2001), and Structural-Constructivist Model (Dressler, Oths, & Gravlee, 2005; Kaufman and Cooper, 1999; and Krieger, 2003).

Each model's constructs of causal relationships has had certain strengths and weaknesses. In an attempt to examine competing causal interpretations of racial

disparities in health, Kawachi, Daniels, and Robinson (2005) posited that three general approaches have been historically applied. In the first approach, race is viewed as a biologically meaningful category and racial disparities in health as reflecting inherited susceptibility to disease. The attribution of racial disparities in health to inherited biological differences in susceptibility to disease is rooted in a long-standing U.S. tradition that continues to the present day. In the second approach, race is treated as a proxy for class and views socioeconomic stratification as "the real culprit" behind racial disparities. In the third approach, race is treated as neither a biological category nor proxy for class, but as a distinct construct, similar to caste. The authors posited that this third approach appears to serve as a better model for the interpretation for racial disparities, as it simultaneously accounts for the independent and interactive effects of both class and race in producing health disparities. The study authors outline three sets of propositions that follow from the third model: 1) race should not be conceptualized as a proxy for class; 2) racial disparities should not be analyzed without simultaneously considering the contribution of class disparities, and 3) potential interactions should be considered between race- and class-based disparities.

Given that disparities exist in prevalence and treatment outcome, the role that ethnic/racial disparities play in the effectiveness of inpatient rehabilitation efforts and recovery outcome must be explored. It is only after presence and magnitude of possible disparities is determined that interventions aimed at their reduction can be effectively developed and implemented. In the following sections, the following with be reviewed: the function of inpatient rehabilitation facilities, how recovery is measured, and the

psychosocial factors that may contribute to rehabilitation outcome among stroke survivors.

Inpatient Rehabilitation

Although inpatient stroke rehabilitation has formally existed in its present form for over forty years, understanding of the recovery process remains in its relative early stages, including the inpatient rehabilitation setting. Horn et al. (2005) observed that conventional theories of stroke rehabilitation held that therapies ought to be gradual from the patient's current functioning level to a normal level of function. Additionally, patients were not be pushed too much for fear that recovery outcome would be compromised due to the patients' perception of failure, stress or even depression.

More recently, De Jong, Horn, Conroy, Nichols, and Healton (2005) described stroke inpatient rehabilitation as a labor intensive event that occurred while in the hospital environment. According to the authors, stroke rehabilitation varies for each patient because it includes customized interventions based on patient differences that include many clinical and psychosocial factors. These factors may include, but are not limit to, the patient's disabilities, individual differences, type and severity of stroke, location of stroke, age, insurance type, ethnicity and cultural differences, time of admission to rehabilitation, and family support (Horn et al., 2005; McNaughton, De Jong, Smout, Melvin, & Brandstater, 2005; Horner, Swanson, Bosworth, & Matchar, 2003; Chiou, Keng, Graves, Chan, & Rintala, 2006; Ottenbacher, Campbell, et al., 2008; Stansbury, Jia, Williams, Vogel, & Duncan, 2005).

De Jong, Horn, Smout et al. (2005), McNaughton et al. (2005), and Horn et al. (2005) reported that inpatient stroke rehabilitation centers more commonly were facilitated by a broad interdisciplinary team that included physical therapists, occupational therapists, speech therapists, psychologists, specialized nurses, dieticians, medical physician, and possibly a chaplain, that coordinated the treatment and care of stroke patients. As an example, Loma Linda University Medical Center's Inpatient Rehabilitation Institute includes all of these aforementioned components as part of its treatment team. In addition to speech, physical and occupational therapies, special dietary planning, and medical care, LLUMC's program includes neuropsychological consultation, individualized discharge planning that is initiated from onset of admission, education for the patient's family, stroke caregiver instruction and support groups, assessment of equipment needs, ongoing assessment of the patient's progress, and activities for community re-entry, and spiritual support.

The view that stroke inpatient rehabilitation was important to stroke recovery was further supported by Somerford, Lee, and Yau (2004). Somerford, Lee, and Yau conducted a large study with 6,469 patients who were identified as first-time ever ischemic stroke admissions to hospitals in Western Australia over a period of four and a half years. They found that patients were less likely to be misdiagnosed or die from stroke during their hospitalization if they were admitted into a hospital that maintained a stroke unit. Further, after controlling for demographic and personal characteristics as well as comorbid conditions, patients admitted into hospitals with stroke units showed improvement without additional hospital stay compared to the patients who were misdiagnosed in rural hospitals without a stroke unit and had to transfer later to a stoke

unit. Early diagnosis of ischemic stroke resulted in earlier intervention and rehabilitation that, incidentally, also reduced hospital costs.

Moreover, new information on therapies, drugs, nutrition, ethnicity disparities, and other modes of treatment continue to improve stroke impatient rehabilitation (Horn et al., 2005). According to Horn et al. (2005), early aggressive therapy was associated with higher total functional independence measurement scores and better recovery outcomes, regardless of stroke severity, age, or ethnicity. Measuring the progress of recovery is a vital part of the inpatient rehabilitation process. This requires an accurate, reliable assessment tool that measures functional independence and gain. One such widely used instrument for measuring functional independence gain, as well as obtaining a baseline measure is the Functional Independence Measurement (FIM).

Functional Independence Measurement (FIM)

The Uniform Data System for Medical Rehabilitation (UDSMR, 1999-a) described Functional Independence Measurement (FIM) as a functional assessment instrument that is used to measure physical and cognitive abilities. According to the UDSMR, the FIM has been recognized nationally and internationally as a valid and standardized rating instrument for over 25 years. Due to its validity and reliability, the FIM is the gold standard for tracking functional change in rehabilitation hospitals, subacute facilities, skilled nursing facilities, Veterans Administration programs, long-term care hospitals, and other settings related to care and rehabilitation. There have been well over 1,300 published peer-review journal articles using the FIM (UDSMR, 1999-b). The FIM instrument has remained a valuable tool in treatment and discharge planning,

and assessment of progress during and post-rehabilitation due to its standardization and high test-retest reliability (0.95) (Young, Fan, Hebel, & Boult, 2009; Ottenbacher, Hsu, Granger, & Fiedler, 1996; Salter et al., 2005).

The FIM is an instrument comprised of an ordinal scale with 18 items, each item ranging from one to seven (Wright, 2000). A rating of seven indicates "completely independent" functional status, whereas, a rating of less than six indicated the need for supervision or assistance of another person. On the other hand, a rating of one is characterized as the patient requiring "total assistance", and indicated that the patient performed less than 25% of the task. Independent performance is measured in six areas of functioning that include self-care, sphincter control, transfers, locomotion, social cognition, and communication (Wright, 2000; Salter et al., 2005; Ottenbacher, Hsu, et al., 1996). Self-care includes eating, grooming, bathing, dressing upper and lower body, and toileting. Sphincter control is characterized by bladder and bowel management, and swallow. Transfers include to and from bed, wheelchair, chair, toilet, shower, and tub. The use and navigation of wheelchair, walking, and using stairs are included in the assessment of locomotion. The areas of social cognition and communication include visual and auditory comprehension, vocal and non-vocal expression, memory, problem solving, and social interaction. Finally, a range between the possible total lowest score of 18 (total assistance) to the total highest score of 126 (completely independent) is calculated by adding all scores from each area assessed.

As well as discussing the characteristics of the FIM instrument and its use, it is also necessary to be aware of the limitations of its use. The FIM instrument was originally designed to predict the burden of care of a patient after being discharged from

an acute or inpatient rehabilitation facility. However, the limitations of the instrument are that the FIM is not sensitive to certain changes including cognitive domains. In addition, the FIM has ceiling and floor effects and decreased sensitivity in certain situations. As an example, take a patient who is able to climb 2 or 3 steps independently but who may not need to climb more because he or she does not have more than 1 or 2 steps in the home. Because the patient does not climb the amount of steps on the FIM scale for the level of independence, the patient would be documented as not independent with an artificially lower FIM score. As another example of the FIM's lack of sensitivity, take a patient who can only walk 5 feet with assistance when admitted into rehabilitation and is able to walk 100 feet with supervision. Such a person will not show any FIM gain because the FIM change includes walking 150 feet (Cournan, 2011). These two examples show that, alone, the FIM scores do not always reflect the patient's abilities and should be combined with documentation with functional descriptions from observation and working with the patients. Adding to the limitations, the FIM is subjective based on the professional's observation and interaction with a given patient. A patient may not participate independently in activities if the activity is undesirable, the patient does not connect with the therapist, or the patient does not like the discharge plan. Lastly, the FIM has only several areas of cognitive, communication, and behavioral functioning; where cognitive functioning is an imperative part of discharge planning, in predicting independent living and cognitive outcome, especially in assessment of patients with brain injury (Krivinskas, 2011). Despite its limitations, based on a systematic review by Chumney et al. (2010), the FIM is likely to continue to serve as an essential predictor of the patients' post-stroke outcomes. Now that we have a better idea of how functional

improvement is measured, it is time to look at some of the common psychosocial factors that have been noted to be associated with stroke recovery.

Suggested Psychosocial Factors (Predictors) in Stroke Recovery

Numerous potential factors have been examined that are believed to be associated with the outcome of rehabilitation after stroke. As a result, a number of clinical factors and psychosocial predictors were identified as having a positive impact on stroke recovery, including time of admission, length of stay, and family support. To date, however, there has been only limited research into the identification of psychosocial factors as predictors of outcome in acute rehabilitation programs. The more commonly identified psychosocial factors are discussed in the following sections.

Age

Although age is a demographic factor, it is important to address the impact of age on stroke recovery to understand why age will be controlled for in the proposed study. Age, as a risk factor in stroke rehabilitation outcome has received much attention in previous research. Younger age has been associated with significantly better stroke recovery (Carod-Artal, Medeiros, Horan, & Braga, 2005; Somerford, Lee, & Yau, 2004), including greater functional gain in FIM scores (Ciou-Tan et al., 2006). Additionally, lower FIM discharge ratings are associated with older patients (Horn et al., 2005). Somerford, Lee, and Yau (2004) also found gender-related age differences in first-time stroke. More specifically, on average, females were significantly older (75.2 yrs old) than males (69.2 yrs old) at the time of admission to a hospital for first-time stroke.

Additionally, females were more likely than males to discharge to skilled nursing facilities, whereas, males were more likely than females to discharge home.

Time of Admission/ Delays from Onset to Care

Another predictor of recovery outcome, regardless of the type and location of stroke, is the time delay between onset of stroke and admission to rehabilitation. Studies have suggested that extended time delay between onset of stroke and admission to stroke rehabilitation has an adverse impact on stroke recovery (Carod-Artal et al., 2005; Maulden, Gassaway, Horn, Smout & De Jong, 2005; De Jong, Horn, Smout & Ryser, 2005; Massucci et al., 2006; and Heruti et al. 2002). Maulden et al. (2005) found that time delay was a significant predictor in stroke recovery with a longer delay being associated with lower total FIM, motor FIM, mobility FIM, and Activities of Daily Living (ADL) FIM. When severity of stroke was worse, the significance of time delay became a greater predictor in stroke recovery outcome, with more time delay associated with significantly lower FIM ratings.

Rehabilitation Length of Stay

There is some disagreement in the literature about the impact of the length of stay (LOS) on recovery outcome in stroke inpatient rehabilitation. The reported LOS in the United States is significantly less for patients in stroke inpatient rehabilitation than other countries. More specifically, the average LOS in the United States varies from 17 to 25 days; whereas, the LOS in Canada is 23 to 49 days, Australia is 28 days, New Zealand is 30 days, and Israel is 42 to 46 days (McNaughton et al., 2005; Maulden et al., 2005;

Gassaway et al., 2005; Ottenbacher, Campbell, et al., 2008; Bhandari, Kushel, Price, & Schillinger, 2005; Somerford et al., 2004; Rabadi, Rabadi, Edelstein, & Peterson, 2008; Bagg, Pombo, & Hopman, 2006; Finestone, Greene-Finestone, Wilson, & Teasell, 1996; and Heruti et al., 2002).

Medical comorbidity, age, and other non-medical issues could explain longer inpatient rehabilitation LOS, but would not necessarily explain differences in LOS between countries. Heruti et al. (2002) investigated the impact of cognition at the time of admission on rehabilitation outcome among elderly patients who had a first-time stroke. The 315 post-stroke patients in the study were admitted to Geriatric Rehabilitation Ward at Sheba Medical Center in Israel with an average LOS of 46 days. The authors concluded that the average LOS found in their study was not an accurate representation of the average LOS in a rehabilitation setting, because the patients in their study had primarily much longer non-medical LOS that included psychosocial factors, economic status, and better accessibility to further nursing care. However, the impact of longer LOS indicated significantly better recovery outcome.

Somerford et al. (2004) reported that differences in LOS were also associated with site of admission, locality of residence, and gender. With respect to site of admission, patients who were initially admitted to a hospital with a stroke unit had a longer stay than those who were admitted to a hospital without a stroke unit, showing a significant impact of stroke unit on recovery outcome. Longer LOS was associated with greater stroke severity and patients being discharged to nursing facilities. With respect to locality of residence, those who came to rehabilitation from rural areas had shorter LOS than their counterparts who came from metropolitan areas due to the distance of family

support. Additionally, rural residence patients with shorter LOS were more likely to be discharged to nursing homes. With respect to gender, females had a longer LOS than males due to greater stroke severity, limited family and/or social support. The study authors believed these severity-related gender differences were because females were older when they encountered their first stroke compared to males.

Of the 561 patients in a study performed in Canada by Bagg et al. (2006), 75% of the patients had a longer LOS compared to the LOS in United States. Bagg et al.'s findings were similar to a previous Canadian study investigated by Rundek, Nielsen, & Phillips, 2004. Bagg et al. accounted the longer LOS to the difference between the Canadian and United States healthcare systems to differences in health care access. More specifically, Canadian healthcare is publicly funded with universal access to physician and hospital services, as opposed to the United States that had purchased private insurance, and public insurance only available to low income and elderly patients. Interestingly, discharge FIM scores were higher in stroke patients treated in Canada (Bagg et al., 2006).

There also appears to be a relation between stroke onset and admission to acute rehabilitation on outcome. In the Post Stroke Rehabilitation Outcomes Project (PSROP), the significant impact of time delay from stroke onset and rehabilitation admission on LOS was reported by Maulden et al. (2005). Specifically, faster progress and shorter LOS was associated with shorter time delay between stroke onset and admission to acute rehabilitation. McNaughton et al. (2005) also compared United States and New Zealand inpatient rehabilitation and found that although patients had shorter LOS in United States, they spent a greater amount of time with a physical therapist and occupational therapists

than their New Zealand counterparts. Finally, better outcomes were observed in United States with a greater increase in FIM score, greater cognitive FIM score change, and with less patients discharged to institutional settings for care compared to New Zealand.

Nutrition level may also have an impact on LOS. Finestone et al. (1996) examined prolonged LOS in a Canadian sample and found that LOS was significantly longer for malnourished patients. Further, Finestone et al. found longer LOS significantly associated with right hemisphere lesion.

Finally, no significant association was found between LOS and Caucasian, African-American, and Hispanic ethnic groups by Bhandari et al. (2005) and Ottenbacher, Campbell, et al. (2008); mean LOS of 20, and 17 days, respectively for each study. However, LOS was significantly associated with total FIM score at discharge and FIM efficiency (total FIM score difference / length of stay= average FIM change per day) between ethnic groups in the three studies by Bhandari et al. (2005), Ottenbacher, Campbell, et al. (2008) and Rabadi et al. (2008). To address the time of admission examined in ethnic groups, the impact of time of admission is further discussed in the following section.

Ethnic Variations/ Disparities in the Use of Rehabilitation

Ethnic differences in stroke recovery were investigated by Horner et al. (2003). The authors postulated that the critical time to initiate stroke rehabilitation was three days regardless of ethnicity. The authors found differences in time of admission between African-Americans and Caucasians, with the former being admitted on average a half day later. Time delay to rehabilitation admission and ethnic group differences emerged from

other studies as well, whereas no differences between ethnic groups and admission time were found in other studies (Stansbury et al., 2005; Lacy et al., 2001; and Morris et al., 2000). Such findings suggested that cultural beliefs and practices may play a role in the locus of control in health situations, as time delay in admission to stroke rehabilitation may not be considered as the only important predictor of better recovery in some ethnic populations.

Despite the severity and greater prevalence of stroke among some ethnic groups, no clear picture appears to exist that explains ethnic disparities in stroke recovery. According to the Stansbury et al.'s (2005) analysis of data from selected ischemic and hemorrhagic stroke studies, differences in acute rehabilitation among ethnic minority groups were not yet well identified. The studies suggest that ethnic disparities possibly existed regionally or in communities; thus, more regional and local studies to investigate ethnic disparities in the treatment and outcome of stroke are warranted. Perhaps then, it would be more beneficial to examine what has been observed in functional outcome during rehabilitation among different ethnic groups of patients who had stroke.

Disparities in Functional Rehabilitation Outcomes

Chiou-Tan, Keng, Graves, Chan, and Rintala (2006) conducted a retrospective study from 2000 to 2003 that included 162 participants and found significant ethnic differences in admission and discharge ratings using the FIM. More specifically, Hispanics were found to have lower admission and discharge FIM scores than African-Americans and Caucasians. However, Hispanics showed a greater increase in FIM gain and FIM efficiency scores than the other two ethnic groups. Additionally, African-

Americans showed higher admission and discharge FIM scores than Caucasians; however, FIM gain and FIM efficiency ratings were very similar between the two ethnic groups. The authors did not suggest possible reasons for the ethnic differences. Given the geographic area and population sample in the study, it is possible that socioeconomic status and/or educational level confounds may be responsible, rather than ethnicity. The participants were from a large urban county hospital in Houston, Texas County, and all of the participants did not have private insurance. Since Houston is relatively close to the United States and Mexican border, it was probable that a larger percentage of the Hispanic participants were immigrants with low-income status and minimal education.

Conversely, Bhandari et al. (2005) found opposite ethnic differences in a retrospective study on racial disparities among inpatient stroke patients. To determine the differences in ethnicity associated with stroke inpatient recovery outcome, data was examined from 1,462 patients over five years in one facility. The African-American group showed worse recovery outcome than the Caucasian, Hispanic and Asian groups based on FIM ratings. Furthermore, there were no differences in outcome between the Caucasian, Asian, and Hispanic groups. Regardless of lower FIM ratings, the African-American group was more likely to be discharged to family/home than the other three ethnic groups. In contrast, the Asian group showed less improvement than the Caucasian group. The Asian group also required more proxy respondent than the other ethnic groups when FIM ratings were taken three months after discharge from inpatient treatment.

Bhandari et al. (2005) also found that the Hispanic and African-American groups were more likely than Caucasians and Asians to have a stroke at a younger age. This

finding is consistent with the findings of Ottenbacher, Campbell, et al. (2008). Bhandari et al. (2005) suggested that possible reasons for the ethnic differences included quality of services, patient's experience in rehabilitation, level of family support associated with ethnic groups, and financial and insurance resources associated with ethnic groups. The study on racial and ethnic differences with stroke rehabilitation in the United States conducted by Ottenbacher, Campbell, et al. (2008) showed age as a significant mediator in ethnic group differences in FIM ratings. They found the smallest differences in discharge FIM scores between ethnic groups with patients between the ages of 30 to 62; and the largest FIM differences between ethnic groups were found among 80-years and older group.

Racial disparities associated with stroke inpatient rehabilitation in Maryland were also found by Gregory, Han, Morozova, and Kuhlemeier (2006). More specifically, the authors found significant differences between the African-American and Caucasian ethnic groups, including the following: 1), African-American patients were more likely to live in urban communities while Caucasian patients were more likely to be equally distributed in urban and rural areas; 2) Compared with the Caucasian patients, the African-American patients tended to be female, unmarried, and younger; 3) Of the urban areas, African-American patients were likely to discharge to home or inpatient rehabilitation facility, while Caucasian patients were likely to discharge home or nursing home. In rural areas, African-American and Caucasian patients were equally likely to discharge home or a nursing home rather than to an inpatient rehabilitation facility, or rehabilitation unit in a skilled nursing facility; 4) two-thirds of the Caucasian patients had Medicare insurance, while of the African-American patients; an equal percentage had

Medicare or other insurance; and 5) African-American patients had greater LOS in stroke inpatient rehabilitation compared to their Caucasian counterparts.

Lacy et al. (2001), in a large collaborative study that included 563 patients from 10 hospitals under one health system in New Jersey, suggested that Medicare and Medicaid had an impact on the patients' medical treatment. Specifically, patients who had Medicaid had a greater probability of waiting longer than the 15-minute or 30-minute time span to be seen by the physician than the patients who had Medicare. Interestingly, the authors found that patients who had Medicare were significantly more likely to use ambulance service to the hospital than the patients with commercial and health maintenance organization (HMO) insurances. In addition, African-American patients were significantly more likely to arrive later than three hours after the onset of stroke symptoms, whereas the Caucasian patients were more likely to arrive within three hours of stroke onset. Ethnic group differences associated with the assistance of public health insurance and proactive attitudes toward medical treatment may produce an alternative risk factor of low-income level to consider; and present the question of whether insurance rather than SES or ethnicity has an impact on stroke recovery outcome.

Socioeconomic Disparities

Given that socioeconomic status (SES) is identified by income, education, and occupation, it stands to reason that SES would be associated with health disparities. A higher SES enables people not only to have medical insurance, but affords people a better lifestyle that includes better nutrition, recreation, housing, and better neighborhoods with stores that carry fresher produce and healthy food selections. The role of occupation and

health status has been established in numerous research studies (Adler & Newman, 2002); with findings that people who are employed have better health than their unemployed counterparts. As important as occupation is to health status, the level of the occupation is equally important. Higher occupations are associated with higher income that in turn afford better medical insurance as well as preventative practices that promote a better health status.

Although Bravata et al. (2005) did not find ethnic differences associated with prevalence of stroke; the study authors did find an association between socioeconomic status (income, education, insurance) and stroke prevalence. When Bravata et al. controlled for 8 identified clinical factors independently associated with stroke (i.e., older age, history of hypertension, treated diabetes, claudication, myocardial infarction, higher C-reactive protein, lower high-density lipoprotein cholesterol, and inactivity), ethnicity was independently associated with stroke. When income was added to the researchers' statistical model, ethnicity was not independently associated with stroke, but income was independently associated with stroke. More specifically, as income increased, the proportion of stroke incidence decreased. Further, education was not independently associated with stroke. Compared to the participants without stroke, participants with stroke were less educated. Additionally, those who were currently employed were less likely to have a history of stroke. On examination of the association of insurance to stroke, the study authors found that participant who did not have insurance were less likely to find out from a doctor that they had a stroke.

Medical Insurance

The percentage of individuals without medical insurance coverage has continued to grow from 16.1% in 2000 to 17.8% in 2004 (Shen & Washington, 2007). According to a nationally representative population study that was representative of 60 randomly drawn communities, ethnic disparities between Caucasians, African-Americans, and Hispanics in having access to medical insurance coverage, and access and use of medical care exist (Hargraves & Hadley, 2003); with a greater percentage of Hispanics (>41%) and African-Americans (>33%) than Caucasians (>25%). As the population of the uninsured increases, the effect on ethnic/racial disparities may also increase. However, insurance alone does not appear to account for ethnic/racial disparities in health care. Fiscella, Franks, Doescher, and Saver (2002) explored the effect of access barriers, including the fluency of the English language, on racial/ethnic disparities in health care among those who had medical insurance. When compared to insured Hispanics, African-Americans, and others, they found that insured Caucasians were more to have private insurance, higher income, higher education levels, report better physical and mental health, have a regular source of care, and have a telephone in the home. Although, Hispanics who spoke English did not differ significantly from the Caucasians in going to a doctor, mental health visits, or receiving the flu vaccination, English-speaking Hispanics were more likely to have had a mammogram than Caucasians. In contrast, compared to Caucasians, Spanish-speaking Hispanics were less likely to go to a doctor, have mental health visits, and receive the flu vaccination – even when insured. Compared to Caucasians, African-Americans were significantly less likely

to get the flu vaccination, but did not differ significantly in doctor visits, mental health visits, and mammograms.

Given the ethnic disparities, increased percentage of uninsured, and the increased statistics of stroke, that few studies have explored insurance coverage-related disparities (Shen & Washington, 2007) in medical and rehabilitation outcome of stroke patients may be a cause for alarm. Shen and Washington (2007) led a nationally representative study that examined discharged stroke patients from acute hospitals in the nation, and reported several findings. Of the three insurance-type groups, the uninsured patients were younger than those with Medicaid; whereas, the oldest age group had private insurance. Although younger, the uninsured patients showed more severe neurologic impairment, a higher percentage of intracerebral hemorrhage (8.4%), and the highest hemorrhage/ischemic related mortality (34.7 & 6.0%, respectively). The Medicaid group showed the same greater severity of neurologic impairment as the uninsured group, a higher percentage of intracerebral hemorrhage (8.1%), and higher ischemic related mortality (5.3%), but the lowest hemorrhagic-related mortality (28.0%). The private insurance patients showed less severe neurologic impairment than their two counterpart groups, a smaller percentage of intracerebral hemorrhage (7.3%), and lowest ischemic-related mortality (4.4%), but higher hemorrhagic-related mortality (28.2%). Among those who experienced ischemic stroke, the patients who were uninsured or had Medicaid had a higher risk of paralysis and mortality, than their privately insured counterparts. The authors suggested that group differences may be attributed to the lack of preventative care (i.e., diagnosis and treatment of hypertension, cholesterolemia, diabetes) among those who are uninsured and possible lifestyle behaviors such as smoking and dietary habits.

Provision of medical and rehabilitative treatment for stroke is one of the greatest costs in the United States (De Jong, Horn, Smout, & Ryser, 2005). Most of the cost associated with stroke acute hospitalization and rehabilitation is paid by Medicare insurance because the vast majority of the patients who suffer from cerebral infarction are the elderly (De Jong, Horn, Smout et al., 2005). Medicaid/Medi-Cal is another source of insurance; this is public health insurance that is available to low-income individuals including seniors, people with disabilities, and other specific diseases (Department of Health Care Services, 2007).

To provide some understanding of the typical payor mix in stroke patients, in the Post Stroke Rehabilitation Outcomes Project (PSROP) study, Gassaway et al. (2005) included 1161 patients from 6 stroke inpatient rehabilitation sites across the U.S. and 1 stroke inpatient rehabilitation site in New Zealand. Medicare was the primary payer for 56% (n = 651). Thirty percent (n = 349) of the patients had commercial insurance and only 2% (n = 24) were self-paid patients. The remaining 12% (n = 137) had no indication of payment type. The impact of Medicare and Medicaid/ Medi-Cal as primary or sole insurance coverage on stroke rehabilitation and recovery outcome has received little attention in the literature.

An earlier study by Retchin et al. (1997) supported the idea that Medicare health maintenance organization (HMO) and fee-for-service (FFS) insurance may impact stroke recovery outcome. Retchin et al. compared 402 HMO and 408 FFS patients from 12 states. Of the entire sample of 810 patients, 656 were identified as Caucasian, whereas the remaining patients were not identified. Despite the similarity of functioning status among patients with HMO and FFS patients at discharge from acute hospitalization for

stroke, Retchin et al. found that patients with Medicare HMO were more likely to discharge to nursing homes than to an inpatient rehabilitation facility. Since patients with FFS had the advantage of participating in an inpatient stroke rehabilitation program for further recovery, it may be that Medicare HMO have an adverse impact on stroke recovery outcome.

Further, Deutsch et al. (2006) investigated patient medical records for 1996 and 1997 for rehabilitation outcomes for patients with Medicare fee-for-service insurance in sub-acute rehabilitation programs and stroke inpatient rehabilitation facilities (IRF). Deutsch et al. found that for all the severity groups, Medicare payment for sub-acute rehabilitation was almost half of the payment for IRF services, although, they found that LOS was significantly shorter for IRFs than for sub-acute facilities among most of the severity groups. Furthermore, Deutsch et al. found significantly better recovery outcome among patients who were admitted to IRFs compared to their counterparts who were admitted in sub-acute rehabilitation facilities.

Conversely, Bhandari et al. (2005) suggested that Medicare did not appear to impact recovery outcome in their study on racial disparities in stroke inpatient rehabilitation outcome. Bhandari et al. concluded that ethnicity was associated with Medicaid/ Medi-Cal insurance in the study; and suggested that other ethnic groups were more likely to have Medicaid or Medicare with Medicaid than the Caucasian group. However, the authors reported that the African-American patients in the study who had Medicare received the same intensity of therapies. It should be noted that this study was conducted on data after IRF- PPS was implemented.

Moreover, De Jong, Horn, Smout, et al. (2005) reported that it was not clear what effects the new changes in inpatient rehabilitation facility (IRF) prospective payment system (PPS) would have on stroke inpatient rehabilitation outcome, and predicted that it would be many years before the direct and indirect effects were observed. However, according to De Jong, Horn, Smout, et al., the results of the PSROP indicated stroke rehabilitation had not been effected by the IRF-PPS.

Finally, the impact of IRF-PPS on stroke rehabilitation recovery outcomes was investigated by Gillen, Tennen and McKee (2007). The study included 945 patients in stroke inpatient rehabilitation during the 5-year pre-implementation of IRF-PPS and 3.5 years after IRF-PPS was implemented. Differences were found between pre and post IRF-PPS implementation. Gillen et al. reported that more years of education, decreased time delay between stroke onset and admission, greater cognitive impairment, shorter LOS, lower discharge FIM scores, and decreased FIM change were observed with IRF-PPS implementation. Additionally, discharge to institutional settings was more likely than discharge to home with IRF-PPS. Lower discharge FIM scores, less LOS, and less FIM change continued to be associated with IRF-PPS after controlling for education level, time delay of assessment, and cognitive impairment. Overall, Gillen et al. found sudden changes with implementation of IRF-PPS in decreased discharge FIM scores, decreased LOS, and a greater increase in discharge to institutions rather than home.

In their examination of the long-term functional recovery from stroke, Dhamoon et al. (2009) found results that suggested that medical insurance was associated with stroke recovery levels. More specifically, after controlling for age, severity of stroke, and other predictors of functional decline, the authors found that patients with Medicare or

private insurance did not show significant functional decline for up to 5 years after their stroke. However, patients with Medicaid or no insurance showed significant functional decline over the same 5-year period.

Marital and Family Support

The literature has generally indicated that social support has a significant impact on the rate and extent of stroke recovery and serves as a predictor of discharge destination (Glass, Dym, et al., 2000). The impact of social support on stroke recovery outcome was explored by Glass, Matchar, Belyea, and Feussner (1993); and was significantly associated with better stroke recovery outcome. More specifically, patients with mild stroke showed a better trajectory of stroke recovery compared to patients with severe stroke; however, a significant effect of social support on outcome was found in the direction of patients with more social support showing the most improvement. Significant differences were also observed with social support level and severity of stroke, namely, that greater functional improvement from severe stroke was associated with greater social support.

Glass and Matchar et al. (1993) observed that functional status did not differ greatly during inpatient across all levels of support. However, at 6 months post-stroke, those patients who received more social support showed broad improvement in less time. Among the low, medium, and high level of support groups, the patients with high support had more severe strokes on average. Interestingly, despite having the lowest baseline scores of adult daily living (ADL), those with the highest support showed the greatest improvement. Conversely, patients with the least support showed normal improvement

during the first 2 months after stroke, but declined in functional status with time (demonstrating an inverse U).

Tsouna-Hadjis, Vemmos, Zakopoulos, and Stamatelopoulos (2000) also investigated the impact of family and social support on post-stroke functional status. The authors found that functional status was significantly associated with family social support. Patients who received greater family support showed significantly greater functional improvement over time; however, this difference did not emerge during their acute rehabilitation hospitalization. More specifically, although there was no difference in functional improvement at discharge from inpatient rehabilitation between patients with low/medium or high support, after adjustment for stroke severity, by 6 months post-stroke patients with high family support showed a significant improvement in functional status.

To investigate and identify the variables that predicted activity limitation and discharge to home among patients with stroke, Massucci et al. (2006) conducted a large retrospective study that included 1,023 patients with first-time stroke from 18 inpatient rehabilitation centers in Italy. In addition to clinical findings, age, and gender differences, the study authors found that independent functional gain and discharge destination were significantly associated with early rehabilitation, low or lack of cognitive deficit, and living status. The study authors postulated that interaction and support from a family member was a principal factor that positively influenced the rehabilitation process by helping functional improvement, accelerating discharge, and reduced the likelihood of discharging to a nursing home. In addition, negative recovery outcome was associated with living alone prior to the stroke.

Finally, Nguyen, Page, Aggarwal, and Henke (2007) examined social predictors of discharge destination among immigrant English-speaking and non-English speaking stroke patients. Their investigation found that marital status was a significant indicator of discharge, with low total admission FIM ratings among the English speaking and non-English speaking groups. Although low total admission FIM rating was associated with the probability of a discharge to nursing home, a significant main effect of marital status was observed in discharge destination among both language groups, wherein married patients were more likely to be discharged to home and unmarried patients discharged to a nursing home. Furthermore, a significant association of non-English speaking and low total admission FIM ratings were observed in the discharge to home compared to their English speaking counterparts. Finally, after controlling for marital status, immigrant predictors (language spoken) were not significant indicators in discharge destination.

Cognitive Functioning

Cognitive function is vital to functional independence, and deficits can adversely impact recovery outcome in stroke inpatient rehabilitation, as well as other settings. An important function of cognition is attention, since it is necessary for learning; and for most activities and tasks. In addition to attention, cognitive functioning includes concentration, planning, problem-solving, perception, processing information, reasoning and thinking (Carod-Artal et al., 2005). Several previously discussed studies are further discussed in this section to address cognitive functioning and impact of its impairment.

In a study of cognitive impairment following ischemic stroke, Saxena (2006) found that cognitive impairment was significantly correlated with age, marital status,

education level and functional impairment among Asian patients with stroke in two Singapore inpatient rehabilitation hospitals. Of the 200 patients, 109 patients (54.5%) were cognitively impaired on admission to the inpatient rehabilitation facilities. Cognitive impairment was found to be significantly associated with the 66 to 80 age group, and even more significant with the 81 and older age group.

Saxena (2006) found that significantly more widowed and divorced patients had cognitive impairment compared to the married patients. Furthermore, significantly more patients with less than secondary education had cognitive impairment compared to their above secondary education counterparts. Cognitive impairment was also observed significantly more with patients who had severe functional impairment. Saxena concluded that cognitive impairment is associated with poor rehabilitation outcome for patients who had a stroke, and postulated that the multidisciplinary team would benefit from identification of the variables that are correlated with cognitive impairment when treating patients with stroke.

Initially discussed in a previous section, Heruti et al. (2000) investigated the relationship between cognitive function at the time of admission and rehabilitation outcome. Using the Mini-Mental State Examination (MMSE) and FIM rating, they observed that nearly 60% of their patients showed cognitive impairment on admission. During the course of rehabilitation, cognitive FIM scores confirmed that patients continued to have cognitive impairment with no significant changes. A significant positive correlation between cognitive status on admission and a variety of functional gain during rehabilitation was found. Furthermore, a correlation was also found between

less LOS and patients who admitted with higher cognitive functioning or lack of cognitive impairment and greater motor function.

Also previously discussed, Massucci et al. (2006) found that a large number of their patients had cognitive impairment, although, it was not formally assessed at the time of admission. Nevertheless cognitive impairments observed included attention and concentration deficits, aphasia, and neglect. Although the impact of cognition was not considered to be a primary focus of investigation, an association between cognitive impairment and functional outcome was found. Finally, it was determined that cognitive functioning level at the time of admission to inpatient rehabilitation is an important criterion in predicting functional outcome. The study authors postulated that consideration of cognitive impairments would be useful in treatment planning for better functional outcome.

In a study to examine whether cognitively impaired patients with stroke could benefit from inpatient rehabilitation, Rabadi et al. (2008) observed that more than half (65.12%) of their 668 patients were cognitively impaired. Furthermore, those who were cognitively impaired were admitted significantly later into the inpatient rehabilitation facility, had more severe strokes, and had longer lengths of stay, compared to the patients with less stroke severity and intact cognitive functioning. A similar change in FIM scores across all the patients was found, with greatest FIM increase among those who had severe cognitive impairment and the least FIM increase with the mild and no cognitive impairment groups. Consistent with other studies suggesting that early admission is significantly correlated to better functional outcome, in their study, the FIM efficiency score was higher among patients who were not cognitively impaired, whereas, the

cognitively impaired patients showed a slower rate of progress in rehabilitation. In addition to cognitive impairment, age and total FIM rating at the time of admission were attributed to FIM change. Based on the improved FIM scores observed with the cognitively impaired patients, Rabadi et al. determined that patients who are cognitively impaired from stroke will benefit from admission to inpatient rehabilitation.

In summary, the four studies presented in this section were from four different countries, Singapore, Israel, Italy, and United States. Further, the implications of cognitive impairment experienced after stroke and its impact on functional outcome were consistently found across the four studies. This would suggest that ethnic differences do not appear to determine recovery outcome. However, with the exception of the United States, the majority of the patients in each country belonged to that country's ethnic group and, as such, did not have foreign language and foreign cultural practices as possible risk factors in rehabilitation outcome. Moreover, the minority population in the United States continues to grow indicating more foreign languages and cultural practices. As such, it remains a quest to determine if and how such factors impact cognitive impairment and rehabilitation outcomes. Thus, it would be remiss to make such conclusions based on several studies alone.

Recovery Outcome Literature

Based on thorough randomized experiments and many different statistical analyses on rehabilitation treatments for stroke recovery, Dobkin (2005) observed that improvement from stroke more likely depended on the type and severity of the impairment. Further, Dobkin reported that of those who are admitted to inpatient

rehabilitation for treatment after stroke, 80 % of patients discharge to home and estimated that 5% more of patients with stroke would be able to return home after inpatient rehabilitation, compared to continued care in general wards of acute hospitals. Furthermore, inpatient rehabilitation treatment was associated with decreased death from stroke, less disability, and less nursing facility institutionalization. Of the impairments that were observed in patients after stroke, Dobkin noted that approximately 20% of patients demonstrated deficits in language comprehension and expression with a wide range of severity and aphasia types. When speech therapy for the deficits started within the initial three months after stroke, a moderate positive effect of treatment was observed. A smaller amount of improvement was associated with speech therapy started between three to twelve months after stroke.

Dobkin (2005) addressed physical disabilities from stroke by estimating that by the end of three months after stroke, patients usually showed less physical disability. However, approximately 65% of patients were still unable to use their affected hand in daily activities six months after stroke. Further, he estimated about 35% with paralysis of the leg at stroke onset wre not able to get back useful function of their affected leg, whereas, another 20 to 25% of patients were not independent and need physical assistance to walk. Finally, only 25% of patients who suffered from stroke returned to their pre-stroke level of functioning. Additionally, the amount of tissue surrounding the infarct site was an indicator of the degree of improvement, particularly during the initial several weeks after stroke. However, Dobkin postulated that functional improvement in cognition, language, and motor skills can improve during any time from intellectual processes engaged in regular learning, during stroke rehabilitation.

The Current Study and Hypotheses

The stroke outcome research literature suggests that psychosocial variables in general impact stroke recovery, but offer little about their relative influences on outcome, particularly in an acute rehabilitation setting. The current retrospective study examined the individual and combined effect of six variables: 1) ethnicity, 2) type of medical insurance, 3) time of admission, 4) marital and family support, 5) length of stay, and 6) socioeconomic status. More specifically, the effect of the six psychosocial factors acting independently, together, or as covariates in poor stroke recovery outcome were explored.

The data sample was collected from Loma Linda University Medical Center's (LLUMC) acute inpatient rehabilitation unit. It is located in the Inland Empire area of southeastern California that is mainly populated by students, faculty, and staff. It is also surrounded by lower socioeconomic neighborhoods, and widespread rural areas that it serves. Stroke recovery patients admitted to LLUMC include those from the rural areas where hospitals or stroke units are not available, affluent retirement communities where "snowbirds" reside during cold seasons of the year, and middle to upper socioeconomic residents who live in the geographic area. Snowbirds are characterized by those who live in cold regions and travel to warmer locations during the winter or cold seasons of the year.

Another goal of the current study was to determine whether stroke recovery outcome with LLUMC patients is similar to stroke recovery literature from studies conducted with other geographic and demographic populations. Given the geographic location of LLUMC and the demographics, the current study would provide specific information that could be used to help in customizing treatment and discharge planning

for this distinct population, as well as to identify the need for special resources during and after discharge. Due to the current economic state and finite financial resources available, identifying the risk factors that can reliably predict unsuccessful treatment outcome would help in the development of cost-effective treatment and/or the consideration of other treatment options in specific circumstances.

Finally, to attain a "pure" sample for the current study, data was collected on ischemic and hemorrhagic strokes.

Aim One

The first aim in the current study was to evaluate the influence of ethnicity on the recovery of stroke in stroke inpatient rehabilitation.

Hypothesis One

First, it was hypothesized that ethnic differences would emerge between African-American, Caucasian, and Hispanic ethnic groups in the level of overall recovery among stroke patients. It was predicted that Caucasian group would show greater overall improvement with higher total FIM scores at discharge than the African-American and Hispanic groups.

Hypothesis Two

Second, it was hypothesized that ethnic differences would be found between the Caucasian, African-American, and Hispanic groups in the improved level of cognitive functioning at the time of discharge from inpatient rehabilitation. Further, it was

predicted that the Caucasian group will show greater cognitive improvement with higher FIM scores in the areas of cognition than the African and Hispanic groups.

Aim Two

The second aim was to explore the impact of medical insurance, location of residence, and martial and family support on stroke recovery in inpatient rehabilitation.

Hypothesis Three

Third, it was hypothesized that medical insurance would have an impact on stroke recovery during inpatient rehabilitation at the time of discharge. It was expected that patients with private insurance, and patients with medicare plus private insurance, would show greater improvement with a higher total FIM rating at the time of discharge than those who have Medicare alone, Medi-Cal alone, and Medi-Cal plus Medicare insurance.

Hypothesis Four

Fourth, marital and family support to the stroke patient would influence the level of overall recovery in inpatient rehabilitation. It was expected that patients who are married, have intact family and/or extended family, will show greater gain in FIM scores at discharge than those who are alone and without such a support system, regardless of ethnicity and type of insurance.

Hypothesis Five

Fifth, it was hypothesized that socioeconomic status would impact recovery

outcome. It was anticipated that patients who live in further rural areas and those who live in lower socioeconomic urban communities will have less functional gain (FIM score change) than those patients who live in close rural areas and higher socioeconomic urban communities.

Aim Three

The third aim was to determine if our data replicates what was found in the stroke recovery literature on the influence of time of admission to rehabilitation and the length of stay in inpatient rehabilitation.

Hypothesis Six

Sixth, it was hypothesized that time of admission in the current study would support past stroke recovery literature related to ethnic differences in time of admission to inpatient rehabilitation for stroke recovery treatment. It was expected that the Caucasian group will show less time delay between onset of stroke symptoms and admission to inpatient rehabilitation than their African-American and Hispanic counterparts.

Hypothesis Seven

The seventh hypothesis was that length of stay showing ethnic differences would support the stroke rehabilitation literature. It was expected that the Caucasian ethnic group will have on average a longer stay in stroke inpatient rehabilitation than the African-American and Hispanic groups.

CHAPTER TWO

METHOD

Archival Data

To address the hypotheses of the proposed study, archival data was extracted from the hospital databank of Loma Linda Medical Center (LLUMC) for patients who had a hemorrhagic or ischemic stroke and were admitted into inpatient rehabilitation from January 2005 through August 2009. In October 2010, LLUMC received its Joint Commission Advanced Certification as a Primary Stroke Center, making it the only facility to earn this certification in San Bernardino, Riverisde, Monon and Inyo Counties. The variables of interest in the present study, namely, ethnicity, socioeconomic status, type of insurance, marital status, length of stay, number of days from onset of stroke to time of admission, cognitive FIM change, and total FIM change, were not investigated in conjunction with any other studies. They also had not been explored previously using this dataset.

Participants

Collected data included 689 participants who were admitted to the inpatient rehabilitation at LLUMC from January 2005 to August 2009. The dataset was examined for duplicate patient medical records, patients under the age of 45, ethnicity other than Caucasian, Hispanic, and African-American, and non-random missing data. Such participants were subsequently removed from the study, leaving 450 participants. Cleaning analyses were conducted to address the assumptions for ANOVA and MANOVA. Four extreme outliers were found for the variable 'onset to treatment.' The

medical records for these four patients were reviewed and it was determined that they were all admitted for acute rehabilitation several or more months post-stroke for treatment of medical complications with stroke rehabilitation as a secondary goal. The 4 outliers were removed from the data leaving a final count of 446 participants for the study analyses.

Of the 446 patients, 60.1% (n =268) were Caucasian, 27.6% (n =123) were Hispanic, and 12.3% (n = 55) were African-American. The participants ranged in age from 45 to 96, with a median age of 65 and a modal age of 58. Of this diverse ethnically diverse sample, 48% (n = 214) were single, divorced, or widowed, and 52% (n = 232) were married or living with a partner. The patients were of varied socioeconomic (SES) statuses ranging from 5.6% of under-low income SES (<$20,000), 56.1% of low-middle income SES ($21,000 - $39,000), 30.7% of middle income SES ($40,000 -$60,000), 7% of upper-middle income SES ($61,000 -$480,000), to 0.7% of upper-high income SES (>$81,000). The income levels were reflective of the statistics given by the U.S. Census Bureau (2006) household income for 2005 and U.S. Bureau (2006) median income of persons 25 years of age and older. The variation of medical insurance included 201 patients with private or Medicare plus private insurance, 70 patients with Medicare only insurance, 104 patients with Medi-Cal or MediCaid only insurance, and 71 patients with Medicare plus Medi-Cal insurance. Of the 446 participants, 330 patients reported as having a religion and identified their religious affiliation as followed: 32 (7.2%) were Seventh-day Adventist, 92 (20.6%) were Catholic, 34 (7.6%) were Baptist, 1 (.2%) was Latter-Day Saints, 94 (21.1%) were Protestant, 77 (17.3%) were non-Christian and 41 (9.2%) were of other religious membership (see Figure 6).

Measures

Functional Independence Measurement (FIM; see Appendix A)

The FIM is a functional assessment instrument that is used to measure physical and cognitive abilities. According to the Wright (2000), Salter et al. (2005), and Ottenbacher, Hsu, et al. (1996), the instrument is comprised of an ordinal scale with 18 items, each item ranging from one to seven. A rating of seven indicates "completely independent" functional status; whereas, a rating of less than six indicated the need for supervision or assistance of another person. On the other hand, a rating of one was characterized as "total assistance"; and indicated that the patient performed less than 25% of the task. Independent performance is measured in six areas of functioning that include self-care, sphincter control, transfers, locomotion, social cognition, and communication. Self-care includes eating, grooming, bathing, dressing upper and lower body, and toileting. Sphincter control is characterized by bladder and bowel management, and swallow. Transfers include to and from bed, wheelchair, chair, toilet, shower, and tub. The use and navigation of wheelchair, walking, and using stairs are included in the assessment of locomotion. The areas of social cognition and communication include visual and auditory comprehension, vocal and non-vocal expression, memory, problem solving, and social interaction. Finally, a range between the possible total lowest score of 18 (total assistance) to the total highest score of 126 (completely independent) is calculated by adding all scores from each area assessed.

The validity and reliability of the FIM was demonstrated by its sheer magnitude of use in rehabilitation hospitals, subacute facilities, skilled nursing facilities, Veterans Administration programs, long-term care hospitals, and other settings related to care and

rehabilitation; and supported by over 1,300 published peer-review journal articles (UDSMR, 1999). The FIM instrument has remained a valuable tool in treatment and discharge planning, and assessment of progress during and post-rehabilitation due to its standardization and high test-retest reliability (0.95) (Young, Fan, Hebel, & Boult, 2009; Ottenbacher, Hsu, Granger, & Fiedler, 1996; Salter et al., 2005).

Procedure

The participants were Caucasian, Hispanic, and African-American patients who were 45 years of age and older, and were admitted into inpatient rehabilitation for stroke recovery from January 1, 2005 through August 30, 2009 at LLUMC. Demographic, total and cognitive FIM scores, and stroke rehabilitation information was extracted from the patients' medical charts. Ethnicity, zip code of primary residence, marital status, type of insurance, patient's religion, and date of stroke onset were recorded as reported by the patient or patient's family member at the time of admission.

The stroke information extracted from the medical records included date of admission to inpatient rehabilitation, admission total FIM scores, admission cognitive FIM scores, date of discharge from inpatient rehabilitation, total FIM score difference, cognitive FIM score difference, length of hospital stay, and the number of day between onset of stroke and admission to inpatient rehabilitation. Because the medical records did not include the patient's average household income, to estimate the patient's socioeconomic status, average household income was calculated by zip code calculation programs from three different sites The average household income was randomly compared for consistency among the three sites: http://U.S. zipcodedemographics.com,

http://factfinder.census.gov/servlet/ACSSAFFFacts, and http://www.zip-codes.com/zip_database_fields.asp. Patient consent was not required to access the medical records as the patients previously signed consent for the release of their medical record information for the purpose of continued research because LLUMC is identified as a medical teaching facility.

Loma Linda Medical Center, a Seventh-Day Adventist (SDA) owned hospital that is located in Loma Linda, California, a city that was identified by researchers for being one of the regions in the Blue Zone where people commonly live past the age of 100 with active lifestyles (Poulain, Grasland, Carru, Baggio, Franceschi, & Deiana, 2004). In order to rule out the influence of SDA practices in the patient's premorbid lifestyle and recovery on FIM score improvements, descriptive statistics were used to look at the percentage of SDA affiliated patients that were included in the current study. According to the patients' self-reported religious affiliation that were recorded in the patients' medical records, only 32 (7.2%) patients included in the current study identified themselves as a member of the SDA religion. Thus, the SDA religion could be ruled out as an influence in the change or lack of change in FIM scores (see Figure 6).

CHAPTER THREE

RESULTS

Statistical Analyses

As stated previously, archival data were used in order to perform the following analyses. All analyses included 446 cases. GPOWER analysis indicated that a sample size of 390 patients was required for alpha = 0.05, beta = 0.2, and power = 0.95, indicating a moderate effect size of 0.20. All analyses were conducted with the use of Statistical Package for Social Sciences (SPSS) software 19.0 version. Preliminary analyses were performed on all of the variables used in the MANOVA, One-Way ANOVAs, and One-tail a priori t-tests to check and meet the assumptions for each of the analyses. One variable was transformed using the square root (SQRT) method to eliminate outliers and achieve normality of distribution. Box's M and Levene's tests were used to check for Homogeneity of variance and covariance. Independence of variables and linearity were met for the analyses. Descriptive statistics were performed to identify and report patient characteristics, and to determine any group differences in admission FIM scores to serve as group baseline scores. According to the descriptive analysis, significant differences between Caucasian, African American, and Hispanic groups did not emerge in pre-treatment admission FIM scores.

A multivariate analysis of variance (MANOVA) was performed to address Hypothesis One (namely, the Caucasian group will show greater overall improvement with higher total FIM scores at discharge than the African-American and Hispanic groups), Hypothesis Two (the Caucasian group will show greater cognitive improvement with higher FIM scores in the areas of cognition than the African and Hispanic groups),

and Hypothesis Seven (the Caucasian ethnic group will have on average a longer stay in stroke inpatient rehabilitation than the African-American and Hispanic groups). The factor variable was ethnicity and the dependent variables were total FIM difference, cognitive FIM difference, and length of stay for Hypotheses One, Two, and Seven that were addressed by the MANOVA.

Three one-tail a priori t-tests were performed to examine the main effects of type of insurance on total FIM score change in Hypothesis Three (patients with private insurance, and patients with Medicare plus private insurance, will show greater improvement with a higher total FIM rating at the time of discharge compared to those who have Medicare alone, medical alone, and medical plus Medicare insurance).

One-way between-groups analyses of variance (ANOVAs) were conducted to address Hypothesis Four (patients who are married, have intact family or extended family, will show greater gain in FIM scores at discharge than those who are alone and without such a support system, regardless of ethnicity and type of insurance), Hypothesis Five (patients who live in further rural areas and those who live in lower socioeconomic urban communities will have less functional gain (FIM efficiency scores) than those patients who live in close rural areas and higher socioeconomic urban communities), and Hypothesis Six (the Caucasian group will show less time delay between onset of stroke symptoms and admission to inpatient rehabilitation than their African-American and Hispanic counterparts).

Results

Multivariate Analysis of Variance

First, it was hypothesized that ethnic differences would emerge between African-American, Caucasian, and Hispanic ethnic groups in the level of overall recovery among stroke patients. It was predicted that the Caucasian group would show greater overall improvement with higher total FIM scores at discharge than the African-American and Hispanic groups. The one-way MANOVA results revealed that there was no significant interaction for ethnic groups on overall improvement measured by total FIM score difference, Wilks' Л=.983, F(6, 882)= 1.271, p >.05, multivariate $\acute{\eta}^2$ = .009. In the ANOVA follow-up test to MANOVA, no significant main effects for ethnic group on total FIM difference between admission and discharge dates emerged, F(2, 443)= .744, p >.05, partial $\acute{\eta}^2$ =.003 (see Tables 1, 2, & 3). The results did not support the literature that Caucasians show more overall improvement in stroke rehabilitation than Hispanics and African-Americans.

Next, to support the literature on ethnic disparities in health and stroke rehabilitation, it is hypothesized that ethnic differences would be found between the Caucasian, African-American, and Hispanic groups in the improved level of cognitive functioning at the time of discharge from inpatient rehabilitation. Further, it was predicted that the Caucasian group would show greater cognitive improvement with higher FIM scores in the areas of cognition than the African and Hispanic groups. No significant interaction was found for ethnic groups on cognitive FIM score changes, F(6, 882)=1.271, p >.05, multivariate $\acute{\eta}^2$ = .009, and no significant main effects emerged for ethnic groups on cognitive FIM difference between admission and discharge dates, F(2,

443)= 1.995, $p > .05$, partial $\acute{\eta}^2$ =.009 (see Tables 1, 2, & 3; Figure 1). The results of did not support the stroke rehabilitation literature; and indicated that Caucasians did not have greater improvement in cognitive functioning than their Hispanic and African-American counterparts.

In Hypothesis Seven, it was believed that length of stay showing ethnic differences would support the stroke rehabilitation literature. It was expected that the Caucasian ethnic group would have an average longer stay in stroke inpatient rehabilitation than their African-American and Hispanic counterpart groups. According to the results of the MANOVA, no significant interaction was found, F(6, 882)=1.271, $p > .05$, multivariate $\acute{\eta}^2 = .009$ for ethnic groups on length of stay, and no significant main effects indicated that Caucasians as a group did not have a longer stay in inpatient rehabilitation than the African-American or Hispanic groups, F(2, 443)= .971, $p > .05$, partial $\acute{\eta}^2$ =.004, again not supporting the literature on stoke rehabilitation and ethnic disparities (see Tables 1, 2, & 3; Figure 2).

A priori t-tests

Medical insurance was predicted to have an impact on stroke recovery during inpatient rehabilitation at the time of discharge in Hypothesis Three. It was expected that patients with private insurance, and patients with Medicare plus private insurance, would show greater improvement with a higher total FIM rating at the time of discharge than those who had Medicare alone, Medi-Cal alone, or Medi-Cal/Medicare insurance. The results from the t-tests indicated that a significant difference between private insurance patients and Medicare plus Medi-Cal patients was observed, t (269) = 2.055, $p < .05$.

Patients who had private insurance (M = 25.53, SE =.931) showed significantly greater total FIM change than patients who had Medicare plus Medi-Cal insurance (M =21.85, SE =1.466). However, significant differences were not found between the patients who had private insurance (M = 25.53, SE =.931) and patients who had Medicare only (M = 22.30, SE = 1.580), t (269) = 1.770, $p > .05$; or Medi-Cal only (M = 24.91, SE = 1.115) insurance, t (302) = .402, $p > .05$ (see Tables 4 & 5; Figure 3).

Analyses of Variance (ANOVAs)

Marital and family support to the stroke patient was predicted to influence the level of overall recovery in inpatient rehabilitation in Hypothesis Four. It was expected that patients who were married, living with a partner, or living with extended family, would show greater overall improvement in total FIM score change at discharge than those who lived alone and without such a support system, regardless of ethnicity or type of insurance. No significant difference was found between the two groups on Total FIM change at discharge from inpatient rehabilitation, $F(1, 444) = 1.486$, $p > .05$, indicating that those who were married or lived with a partner or family did not have greater overall improvement in stroke rehabilitation than those who were single and lived alone (see Tables 4 & 6; Figure 4).

Hypothesis Five predicted that location of residence would impact recovery outcome. It was anticipated that patients who lived in more rural areas away from resources (i.e., hospital, physical and speech therapy) and those who lived in low socioeconomic urban communities would have less functional gain (total FIM change) than those patients who lived in close rural areas and higher socioeconomic urban

communities. Again, no significant differences were found among the groups on total FIM change, F (4, 441) = .779, $p > .05$. According to the results of the analysis, patients who were identified as middle to high (upper) SES or those who lived in close rural areas where there were more resources available for medical and preventative care did not show greater overall improvement observed in total FIM score change than the patients who were identified as low/under income SES and those lived further out in remote rural communities (see Tables 4 & 7).

In Hypothesis Six, it was predicted that time of admission in the current study would support past stroke recovery literature related to ethnic differences in time of admission to inpatient rehabilitation for stroke recovery treatment. It was expected that the Caucasian group would show less time delay between onset of stroke symptoms and admission to inpatient rehabilitation than their African-American and Hispanic counterparts. Significant interaction was not found for ethnic groups on time delay to treatment from onset of stroke, F (2, 443) = .095, $P > .05$ (see Table 8). Furthermore, no significant group differences were found between the Caucasian group ($\underline{M}$ = 11.93, SD =10.63) and Hispanic group ($\underline{M}$ =11.80, SD =11.69), and between the Caucasian group ($\underline{M}$ = 11.93, SD =10.63) and African-American group ($\underline{M}$ = 12.67, SD =13.98) (see Table 1). The Caucasian group was not admitted into stroke inpatient rehabilitation in fewer days after onset of stroke than the Hispanic or African-American groups.

CHAPTER FOUR

DISCUSSION

The discussion will include a review of each predicted hypothesis followed by a summary of the results. In addition, general conclusions and limitations of the current study will be discussed. Finally, recommendations for future research will be suggested.

First Aim

The first aim was to evaluate the influence of ethnicity on the recovery of stroke in stroke inpatient rehabilitation. Bhandari et al. (2005) found significant ethnic differences between ethnic groups in FIM score change. More specifically, African-Americans showed less FIM score change than the Caucasians and Hispanics in overall improvement from stroke when discharged from inpatient rehabilitation. Hypothesis One tested Bhandari et al.'s (2005) findings, predicting that the Caucasian group would show greater overall improvement with higher total FIM scores at discharge than the African-American and Hispanic groups.

The current study followed Bhandari et al.'s (2005) method for determining ethnic group identify, FIM scores at admission and discharge from inpatient rehabilitation, and type of stroke. However, Hypothesis One did not corroborate Bhandari et al.'s (2005) findings. That is, the current study did not find that Caucasians showed significantly greater overall improvement from Hispanics and African-Americans in stroke rehabilitation as evidenced by FIM score changes. Although, significant differences were not found, the mean for FIM score difference was higher for the Caucasians than for the African-Americans and the Hispanics.

In contrast to the current study, the sample size in Bhandari et al.'s (2005) study was much larger. Additionally, they had and equivalent number of Caucasian and African-American subjects, whereas the number of Caucasian subjects was double that of African-Americans in the current study. There are at least a couple possible reasons for the discrepancies between the findings of the two studies. First, Bhandari et al.'s (2005) sample size better represented the African-American community than our sample size. Second, their study was conducted in San Francisco, California, where a different lifestyle is practiced due to a colder climate and year-round recreational opportunities. Southern California residents are able to engage in many more outdoor as well as indoor activities. As one example, more outdoor activities are included in junior and high schools, such as swimming, water polo, tennis, and beach volleyball, helping the individual to develop more outdoor activity interests that carry into adult lifestyles.

Also inconsistent with past research, the results did not support the studies by Chiou-Tan, Keng, Graves, Chan, and Rintala (2006), Gregory, Han, Morozova, and Kuhlemeier (2006) and Ottenbacher, Campbell et al. (2008), who reported significant ethnic group differences in overall improvement in FIM scores among stroke patients in their studies. Although Chiou-Tan, Keng, Graves, Chan, and Rintala (2006) reported a significant difference between Hispanics and African-Americans in their post hoc testing, they reported that race/ethnicity was not predictive of discharge disposition due to the lack of significance between other ethnic groups. Further, the Caucasian group size was one-third of the Hispanic group and one-fourth of the African-American group; thus, the sample representing the Caucasian ethnic group was not of an adequate size. Additionally, according to the authors, the participants were from a large county hospital

and the majority of the participants were underinsured (Medicaid) and of low SES status. Given these differences, several confounds stand in the way of ethnicity alone being able to account for the difference in their findings.

In their study, Gregory, Han, Morozova, and Kuhlemeier (2006) reasoned that the ethnic group differences between African-Americans and Caucasians discharged from acute hospitals in Maryland were due to the patients' rural or urban dwelling and insurance type. Their African-American stroke group was more likely to be younger than the Caucasian group. The African-American group also showed a longer stay than the Caucasian group, suggesting that their stroke was more severe and/or complicated by other medical problems. Given these confounds, namely, age and length of stay, it could be argued that these variables either independently or interactively had an influence on the observed differences between ethnicities.

Moreover, possible accounts for the discrepancy between the current study and Ottenbacher, Campbell et al.'s (2008) study include several factors. First, Ottenbacher et al.'s (2008) study had a younger and wider age group that ranged from 30 to 105, whereas, the current study included only patients with age range from 45 to 96. As noted in the introduction of the current study, past stroke literature was consistent in reporting that age impacted rehabilitation, with younger patients showing significantly better recovery and prognosis. Second, Ottenbacher, Campbell et al.'s (2008) study was a national study that included a large number of hospitals across the 50 states, and the current study was based on one inpatient rehabilitation institute. It would be interesting to see if any differences would emerge if their sample size was equal to our study.

In summary, although ethnic disparities have emerged in past stroke literature, and continue to be a problem according to Healthy People 2010, the current study did not find any significant ethnic differences in overall improvement from inpatient rehabilitation among stroke recovery patients. The previously discussed factors may account for the finding in the current study. A unique account for the lack of differences may also be related to the standards and philosophy of care that are emphasized and endorsed by the professionals at Loma Linda Medical Center Inpatient Rehabilitation/ Stroke Institute, namely, the "treatment of the patient as whole" (i.e., mental, physical, emotional, spiritual).

In accordance with previous stroke rehabilitation and ethnic disparities in health literatures demonstrating that ethnic differences existed in the improvement level of cognitive functioning, Hypothesis Two predicted that ethnic differences would be found between the Caucasian, African-American, and Hispanic groups in the improved level of cognitive functioning at the time of discharge from inpatient rehabilitation. Further, it was predicted that the Caucasian group would show greater cognitive improvement with higher FIM scores in the areas of cognition than the African and Hispanic groups. The lack of significant findings of cognitive improvement between ethnic groups in the current study were consistent with studies conducted by Heruti et al. (2002) Horn et al. (2010) and Saxena (2006).

Heruti et al. (2002) reasoned that the minimal cognitive improvement observed in their study patients was due to their patients' advanced age (all were elderly), although the same patients showed overall functional improvement equal to the cognitively intact patients. Ethnic differences were not explored. However, putting aside ethnicity and

elderly age, the authors did not find significant cognitive FIM score changes among the participants. Heruti et al. (2002) suggested that cognitive improvement was influenced by sensory, motor, and/or global impairment. If speech was impaired by motor, cognitive improvement FIM scores would continue to change but sensory or global impairment would negatively impact FIM score change.

Horn et al.'s (2010) study was partially supported by the current findings. Horn et al. did not find significant difference in cognitive FIM score change between African-Americans and Caucasians with moderate stroke. However, among severe strokes, significant differences between the two races emerged in cognitive FIM score change. Their study included a much larger sample size that came from 6 inpatient facilities in the U. S. It is apparent that when stroke is separated by level of severity, findings may be different.

Two additional points about Horn et al.'s (2010) study stand out. First, ethnic group identification in the current study was from self-identified group membership by the patients, whereas, Horn et al. acknowledged that race misclassification was a risk because patients were classified as African-American or Caucasian (i.e., group membership was determined by collapsing groups by race as opposed to ethnicity). The question remains, if ethnic groups were identified rather than the use of race classification, would the findings be the same? Second, their sample came from six separate facilities with ethnicity/race unevenly dispersed, whereas, our sample size was from one facility with better representation of the diverse population in the regional area of the study when exploring ethnic disparities.

Other studies completely omit the influence of ethnicity on stroke recovery. As an example, Saxena (2006), in a study conducted in Singapore with three different ethnicities (Indian, Malay, and Chinese) found lack of cognitive improvement was accounted for by depression and older age. One would assume rich differences in languages and cultures among the participants; however, the influence of ethnicity was not explored.

In contrast to our findings, Rabadi, Rabadi, Edelstein, & Peterson (2006) found significant difference in cognitive FIM score change between normal, mild, moderate, and severe groups. However, Cognitive FIM score changes were compared with/and accounted for by severity of stroke. Rabadi, Rabadi, Edelstein, & Peterson's (2006) study was conducted in New York, an ethnically diverse area, and the authors included ethnic group membership in their demographic table, but interestingly did not examine ethnicity as part of their study.

In summary, although there has been no direct examination of the possible health disparities specific to cognitive recovery from stroke, the current study did not find support for any such disparities. However, it may be fortunate that significant ethnic group differences were not found in cognitive FIM score change in the current study. This may indicate that all ethnic groups were treated with the same level of whole-person care. Another idea is that possibly the margins of ethnic disparity are closing in. But a more logical explanation may be that depending on the location and severity of the stroke, some patients did not experience much if any cognitive impairment. Thus, those patients' cognitive FIM scores would not change or would have small change.

Second Aim

The second aim was to explore the impact of medical insurance, location of residence, and marital and family support on stroke recovery in inpatient rehabilitation. Supporting the prediction in Hypothesis Three, Shen & Washington (2007) found that privately insured patients had a lower level of neurological impairment compared to uninsured/Medicaid patients who had suffered an ischemic or hemorrhagic stroke. Following Shen & Washington's (2007) findings, it was predicted that medical insurance would have an impact on stroke recovery during inpatient rehabilitation at the time of discharge. It was expected that patients with private insurance, and patients with Medicare plus private insurance, would show greater improvement with a higher total FIM rating at the time of discharge than those who had Medicare alone, MediCal alone, or MediCal plus Medicare insurance.

On the contrary to our prediction, the lack of significant findings for this population was unexpected. However, Hypothesis Three was supported by Bhandri et al.'s (2005) study, namely their finding that Medicare did not appear to impact recovery outcome. Yet, this is interesting to think about in light of results from other studies. Retchin et al. (1997) reported that Medicare HMO and fee-for-service (FFS) insurance may impact stroke recovery outcome, as patients with Medicare HMO were more likely to discharge to nursing home, whereas, those with FFS were able to participate in an inpatient rehabilitation program. Deutsch et al. (2006) had similar findings and found that stroke patients who went to inpatient rehabilitation facilities (FFS) showed significantly better recovery outcome than those who went to subacute facilities

(Medicare HMO). Gillen, Tennen & McKee (2007) found similar significant impact of Medicare HMO and FFS that will be discussed later.

So, why did the current study find no significant difference between the privately insured and Medicare, MediCal/Medicaid groups in our sample? Possible explanations may be due to demographic differences between the population in the current study and other studies. These would include a difference in age range of the patients, family support of the patients, or the strength of the discharge plan. The patients in the current study had to have a good discharge plan presented prior to being admitted into the inpatient rehabilitation program. This criterion was set to ensure that the patient would continue to make improvements after being discharged from the inpatient facility. Finally, it may be that although the type of insurance has been shown to impact rehabilitation among stroke patients, the outcome from the high standards of care and philosophy of treating the whole person at LLUMC Inpatient Rehabilitation stands out among other studies.

According to Massucci et al. (2006), negative outcome in recovery from stroke was associated with the patient living alone. The authors suggested that living alone prior to the stroke negatively impacted recovery because it meant that the patient would not be able to return home or be able to go home to his or her family. Hypothesis Four in the current study predicted that marital and family support to the stroke patient would influence the level of overall recovery in inpatient rehabilitation. It was expected that patients who were married, or lived with an intact family and/or extended family, would show greater overall improvement evidenced by total FIM score change from such a support system, regardless of ethnicity and type of insurance.

In contrast, the current findings did not support Massucci et al. (2006), but rather they supported Nguyen, Page, Aggarwal, and Henke (2007), who found that marital status was the main factor for the place of discharge, but not with discharge function (total FIM score change). Moreover, Tsouna-Hadjis et al. (2000) suggested that the amount of marital/family support was a determinant of the patients' functional change. Accordingly, they found a significant difference between low/medium support group and high marital/family support group within a 6-month period. One argument for the contrast in our findings is that we wanted to examine the effects of marital/family support during the patients' participation in an inpatient rehabilitation program, thus, we did not track our patients once they were discharged from the facility for this study. A possible reason for not finding significant changes between the marital status groups in our study may be due to the pre-requisite of having family support/discharge plan prior to admission into our inpatient rehabilitation. Therefore, regardless of being married or single, the patients who were admitted into this inpatient rehabilitation program were receiving some type of support during their recovery and participation in the rehabilitation program.

Finally, Glass et al. (2000) discussed the importance of "using language that is active rather than passive, and collective than directive" with patients who have survived stroke to facilitate independence in the patient. Patients need to feel that they can be independent from their family members' help and can have control over their lives. It would be appropriate that our findings support Glass et al.'s assumptions, given that our inpatient rehabilitation program endorses the collaborative method of rehabilitation

therapies encourages patients to be actively involved in the decision-making process regarding their therapies.

Past studies suggested that SES was associated with the level of stroke recovery. As example of such studies, Horner et al. (2003) found that low SES African-Americans had lower functional gain than high SES African-Americans among the African-American patients in their study. Hypothesis Five in the current study predicted that socioeconomic status would impact recovery outcome. It was anticipated that patients who lived in further low-income rural areas and those who lived in lower socioeconomic urban communities (low SES) would have less functional gain (FIM score change) than those patients who lived in close rural areas and higher socioeconomic urban (middle, high SES) communities. Horner et al. suggested that the difference between the two SES groups was because the low SES group of African-Americans had delayed admission to inpatient rehabilitation after the onset of stroke. Horner et al. went on to suggest that the delayed admission was possibly due to less social support and resources that low SES African-Americans experience compared to other low SES ethnic groups.

Our prediction was not supported by past literature. Several ideas may account for the lack of significant differences between the SES groups in total FIM change at the time of discharge. First, because of the admission criteria, most patients who admit to the inpatient rehabilitation program have some type of family or social support system. Second, the high standards and equality of care for the patients seem to be observable in the results of the current study. Since this study was retrospective rather than prospective, information about the patient's income and education level was not available. Thus, the method for estimating the patients' SES was by the use of an internet

program that calculated average income based on the patients' reported zip code of primary residence. This same method was used by Sandel et al. (2009) to determine average household income in their study, to investigate disparities in stroke rehabilitation. Further, even in prospective studies, it is difficult to collect accurate data for the income variable. In general, people are private and do not feel comfortable in revealing their income to others. It would be interesting to see if the findings would be different if that data were available. Lastly, race/ethnicity is often grouped with SES, and past studies on ethnic disparity have shown that it was difficult to partition the ethnicity and SES as independent predictors in stroke recovery, according to Horner et al. (2005), Sacco et al. (2001), Kapral et al. (2002) and Sandel et al. (2009).

Third Aim

Finally, the third aim was to determine if our data would replicate what prior stroke recovery literature regarding the influence of time of admission to rehabilitation and the length of stay in inpatient rehabilitation. Horner et al. (2003) found an average difference of one-half day longer delay for admission to inpatient rehabilitation, and significantly slower rate of physical functioning recovery during the first year after stroke for African-Americans and Caucasians. According to Horner et al., the delayed admission negatively impacted initiation of stroke recovery with African-American more than with Caucasian patients. The authors suggested that patients who admitted within three days post-stroke showed greater improvement in physical functioning than those who admitted more than three days after stroke with both Caucasians and African-

Americans. Conversely, Sandel et al. (2009) found that admission into inpatient rehabilitation was more likely among African-Americans than Caucasians.

To determine if the current study would support prior research demonstrating ethnic differences in time of admission to rehabilitation, Hypothesis Six predicted Caucasian group would show less time delay between onset of stroke and admission to inpatient rehabilitation than their African-American and Hispanic counterparts. Such differences were not found. Our findings were counter to those of Sandel et al. (2009), Horner et al. (2003), and Carod-Artal et al.'s (2005) findings that extended time delay between stroke and admission to rehabilitation has an adverse impact on recovery. Moreover, they were not consistent with Maulden et al.'s (2005) findings that suggested fewer days between onset of stroke and admission to inpatient rehabilitation were associated with significantly greater functional improvement.

Perhaps our findings support the national focus to eliminate ethnic health disparities through educational and prophylactic resources that address stroke and medical assistance. Because we are a non-profit medical institution, all patients receive the same medical care and therapeutic recommendations. Furthermore, due to admission criteria for inpatient rehabilitation, the patients more likely have family support and interest in the patient's well-being, thus, the patients' families advocate for their timely admission after onset of stroke. It may also be possible that the physicians who refer their patients to the inpatient rehabilitation program have a trusted relationship with their patients and a collaborative relationship with our medical center. Therefore, the patients do not delay to admit into our facility after being discharged from acute hospitals/units. On a final note, although there was no significant difference found between ethnic groups

on delay from onset of stroke to admission to inpatient rehabilitation, our average number of days between stroke onset and admission was not different from other inpatient rehabilitation hospitals included in a study by Gassaway et al. (2005).

Stroke literature in the investigation of ethnic differences in the length of stay (LOS) in acute rehabilitation facilities has been inconclusive. Some studies have found significant differences between ethnic groups while other studies have not. In Hypothesis Seven, it was expected that the Caucasian ethnic group would have on average a longer stay in stroke inpatient rehabilitation than the African-American and Hispanic groups, as was found in some studies. This hypothesis was not supported.

Although the hypothesis was not supported, the current findings are consistent with Bhandari et al. (2005) and Ottenbacher, Campbell, et al. (2008), who did not find significant differences between ethnic groups and LOS. The fact that significant differences did not emerge between ethnic groups in the current study may better be accounted for by the standard of care that is given to all of the patients regardless of ethnic membership. Further, past studies, delayed or long admission in the acute hospital after the onset of stroke. The average days from stroke onset to admission into inpatient rehabilitation in the current study was 12 days.

Conclusions

Given the prevalence of ethnic/racial disparities in health demonstrated in the literature as well as the U.S. government's recent increased focus on the reduction of these disparities, the current study investigated whether ethnic disparities existed in the treatment and recovery level among the stroke recovery patients in our inpatient

rehabilitation program. The current study predicted that significant differences between ethnic groups would emerge in overall improvement in recovery, level of cognitive improvement, time delay from onset of stroke to admission to inpatient rehabilitation, and length of stay. Furthermore, significant differences were predicted to emerge in patients' overall improvement with respect to insurance type, level of social support, and socioeconomic status.

Interestingly, no significant differences were found in any of the predictions in the current study. More specifically, significant differences did not emerge between ethnic groups in overall improvement based on total FIM score changes, in cognitive improvement based on cognitive FIM score changes, in the time delay from onset of stroke to admission into our inpatient rehabilitation facility, or in the length of stay in our inpatient rehabilitation facility. Additionally, no significant differences in total FIM score changes emerged between the patient's type of insurance (Medicare, Medi-Cal, Medicare/Medi-Cal, private insurance), level of social support (whether the patient was married or single and lived alone), or socioeconomic status (place of residence in low, middle, or high income areas).

Recall that prior investigations have suggested that ethnicity may not be independent of SES and insurance type. Other literature has suggested that cultural beliefs and practices, marital status, and location of residence impacted the patient's recovery. Furthermore, this was thought to be due to the extended delay to treatment after onset of stroke and the length of stay. Several studies suggested that ethnic differences and LOS were due to differences in service quality between the African-Americans and Caucasians, the patient's experience in inpatient rehabilitation, and the

providers' filter of services that were provided based on the providers' assumptions of the patient's expectations, preferences, and resources. Others have suggested that external locus of control among the African-Americans related to health and medical beliefs and behaviors better accounted for the ethnic and LOS differences. Yet, other studies have suggested that the delay of admission into inpatient rehabilitation after onset of stroke and LOS were the result of patients' geographical distance – living in rural areas, far from medical care only offered in urban areas – or to other psychosocial factors such as living alone (Sandel et al., 2009; Heruti et al., 2002).

Several possible explanations are proposed for the lack of significant findings in the current study. First, there may be intrinsic differences in LLUMC's acute inpatient rehabilitation program. It stands to reason that that all patients are treated with the same standard of care regardless of their ethnic membership, type of insurance, marital status, and SES.

Second, the hospital's philosophy of treating the whole patient includes not only the medical and physical, but the mental, emotional, and spiritual aspects that the patient may have problems with during their inpatient stay. Thus, the patient's strengths and resources are incorporated into the individual's treatment. The patient is also given options to help them face their obstacles or lack of resources once they are discharged. Addressing these factors and helping the patients with emotional, mental, and spiritual struggles, the patients are better able to develop a balance in their life and feel an internal locus of control that results in their desire to actively engage in their therapies.

Third, every patient is given the same LOS based on their medical and therapeutic needs, and allowances. That is, the length of stay is largely determined by their case mix

group which is the basis for the Health Insurance Prospective Payment System (HIPPS) rate codes used by Medicare in its prospective payment systems. In other words, the treatment team's length of stay is primarily dictated by an external source.

Fourth, all patients who are admitted into the LLUMC acute unit after being diagnosed with stroke, are encouraged to transfer as soon as possible into the inpatient rehabilitation program for further stroke recovery therapy rather than discharging to home or into a skilled nursing facility. This practice may well account for the contradicting results that emerged in the current study.

Fifth, once the patients are in the inpatient rehabilitation institute, they are immersed into a rigorous rehabilitation program that includes intense physical therapy, occupational therapy, speech therapy, and recreational therapy at 3-5 hours per day, whereas, insurance guidelines require only 3 hours per day. This intense rehabilitation practice was supported by the findings from an international study that compared stroke rehabilitation practice and outcomes between U.S. and New Zealand facilities (McNaughton, DeJong, Smout, Melvin, & Brandstater, 2005; Horn et al., 2005), that intensive rehabilitation right after the onset of stroke is the best course to achieve the best prognosis possible with recovery.

Sixth, the patient's family and/or friends are encouraged to participate in the patient's rehabilitation program during the patient's stay as long as the patient is encouraged to develop and practice independence in his/her daily functions (i.e., feeding themselves, dressing). Some inpatient facilities accommodate the patient but not the family, whereas, our inpatient rehabilitation institute makes great effort to encourage family engagement by providing the patients with private rooms with a sleeping area for

family members. Visiting hours are not limited to encourage friends and family-support for the patients. The patients and their families are given education on stroke and recovery via the electronic educational and resource program, handouts on stroke and acquired brain injury support groups that meet at the hospital, as well as other resources at the time of discharge.

Considering the characteristics of the inpatient rehabilitation program that was used in the current study, it is appropriate ethnic differences were not found in stroke inpatient rehabilitation. Further, the paradigm of the inpatient rehabilitation program in the current study appears to be a good model for reducing the ethnic disparities reported in past studies on stroke rehabilitation. Perhaps this is a paradigm that the U.S. government should consider to implement in regional or county medical facilities that have inpatient stroke rehabilitation, or support private providers who offer such services.

Limitations of Current Study

The current study had several limitations. Starting with socioeconomic status, it was difficult to determine the exact SES classification of each stroke survival patient who was admitted in the inpatient rehabilitation program. Socioeconomic classification is generally calculated by the level of education and average annual income. Income and career information were not consistently found in the patients' medical records since this information is not included in preadmission interviews. Of the current sample, a larger portion of the patients were unemployed for various reasons, including physical disability, elderly age, and medical conditions, thus, suggesting a lower income.

However, to examine and obtain more accurate findings whether SES is a factor that helps or impedes recovery from stroke, accurate SES classification is needed.

The second limitation was the patient's education level. Not only does education level play an important part of the patient's cognitive reserve as a predictor in treatment outcome, it is another factor that is used for calculating SES. Given that education level and average annual income information was not available, the zip code method was used to determine the patient's average annual income and SES. Other studies have used this method for determining the patient's SES. Although the zip code method does not give a completely accurate income figure, it gives a conservative estimation of one's income and SES calculation. The patient's education level is also suggestive of the type of career that the patient was engaged in before retirement or disability. Education and career give health professionals rich data about the patient's drive, motivations, interests, and limitations that facilitate their treatment.

The third limitation was patients' often incomplete medical history, making it difficult to determine if they had had previous strokes. In cases where the patients may have had a previous stroke, it is important to determine how much physical and cognitive impairment is from the new stroke or residual impairment from prior strokes. Perhaps, significant differences were camouflaged by members in their ethnic group who did not make better recovery due to past stroke history.

The fourth limitation was uneven ethnic group sizes. Of the total sample in the current study, the group size for the Caucasians was two times greater than the Hispanics, and five times greater than the African-Americans. It would be interesting to see if ethnic

differences would emerge if the African-American and Hispanic groups were of the same size as the Caucasian group.

The fifth limitation was inaccurate information concerning patients' residential status. Because the criterion for admission into the inpatient rehabilitation facility in the current study is to have an adequate discharge plan for the patient, some patients are reported as living with family whereas they may live alone. More accurate documentation regarding the patient's residential status is more important in treatment and recovery than is realized.

The sixth limitation was that primary language was not consistently reported in the medical records. English as a second language can have a significant impact on cognitive recovery scores. There are situations where the primary language is not English and the patient does not do well with speech therapy, only to find out that the patient is doing well in their own primary language. This information can also greatly help to obtain translators for the patients so that they get the best therapy possible.

The seventh limitation was the inconsistent patient history and medical information that reported by the attending physicians. Although the hospital's attending physicians fairly consistently reported accurate and detailed information about the patient's handedness, marital status, ethnicity, education level, site and type of stroke, symptoms that were endorsed by the patient, and past medical history in their history and medical information report, some adjunct physicians did not give accurate and detailed information with any personal and medical history.

The eighth limitation was that the FIM scores used to measure improvement are in themselves a limitation as they are not sensitive to the degree of change on a broader

range of function. A more sensitive measurement system that would capture the minute changes in a patient's improvement on a broader range of functions would certainly give a more accurate picture of change and improvement level in stroke recovery.

Finally, not having severity classification of the stroke was a limitation in the current study. Since cognitive change depends largely on the severity level, it was impossible to measure cognitive change based on severity between the ethnic groups. It would be interesting if differences would emerge between ethnic groups when measured within the same severity classification.

Future Directions

The current study does not dispute that ethnic differences exist in stroke rehabilitation, although, the current study, did not reach such findings. Thus, this study may help to shed light on the effectiveness of the rehabilitation model that was used in the current study. Implementation of a document that includes all of the variables that were addressed in the limitations of the study would be very useful in future research. The document could be filled out by a designated staff member upon admission to the inpatient rehabilitation facility.

Since recovery from stroke continues for approximately six to eighteen months following discharge from inpatient rehabilitation, it would be beneficial to know if ethnic differences would emerge after the patient is recovering in another setting such as home, nursing facility, or other living situation.

Periodic follow-up appointments or phone calls every three months would facilitate in obtaining added information related to recovery, ethnic disparities, continued

resources for stroke patients impacted by insurance type, overall improvement, cognitive improvement, and changes in lifestyle after stroke. Such information is valuable not only for the reduction of ethnic disparities among stroke patients but as well as for obtaining information of what resources could be encouraged before discharge as part of the patient's therapy.

TABLES

Table 1

Means and Standard Deviations for Total FIM Change, Cognitive FIM Change, Length of Stay,& Stroke Onset to Inpatient Rehabilitation Admission Time as a Function of Ethnic Groups

		Total FIM Change		*Cognitive FIM Change*		*Length of Stay*		Stroke Onset To Rehab Admit Time	
Ethnic Group	(N)	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Caucasian	268	24.78	12.673	0.72	0.671	19.23	8.145	11.93	10.631
Hispanic	123	23.97	12.172	0.59	0.478	18.63	6.981	11.8	11.693
African American	55	22.56	14.127	0.72	0.634	17.69	7.796	12.67	13.983

Note. FIM = Functional Independence Measurement

Table 2

Multivariate and Univariate Analyses of Variance for Ethnicity

Effect	Λ	F	df1	df2	?2	p	SS	M
Ethnicity	0.983	1.271	6	882	0.009	0.268		
Ethnicity X Total FIM Score Change		0.744	2	443	0.003	0.476	240.995	120.498
Ethnicity X Cognitive FIM Score Change		1.995	2	443	0.009	0.137	1.528	0.764
Ethnicity X Length of Stay (LOS)		0.971	2	443	0.004	0.38	118.057	59.029

Note. p > .05

Table 3

Correlation Coefficients for Relations Among Total FIM Score Change, Cognitive FIM Score Change, and Length of Stay

Measure	LOS	TotFIMchg	CogFIMchg
Lenth of Stay (LOS)	1	0.25*	-0.14*
Total FIM Change		1	-0.24*
Cognitive FIM change			1

Note. $p < .01$ *(2-tailed); TotFIMchg =Total Functional Independence Measurement change between admission and discharge; CogFIMchg = cognitive FIM change between admission and discharge; LOS = Length of hospital stay*

Table 4

Means, Standard Deviations, and Standard Error for Marital Status, SES, and Type of Insurance as a Function of Total FIM Score Change

		N	Mean	SD	SE
Marital Status	Married	232	24.99	12.914	0.848
	Single	214	23.52	12.487	0.854
Socioeconomic Status	Low Income	25	21.4	11.722	2.344
	Low Mid Income	250	24.54	12.618	0.798
	Middle Income	137	24.09	12.59	1.076
	Upper Mid Income	31	26.1	15.116	2.715
	Upper Income	3	16.67	7.767	4.485
Type of Insurance	Private	200	25.53	13.167	0.931
	Medicare	*71*	*22.3*	*13.32*	*1.580*
	MediCal	104	24.91	11.374	1.115
	Medicare/MediCal	71	21.85	12.356	1.466

Note. SES = Socioeconomic Status; FIM = Functional Independence Measurement.

Table 5

Independent Samples t-test Analyses between Private Insurance and Other Type of Insurance on Total FIM Score Change

	F	*t*	*df*	*Sig*	Mean Difference	Confidence Interval of the difference	
						Lower	Upper
Medicare	0.082	1.77	269	0.078	3.229	-0.363	6.821
MediCal	2.577	0.402	302	0.688	0.612	-2.382	3.605
Medicare/MediCal	0.276	2.055*	269	0.041	3.68	0.155	7.205

Note. Confidence Interval (C.I.) = 95%
Note. p <.05, Significance in between group differences

Table 6

One-Way Analysis of Variance Summary for Effect of Marital Status (married, single) on Total FIM Score Change

Source	df	SS	MS	F
Between Groups	1	240.02	240.02	1.49
Within Groups	444	71736.39	161.57	

Note. $p > .05$; FIM= Functional Independence Measurement

Table 7

One-Way Analysis of Variance Summary for Effect of Socioeconomic Status (low, low-middle, middle, middle-high, high) on Total FIM Score Change

Source	df	SS	MS	F
Between Groups	4	505.161	126.29	0.779
Within Groups	441	71471.243	162.066	

Note. $\underline{p} > .05$; FIM = Functional Independence Measurement

Table 8

One-Way Analysis of Variance Summary for Effect of Ethnic group (Hispanic, Caucasian, African American) on Delay from Stroke Onset to Rehab Admission

Source	df	SS	MS	F
Between Groups	2	30.727	15.363	0.119
Within Groups	443	57446.944	129.608	

Note. $p > .05$

Table 9

Pre-Treatment FIMs and Percentages for Independent Variables (ethnicity, marital status, type of insurance, socioeconomic status)

	N	%	Admit FIM
Ethnic Group			
Caucasian	268	60.1	46.78
African American	55	12.3	47.58
Hispanic	123	27.6	46.42
SES*			
Low income (< $20,000)	25	5.6	
Low-middle income ($21,000 - $39,000)	250	56.1	
Middle income ($440,000 - $60,000)	137	30.7	
Upper-middle income ($61,000 – $80,000)	31	7	
Upper/High income (>$81,000)	3	0.7	.
Insurance Type			
Private or Medicare + Private	201	45.1	
Medicare alone	70	15.7	
MediCal/Medicaid alone	104	23.3	
Medicare + MediCal	71	15.9	
Marital Status			
Single, divorced, widowed	214	48	
Married/ living w/partner	232	52	

* Note. SES: income levels based on U.S. Census Bureau (2006) household income levels for 2005 and U.S. Bureau (2006) median income of persons 25 years of age and older.

Table 10

Loma Linda Rehabilitation Institute Percentage of Discharge to Home and SNF Compared to Discharge Averages in the U. S. For January 2005 thru August 2009

Year	Home	Nation	SNF	Nation
2005	79.90%	66%	13%	14.80%
2006	82.70%	67.10%	13%	13.90%
2007	74.60%	65.70%	19%	13.90%
2008	80.80%	62.90%	9%	14%
2009	77.20%	59.20%	13%	15%

Note: SNF= Skilled nursing facility

FIGURES

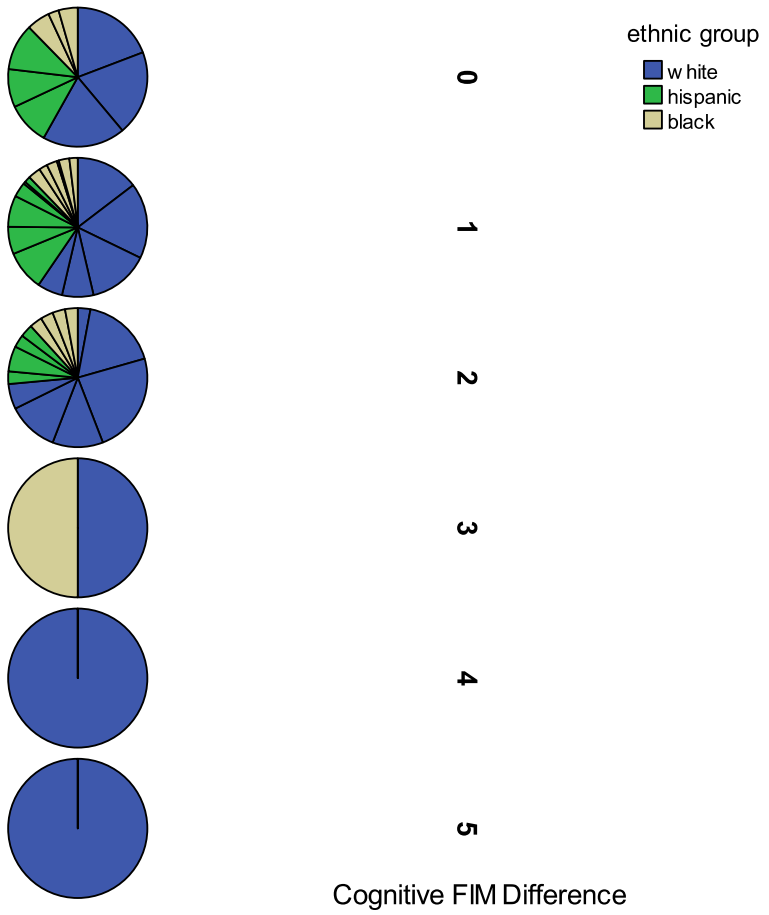


Figure 1. Cognitive FIM score difference between admission and discharge among ethnic groups.

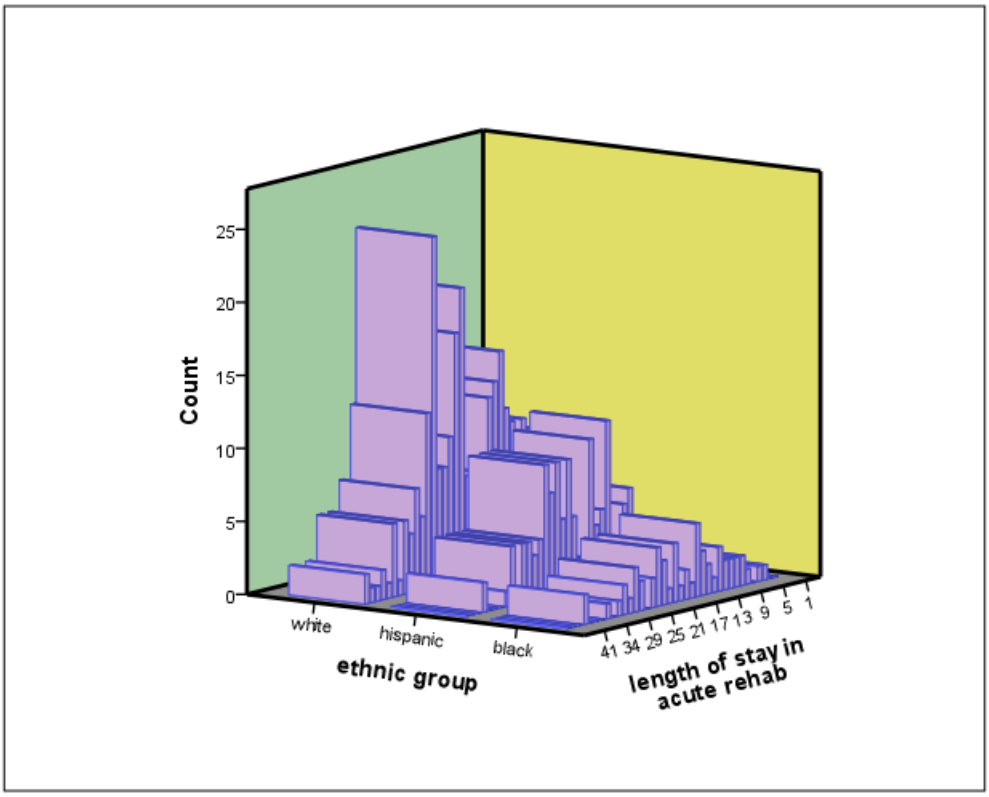


Figure 2. Differences between ethnic groups in hospital length of stay.

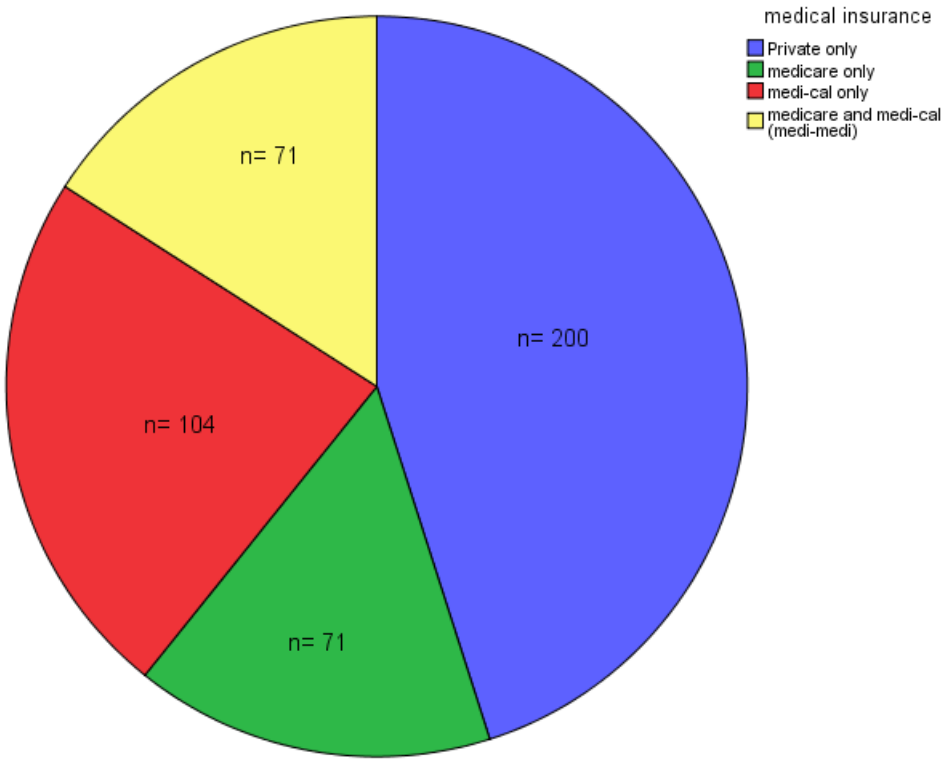


Figure 3. Insurance group membership for stoke patients admitted into inpatient rehabilitation.

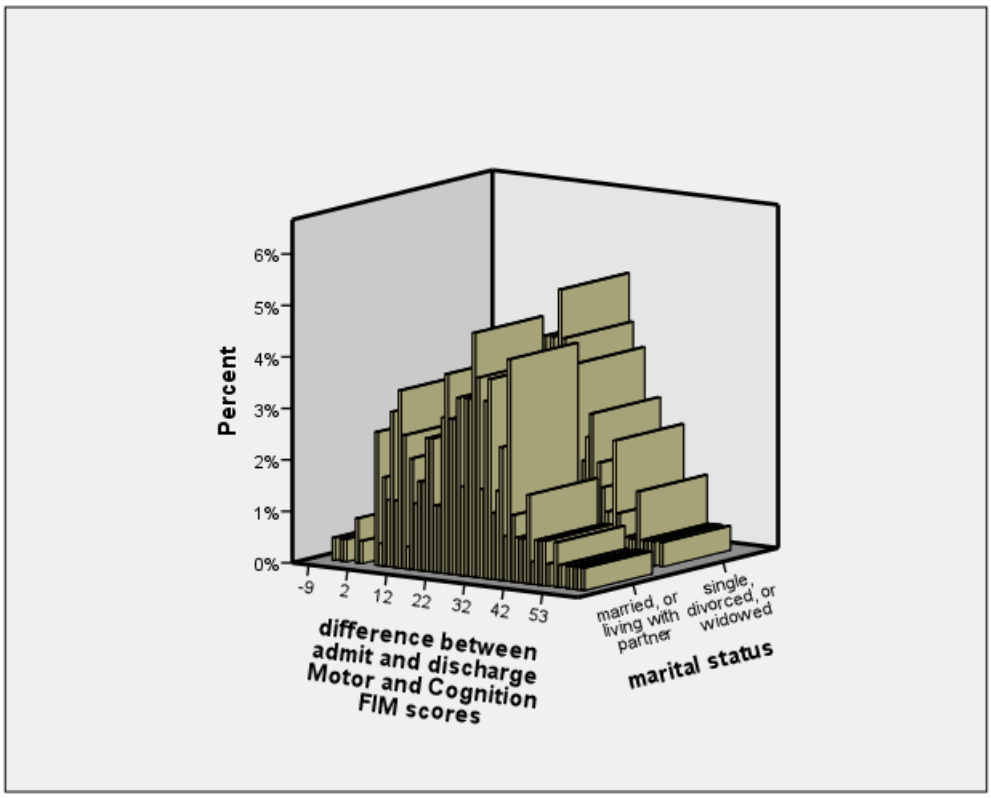


Figure 4. Total FIM score changes between marital status groups.

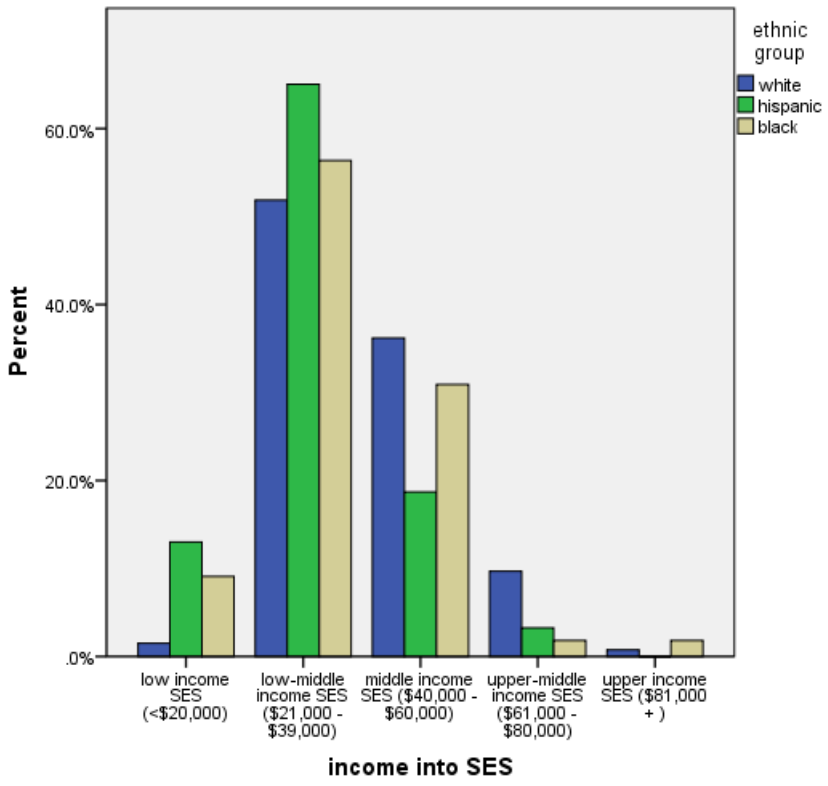


Figure 5. Ethnic groups categorized by socioeconomic status.

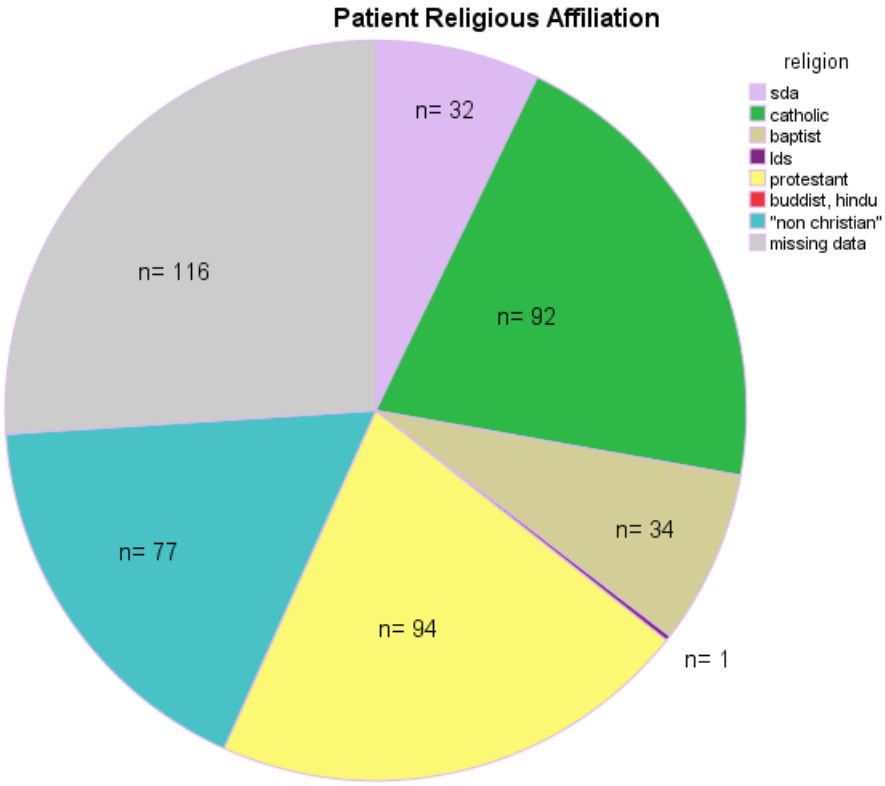


Figure 6. Patient's self-reported religious affiliation.

REFERENCES

Adler, N.E. & Newman, K. (2002). Socioeconomic disparities in health: Pathways and Polices. *Health Affairs, 21, 2,* 60-76.

Ayala, C., Croft, J. B., Greenlund, K. J., Keenan, N. L., Donehoo, R. S., Malarcher, A. M., & Mensah, G. A. (2002). Sex differences in US mortality rates for stroke and stroke subtypes by race/ethnicity and age, 1995-1998. *Stroke, 33,* 1197-1201.

Bagg, S. D., Pombo, A. P., & Hopman, W. M. (2006). Toward benchmarks for stroke rehabilitation in Ontario, Canada. *American Journal of Medicine and Rehabilitation, 85,* 12, p. 971-976.

Bassett, D. R., Futzhugh, E. C., Crespo, C. J., King, G. A., & McLaughlin, J. E. (2002). Physical activity and ethnic differences in hypertension prevalence in the United States. *Prev. Med., 34,* 179-186.

Bhandari, V. K., Kushel, M., Price, L., & Schillinger, D. (2005). Racial disparities in outcomes of inpatient stroke rehabilitation. *Archives of Physical Medicine and Rehabilitation, 86,* p. 2081-2086.

Bravata, D. M., Wells, C. K., Gulanski, B., Kernan, W. N., Brass, L. M., Long, J., & Concato, J. (2005). Racial disparities in stroke risk factors: The impact of socioeconomic status. *Stroke, 36,* 1507-1511.

Carod-Artal, F. J., Medeiros, M.S., Horan, T. A., & Braga, L. W. (2005). Predictive factors of functional gain in long-term stroke survivors admitted to a rehabilitation programme. *Brain Injury, 19,* 9, p. 667-673.

Centers for Diseases Control (October 10, 2007). *About Stroke.* Retrieved on August 17, 2009 from: http://www.cdc.gov/stroke/

Centers for Disease Control (2003). A public health action plan to prevent heart disease And stroke. Atlanta, GA: US Department of Health and Human Services, CDC; 2003. Retrieved on May 5, 2011 from: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5405a1.htm

Centers for Disease Control (June 11, 2009). National Center for Health Statistics. Retrieved on September 28, 2009 from: http://www.cdc.gov/nchs/ PRESSROOM/ 08newsreleases/mortality2006.htm

Chiou-Tan, F., Keng, M. J., Graves, D. E., Chan, K. T., & Rintala, D. H. (2006). Racial/ ethnic differences in FIM scores and length of stay for underinsured patients undergoing stroke inpatient rehabilitation. *American Journal of Physical Medicine and Rehabilitation, 85,* p. 415-423.

Chumney, D., Nollinger, K., Shesko, K., Skop, K., Spencer, M., & Newton, R. A. (2010). Ability of functional independence measure to accurately predict functional outcome of stroke-specific population: Systematic review. *Journal of Rehabilitation Research & Development, 47, (1),* 17-29.

Cournan, M. (2000). Use of the functional independence measure for outcomes measurement in acute inpatient rehabilitation. *Rehabilitation Nursing, 36, (3),* 111-117.

De Jong, G., Horn, S. D., Conroy, B., Nichols, D., & Healton, D. B. (2005). Opening the black box of Poststroke rehabilitation: Stroke rehabilitation patients, processes, and outcomes. *Archives of Physical Medicine and Rehabilitation, 86, 2,* S1-S7.

De Jong, G., Horn, S. D., Smout, R. J., & Ryser, D. H. (2005). The early impact of the Inpatient rehabilitation facility prospective payment system on stroke rehabilitation case mix, practice patterns, and outcomes. *Archives of Physical Medicine and Rehabilitation, 86,* S2, p. 93-100.

Department of Health Care Services (DHCS) (2007). *Programs and services: Medi-Cal.* Retrieved on May 5, 2010 from: http://www.dhcs.ca.gov/services/medi-cal/Pages/Medi-CalFAQs.aspx#whatismedi-cal

Deutsch, A., Granger, C. V., Heinemann, A. W., Fiedler, R. C., De Jong, G., Kane, R. L., et al. (2006). Poststroke rehabilitation outcomes and reimbursement of inpatient rehabilitation facilities and subacute rehabilitation programs. *Stroke, 37,* p. 1477-1482.

Dhamoon, M. S., Moon, Y. P., Paik, M. C., Boden-Albala, B., Rundek, T., Sacco, R. L., & Elkind, M. S. V. (2009). Long-Term functional recovery after first ischemic stroke. *Stroke, 40,* 2805-2811.

Dobkin, B. H. (2005). Rehabilitation after stroke. *The New England Journal of Medicine, 352,* p. 1677-1684.

Dressler, W. W., Bindon, J. R., & Neggers, Y. R. (1998). John Henryism, gender, and arterial blood pressure in an African American community. *Psychosom. Med., 60,* 620-624.

Dressler, W. W., Oths, K. S., & Gravlee, C. C. (2005). Race and ethnicity in public Health research: Models to explain health disparities. *The Annual Review of Anthropology, 34,* 231- 252.

Faul, F. & Erdfelder, E. (1992). GPOWER: A priori, post-hoc, and compromise power Analyses for MD-DOS [Computer program]. Bonn, FRG: Bonn University, Dep. of Psychology.

Field, A. (2005). Discovering Statistics Using SPSS (2nd ed). Thousand Oaks, CA: Sage Publications Ltd.

Finestone, H. M., Greene-Finestone, L. S., Wilson, E. S., & Teasell, R. W. (1996). Prolonged length of stay and reduced functional improvement rate in mal-nourished stroke rehabilitation patients. *Archives of Physical Medicine and Rehabilitation, 77,* p. 34-345.

Fiscella, K., Franks, P., Doescher, M. P., & Saver, B. G. (2002). Disparitites in health Care by race, ethnicity, and language among the insured. *Medical care, 40, 1,* 52-59.

Gassaway, J., Horn, S. D., De Jong, G., Smout, R. J., Clark, C., & James, R. (2005). Applying the clinical practice improvement approach to stroke rehabilitation: Methods used and baseline results. *Journal of Physical Medicine and Rehabilitation, 86,* S2, p.16-33.

Gillen, R., Tennen, H., & McKee, T. (2007). The impact of the inpatient rehabilitation facility prospective payment system on stroke program outcomes. *American Journal of Physical Medicine and Rehabilitation, 86,* 5, p. 356-363.

Glass, T. A., Matchar, D. B., Belyea, M., & Feussner, J. R. (1993). Impact of social support on outcome in first stroke. *Stroke, 24,* p. 64-70.

Glass, T. A., Dym, B., Greenberg, S., Rintell, D., Roesch, C. & Berkman, L. F. (2000). Psychosocial intervention in stroke: Families in recovery from stroke trial (FIRST). *American Journal of Orthopsychiatry, 70,* 2, p. 169-181.

Gregory, P. C., Han, E., Morozova, O., & Kuhlemeier, K. V. (2006). Do racial disparities exist in access to inpatient stroke rehabilitation in the state of Maryland? *American Journal of Physical Medicine and Rehabilitation, 85,* 10, p. 814-819.

Hargraves, J. L. & Hadley, J. (June, 2003). Impact of health care context: The contribution of insurance coverage and community resources to reducing racial/ethnic disparities in access to care. *Health Services Research, 38, 3,* 809-829.

Heron, M. P., Hoyt, D. L., Murphy, L., Xu, J. Q., Kochanek, K. D., & Tejada-Vera, B. (2009). Deaths: Final data for 2006. *National Vital Statistics Reports 2009, 57,* 14, 1-15.

Heruti, R. J., Lusky, A., Dankner, R., Ring, H., Dolgopiat, M., Barell, V., Levenkrohn, S., & Adunsky, A. (2002). Rehabilitation outcome of elderly patients after a first stroke: Effect of cognitive status at admission on the functional outcome. *Archives of Physical Medicine and Rehabilitation, 83,* p. 742-749.

Horn, S. D., De Jong, G., Smout, R. J., Gassaway, J., James, R., & Conroy, B. (2005). Stroke rehabilitation patients, practices, and outcomes: Is earlier and more aggressive therapy better? *Archives of Physical Medicine and Rehabilitation, 86,* S2, p. 101-114.

Horner, R. D., Swanson, J. W., Bosworth, H.B., & Matchar, D. B. (2003). Effects of race and poverty on the process and outcome of inpatient rehabilitation services among stroke patients. *Stroke, 34,* p. 1027-1031.

James, S. A., Harnett, S. A., & Kalsbeek, W. D. (1983). John Henryism and blood pressure differences among black men. *Journal of Behavioral Medicine, 6,* 259-278.

Jonas, B. S., & Lando, J. F. (2000). Negative affect as a prospective risk factor for hypertension. *Psychosom. Med., 62,* 188-196.

Jones, M. R., Horner, R. D., Edwards, L. J., Hoff, J., Armstrong, S. B., Smith-Hammond, C. A., Matchar, D. B., & Oddone, E. Z. (2000). Racial variation in initial stroke severity. *Stroke, 31,* 563-567.

Kapral, M. K., Wang, H., Mamdani, M., Tu, J. V., Boden-Albala, B., & Sacco, R. L. (2002). Effect of socioeconomic status on treatment of mortality after stroke. *Stroke, 33,* 268-275.

Kaufman, J. S., & Cooper, R. S. (1999). Seeking causal explanations in social epidemiology. *American Journal of Epidemiology, 154,* 291-298.

Kawachi, I., Daniels, N., & Robinson, D. E. (2005). Health disparities by race and class: Why both matter. *Health Affairs, 24,* (2), 343-352.

Knox, S. S., Hausdorff, J., & Markovitz, J. H. (2002). Reactivity as a predictor of subsequent blood pressure. *Hypertension, 40,* 914-919.

Krieger, N. (2003). Does racism harm health? Did child abuse exist before 1982? On Explicit questions, critical science, and current controversies: an ecosocial perspective. *American Journal of Public Health, 93,* 194-199.

Krivinskas, S. (2011). What are the advantages and disadvantages of using the Functional Independence Measure (FIM) as an outcome measure for people receiving rehabilitation? Retrieved on May 6, 2011 from: http://www.bsrm.co.uk/prizes/Kravinski-Sophie-FIM.pdf

Lacy, C. R., Suh, D. C., Bueno, M., & Kostis, J. B. (2001). Delay in presentation and evaluation for acute stroke: Stroke time registry for outcomes, knowledge, and epidemiology (S.T.R.O.K.E.). *Stroke, 32,* p. 63-69.

Levenstein, S., Smith, M. W., & Kaplan, G. A. (2001). Psychosocial predictors of hypertension in men and women. *Archives of Internal Medicine, 161,* 1341-1346.

Lloyd-Jones, D., Adams, R., Carnethon, M., et al. (2009). Heart disease and stroke statistics- 2009 update: a report from the American heart association statistics committee and stroke statistics subcommittee. *Circulation* 2009, 119: e21-e181.

Markovitz, J. H., Matthews, K. A., Whooley, M., Lewis, C. E., & Greenlund, K. J. (2004). Increases in job strain are associated with incident hypertension in the CARDIA study. *American Journal of Behavioral Medicine, 28,* 4-9.

Massucci, M., Perdon, L., Agosti, M., Celani, M. G., Righetti, E., Recupero, E., Todeschini, E., & Franceschini, M. (2006). Prognostic factors of activity limitation and discharge destination after stroke rehabilitation. *American Journal of Physical Medicine and Rehabilitation, 85,* p. 963-970.

Maulden, S. A., Gassaway, J., Horn, S. D., Smout, R. J., & De Jong, G. (2005). Timing of initiation of rehabilitation after stroke. *Archives of Physical Medicine and Rehabilitation, 86,* S2, p. 34-40.

McNaughton, H., De Jong, G., Smout, R. J., Melvin, J. L., & Brandstater, M. (2005). A comparison of stroke rehabilitation practice and outcomes between New Zealand and United States facilities. *Archives of Physical Medicine and Rehabilitation, 86,* S2, p. 115-120.

Morris, D. L., Rosamond, W., Madden, K., Schultz, C., & Hamilton, S. (2000). Pre-hospital and emergency department delays after acute stroke: the Genentech stroke presentation survey. *Stroke, 31,* p. 2585-2590.

Nguyen, T. A., Page, A., Aggarwal, A., & Henke, P. (2007). Social determinants of discharge destination for patients after stroke with low admission FIM instrument Scores. *Archives of Physical Medicine and Rehabilitation, 88,* p. 740-744.

Oths, K. S., Dunn, L. L., & Palmer, N. S. (2001). A prospective study of psychosocial job strain and birth outcomes. *Epidemiology, 12,* 744-746.

Ottenbacher, K. J., Campbell, J., Kuo, Y. F., Deutsch, A., Ostir, G. V., & Granger, C. V. (2008). Racial and ethnic differences in postacute rehabilitation outcomes after stroke in the United States. *Stroke, 39,* p. 1514-1519.

Ottenbacher, K. J., Hsu, Y., Granger, C. V., & Fiedler, R. C. (1996). The reliability of the Functional Independence Measure: A quantitative review. *Archives of Physical Medicine and Rehabilitation, 77,* p. 1226-1232.

Poulain M., Pes, G.M., Grasland C., Carru C., Ferucci L., Baggio G., Franceschi C., Deiana L. (2004). "Identification of a Geographic Area Characterized by Extreme Longevity in the Sardinia Island: the AKEA study". *Experimental Gerontology, 39* **39** (9): 1423–1429

Rabadi, M. H., Rabadi, F. M., Edelstein, L., & Peterson, M. (2008). Cognitively impaired stroke patients do benefit from admission to an acute rehabilitation unit. *Archives of Physical Medicine and Rehabilitation, 89,* p. 441-448.

Retchin, S. M., Brown, R. S., Yeh, S. J., Chu, D., & Moreno, L. (1997). Outcomes in Stroke patients in Medicare fee for service and managed care. *Journal of American Medical Association, 278,* 2, P. 119-124.

Sacco, R. L., Boden-Albala, B., Abel, G., Lin, I. F., Elkind, M., Hauser, W. A., Paik, M. C., & Shea, S. (2001). Race-ethnic disparities in the impact of stroke risk factors: The northern manhattan stroke study. *Stroke, 32,* 1725-1731.

Salter, K., Jutai, J. W., Teasell, R., Foley, N. C., Bitensky, J., & Bayley, M. (2005). Issues for selection of outcome measures in stroke rehabilitation: ICF activity. *Disability and Rehabililtation, 27,* 6, p. 315-340.

Sandel, M. E., Wang, H., Terdiman, J., Hoffman, J. M., Cioi, M. A., Sidney, S., Quesenberry, C., Lu, Q., & Chan, L. (2009). Disparities in stroke rehabilitation: Results of a study in an integrated health system in northern California. *American Academy of Physical Medicine and Rehabilitation, 1,* 29-40.

Saxena, S. K. (2006). Prevalence and correlated of cognitive impairment in stroke patients in a rehabilitation setting. *The International Journal of Psychosocial Rehabilitation, 10,* 2, p. 37-47.

Schneider, A. T., Kissela, B., Woo, D., Kleindorfer, D., Alwell, K., Miller, R., et al. (2004). Ischemic stroke subtypes: A population-based study of incidence rates among blacks and whites. *Stroke, 35,* 1552-1556.

Schum, J. L., Jorgensen, R. S., Verhaeghen, P., Sauro, M., & Thibodeau, R. (2003). Trait Anger, anger expression, and ambulatory blood pressure: a meta-analytic review. *Journal of Behavioral Medicine, 26,* 395-415.

Shen, J. J. & Washington, E. L. (2007). Disparities in outcomes among patients with stroke associated with insurance status. *Stroke, 38,* 1010-1016.

Somerford, P. J., Lee, A. H., & Yau, K. KW. (2004). Ischemic stroke hospital stay and Discharge destination. *Annals of Epidemiology, 14,* 10, p. 773-777.

Stansbury, J. P., Jia, H., Williams, L. S., Vogel, W. B., & Duncan, P. W. (2005). Ethnic disparities in stroke: Acute care, and postacute outcomes. *Stroke, 36,* p. 374-386.

Tsouna-Hadjis, E., Vemmos, K. N., Zakopoulos, N., & Stamatelopoulos, S. (2000). First-stroke recovery process: The role of family support. *Archives of Physical Medicine and Rehabilitation, 81,* p. 881-887.

Uniform Data System for Medical Rehabilitation (1999-2009-a). *About the FIM system.* Retrieved on September 4, 2009 from: http://www.udsmr.org/WebModules/FIM/Fim_ About.aspx

Uniform Data System for Medical Rehabilitation (1999-2009-b). *Reliability and Validity of the FIM.* Retrieved on September 3, 2009 from: http://www.udsmr.org/Default.aspx

U.S. Census Bureau (2006). Household income for 2005. Retrieved on May 1, 2011 from: http://pubdb3.census.gov/macro/032006/hhinc/new02_001.htm

U.S. Census Bureau (2006). Median income of persons, age 25 and older. Retrieved on May 1, 2011 from: http://pubdb3.census.gov/macro/032006/perinc/ne03_001.htm

U.S. Health and Human Service Department (2010). Health disparities. Healthy People, 2010: Understanding and Improving Health.

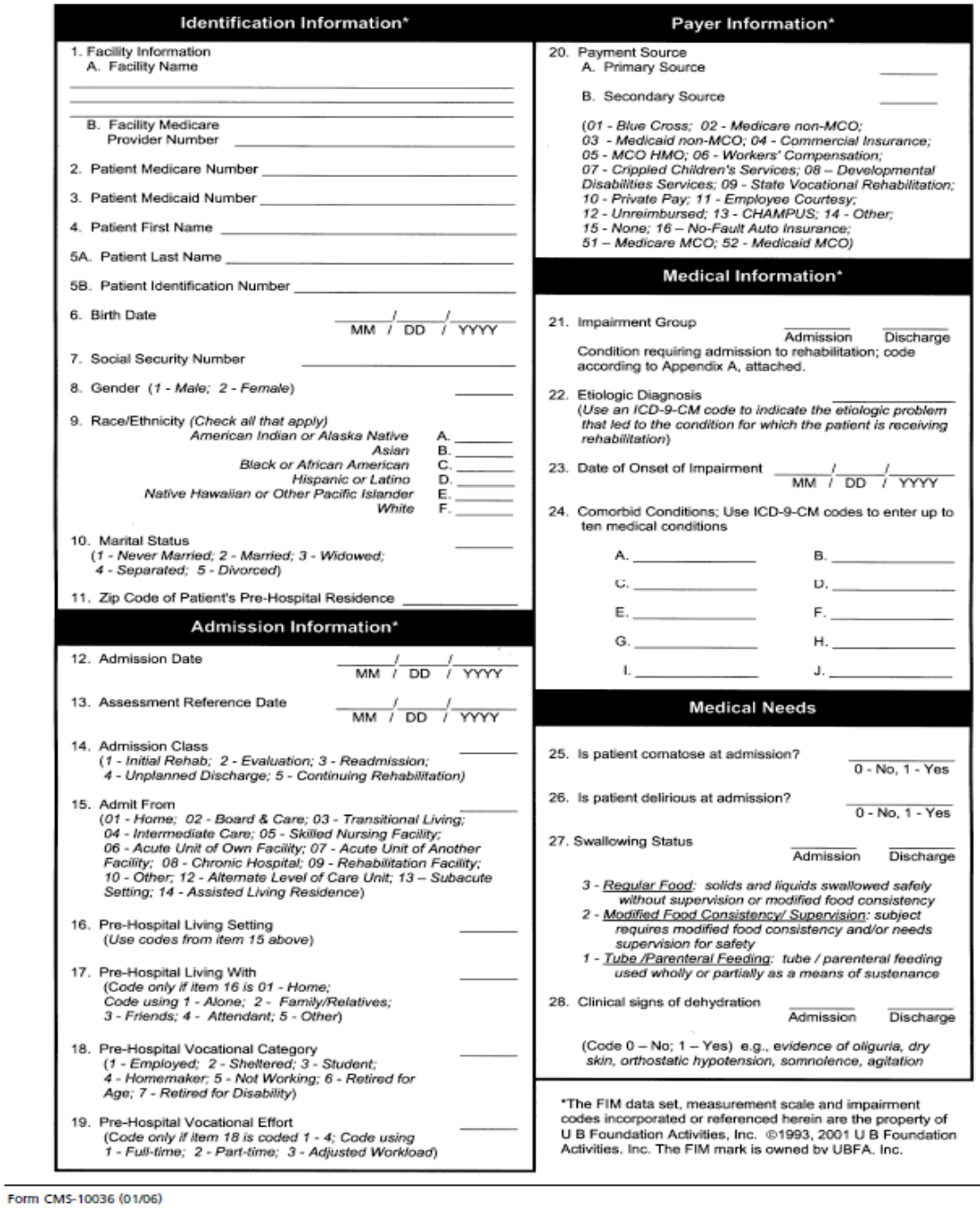
White, H., Boden-Albala, B., Wang, C., Elkind, M. S., Rundeck, T., Wright, C. B., & Sacco, R. L. (2005). Ischemic stroke subtype incidence among whites, blacks, and Hispanics: The northern manhattan study. *Circulation, 111,* 1327-1331.

Wright, J. (2000). The FIM. *The Center for Outcome Measurement in Brain Injury.* Retrieved on August 25, 2009 from: http://www.tbims.org/combi/FIM/index.html

Young, Y., Fan, M. Y., Hebel, J. R., & Boult, C. (2009). Concurrent validity of administering the Functional Independence Measure (FIM) instrument by interview. *American Journal of Physical Medicine and Rehabilitation, 88,* 9, p. 766-770.

APPENDIX A

FUNCTIONAL INDEPENDENCE MEASUREMENT (FIM)



DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR MEDICARE & MEDICAID SERVICES

Form Approved
OMB No. 0938-0842

INPATIENT REHABILITATION FACILITY – PATIENT ASSESSMENT INSTRUMENT

Identification Information*

1. Facility Information
   A. Facility Name
   B. Facility Medicare Provider Number
2. Patient Medicare Number
3. Patient Medicaid Number
4. Patient First Name
5A. Patient Last Name
5B. Patient Identification Number
6. Birth Date ___/___/___ (MM / DD / YYYY)
7. Social Security Number
8. Gender (*1 - Male; 2 - Female*)
9. Race/Ethnicity *(Check all that apply)*
   American Indian or Alaska Native A.
   Asian B.
   Black or African American C.
   Hispanic or Latino D.
   Native Hawaiian or Other Pacific Islander E.
   White F.
10. Marital Status
    (*1 - Never Married; 2 - Married; 3 - Widowed; 4 - Separated; 5 - Divorced*)
11. Zip Code of Patient's Pre-Hospital Residence

Admission Information*

12. Admission Date ___/___/___ (MM / DD / YYYY)
13. Assessment Reference Date ___/___/___ (MM / DD / YYYY)
14. Admission Class
    (*1 - Initial Rehab; 2 - Evaluation; 3 - Readmission; 4 - Unplanned Discharge; 5 - Continuing Rehabilitation*)
15. Admit From
    (*01 - Home; 02 - Board & Care; 03 - Transitional Living; 04 - Intermediate Care; 05 - Skilled Nursing Facility; 06 - Acute Unit of Own Facility; 07 - Acute Unit of Another Facility; 08 - Chronic Hospital; 09 - Rehabilitation Facility; 10 - Other; 12 - Alternate Level of Care Unit; 13 – Subacute Setting; 14 - Assisted Living Residence*)
16. Pre-Hospital Living Setting
    (*Use codes from item 15 above*)
17. Pre-Hospital Living With
    (*Code only if item 16 is 01 - Home; Code using 1 - Alone; 2 - Family/Relatives; 3 - Friends; 4 - Attendant; 5 - Other*)
18. Pre-Hospital Vocational Category
    (*1 - Employed; 2 - Sheltered; 3 - Student; 4 - Homemaker; 5 - Not Working; 6 - Retired for Age; 7 - Retired for Disability*)
19. Pre-Hospital Vocational Effort
    (*Code only if item 18 is coded 1 - 4; Code using 1 - Full-time; 2 - Part-time; 3 - Adjusted Workload*)

Payer Information*

20. Payment Source
    A. Primary Source
    B. Secondary Source
    (*01 - Blue Cross; 02 - Medicare non-MCO; 03 - Medicaid non-MCO; 04 - Commercial Insurance; 05 - MCO HMO; 06 - Workers' Compensation; 07 - Crippled Children's Services; 08 – Developmental Disabilities Services; 09 - State Vocational Rehabilitation; 10 - Private Pay; 11 - Employee Courtesy; 12 - Unreimbursed; 13 - CHAMPUS; 14 - Other; 15 - None; 16 – No-Fault Auto Insurance; 51 – Medicare MCO; 52 - Medicaid MCO*)

Medical Information*

21. Impairment Group (Admission / Discharge)
    Condition requiring admission to rehabilitation; code according to Appendix A, attached.
22. Etiologic Diagnosis
    (*Use an ICD-9-CM code to indicate the etiologic problem that led to the condition for which the patient is receiving rehabilitation*)
23. Date of Onset of Impairment ___/___/___ (MM / DD / YYYY)
24. Comorbid Conditions; Use ICD-9-CM codes to enter up to ten medical conditions
    A. B.
    C. D.
    E. F.
    G. H.
    I. J.

Medical Needs

25. Is patient comatose at admission? (0 - No, 1 - Yes)
26. Is patient delirious at admission? (0 - No, 1 - Yes)
27. Swallowing Status (Admission / Discharge)
    3 - Regular Food: solids and liquids swallowed safely without supervision or modified food consistency
    2 - Modified Food Consistency/ Supervision: subject requires modified food consistency and/or needs supervision for safety
    1 - Tube /Parenteral Feeding: tube / parenteral feeding used wholly or partially as a means of sustenance
28. Clinical signs of dehydration (Admission / Discharge)
    (Code 0 – No; 1 – Yes) e.g., *evidence of oliguria, dry skin, orthostatic hypotension, somnolence, agitation*

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INPATIENT REHABILITATION FACILITY – PATIENT ASSESSMENT INSTRUMENT

Function Modifiers*

Complete the following specific functional items prior to scoring the FIM™ Instrument:

	ADMISSION	DISCHARGE
29. Bladder Level of Assistance (Score using FIM Levels 1 - 7)	☐	☐
30. Bladder Frequency of Accidents (Score as below)	☐	☐

7 - No accidents
6 - No accidents; uses device such as a catheter
5 - One accident in the past 7 days
4 - Two accidents in the past 7 days
3 - Three accidents in the past 7 days
2 - Four accidents in the past 7 days
1 - Five or more accidents in the past 7 days

Enter in Item 39G (Bladder) the lower (more dependent) score from Items 29 and 30 above.

	ADMISSION	DISCHARGE
31. Bowel Level of Assistance (Score using FIM Levels 1 - 7)	☐	☐
32. Bowel Frequency of Accidents (Score as below)	☐	☐

7 - No accidents
6 - No accidents; uses device such as an ostomy
5 - One accident in the past 7 days
4 - Two accidents in the past 7 days
3 - Three accidents in the past 7 days
2 - Four accidents in the past 7 days
1 - Five or more accidents in the past 7 days

Enter in Item 39H (Bowel) the lower (more dependent) score of Items 31 and 32 above.

	ADMISSION	DISCHARGE
33. Tub Transfer	☐	☐
34. Shower Transfer	☐	☐

(Score Items 33 and 34 using FIM Levels 1 - 7; use 0 if activity does not occur) *See training manual for scoring of Item 39K (Tub/Shower Transfer)*

	ADMISSION	DISCHARGE
35. Distance Walked	☐	☐
36. Distance Traveled in Wheelchair	☐	☐

(Code items 35 and 36 using: 3 - 150 feet; 2 - 50 to 149 feet; 1 - Less than 50 feet; 0 – activity does not occur)

	ADMISSION	DISCHARGE
37. Walk	☐	☐
38. Wheelchair	☐	☐

(Score Items 37 and 38 using FIM Levels 1 - 7; 0 if activity does not occur) See training manual for scoring of Item 39L (Walk/ Wheelchair)

39. FIM™ Instrument*

	ADMISSION	DISCHARGE	GOAL
SELF-CARE			
A. Eating	☐	☐	☐
B. Grooming	☐	☐	☐
C. Bathing	☐	☐	☐
D. Dressing - Upper	☐	☐	☐
E. Dressing - Lower	☐	☐	☐
F. Toileting	☐	☐	☐
SPHINCTER CONTROL			
G. Bladder	☐	☐	☐
H. Bowel	☐	☐	☐
TRANSFERS			
I. Bed, Chair, Whlchair	☐	☐	☐
J. Toilet	☐	☐	☐
K. Tub, Shower	☐	☐	☐
LOCOMOTION (W - Walk; C - wheelChair; B - Both)			
L. Walk/Wheelchair	☐ ☐	☐ ☐	☐
M. Stairs	☐	☐	☐
COMMUNICATION (A - Auditory; V - Visual; B - Both)			
N. Comprehension	☐ ☐	☐ ☐	☐
O. Expression (V - Vocal; N - Nonvocal; B - Both)	☐ ☐	☐ ☐	☐
SOCIAL COGNITION			
P. Social Interaction	☐	☐	☐
Q. Problem Solving	☐	☐	☐
R. Memory	☐	☐	☐

FIM LEVELS

No Helper
7 Complete Independence (Timely, Safely)
6 Modified Independence (Device)

Helper - Modified Dependence
5 Supervision (Subject = 100%)
4 Minimal Assistance (Subject = 75% or more)
3 Moderate Assistance (Subject = 50% or more)

Helper - Complete Dependence
2 Maximal Assistance (Subject = 25% or more)
1 Total Assistance (Subject less than 25%)

0 Activity does not occur; Use this code only at admission

INPATIENT REHABILITATION FACILITY – PATIENT ASSESSMENT INSTRUMENT

Discharge Information*

40. Discharge Date ____/____/____ MM / DD / YYYY

41. Patient discharged against medical advice? ____ *(0 - No, 1 -Yes)*

42. Program Interruption(s) ____ *(0 - No; 1 - Yes)*

43. Program Interruption Dates
(Code only if Item 42 is 1 - Yes)

A. 1st Interruption Date ____ MM / DD / YYYY

B. 1st Return Date ____ MM / DD / YYYY

C. 2nd Interruption Date ____ MM / DD / YYYY

D. 2nd Return Date ____ MM / DD / YYYY

E. 3rd Interruption Date ____ MM / DD / YYYY

F. 3rd Return Date ____ MM / DD / YYYY

44A. Discharge to Living Setting ____
(01 - Home; 02 - Board and Care; 03 - Transitional Living; 04 - Intermediate Care; 05 - Skilled Nursing Facility; 06 - Acute Unit of Own Facility; 07 - Acute Unit of Another Facility; 08 - Chronic Hospital; 09 - Rehabilitation Facility; 10 - Other; 11 - Died; 12 - Alternate Level of Care Unit; 13 - Subacute Setting; 14 - Assisted Living Residence)

44B. Was patient discharged with Home Health Services? ____ *(0 - No; 1 - Yes)*
(Code only if Item 44A is 01 - Home, 02 - Board and Care, 03 - Transitional Living, or 14 - Assisted Living Residence)

45. Discharge to Living With ____
(Code only if Item 44A is 01 - Home; Code using 1 - Alone; 2 - Family / Relatives; 3 - Friends; 4 - Attendant; 5 - Other

46. Diagnosis for Interruption or Death ____
(Code using ICD-9-CM code)

47. Complications during rehabilitation stay
(Use ICD-9-CM codes to specify up to six conditions that began with this rehabilitation stay)

A. _____ B. _____

C. _____ D. _____

E. _____ F. _____

Quality Indicators

RESPIRATORY STATUS
(Score items 48 to 50 as 0 - No; 1 - Yes)

	Admission	Discharge
48. Shortness of breath with exertion	_____	_____
49. Shortness of breath at rest	_____	_____
50. Weak cough and difficulty clearing airway secretions	_____	_____

Quality Indicators

PAIN

51. Rate the highest level of pain reported by the patient within the assessment period:
Admission: _____ Discharge: _____

(Score using the scale below; report whole numbers only)

0 1 2 3 4 5 6 7 8 9 10
No Pain — Moderate Pain — Worst Possible Pain

Pressure Ulcers

52A. Highest current pressure ulcer stage
Admission _____ Discharge _____

(0 - No pressure ulcer; 1 - Any area of persistent skin redness (Stage 1); 2 - Partial loss of skin layers (Stage 2); 3 - Deep craters in the skin (Stage 3); 4 - Breaks in skin exposing muscle or bone (Stage 4); 5 - Not stageable (necrotic eschar predominant; no prior staging available)

52B. Number of current pressure ulcers
Admission _____ Discharge _____

PUSH Tool v. 3.0 ©

SELECT THE CURRENT LARGEST PRESSURE ULCER TO CODE THE FOLLOWING. Calculate three components (C through E) and code total score in F.

52C. Length multiplied by width (open wound surface area)
Admission _____ Discharge _____

(Score as 0 - 0 cm^2; 1 - < 0.3 cm^2; 2 - 0.3 to 0.6 cm^2; 3 - 0.7 to 1.0 cm^2; 4 - 1.1 to 2.0 cm^2; 5 - 2.1 to 3.0 cm^2; 6 - 3.1 to 4.0 cm^2; 7 - 4.1 to 8.0 cm^2; 8 - 8.1 to 12.0 cm^2; 9 - 12.1 to 24.0 cm^2; 10 - > 24 cm^2)

52D. Exudate amount
Admission _____ Discharge _____
0 - None; 1 - Light; 2 - Moderate; 3 - Heavy

52E. Tissue type
Admission _____ Discharge _____
0 - Closed/resurfaced: The wound is completely covered with epithelium (new skin); 1 - Epithelial tissue: For superficial ulcers, new pink or shiny tissue (skin) that grows in from the edges or as islands on the ulcer surface. 2 - Granulation tissue: Pink or beefy red tissue with a shiny, moist, granular appearance. 3- Slough: Yellow or white tissue that adheres to the ulcer bed in strings or thick clumps or is mucinous. 4 - Necrotic tissue (eschar): Black, brown, or tan tissue that adheres firmly to the wound bed or ulcer edges.

52F. TOTAL PUSH SCORE (Sum of above three items -- C, D and E)
Admission _____ Discharge _____

SAFETY	Admission	Discharge
53. Balance problem *(0 - No; 1 - Yes)* *e.g., dizziness, vertigo, or light-headedness*	_____	_____
54. Total number of falls during the rehabilitation stay		Discharge _____