FACTORS ASSOCIATED WITH POST-STROKE DEPRESSIVE SYMPTOMS AND QUALITY OF LIFE

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DEDICATION

This work is dedicated first to my mother, Sally Williams, who encouraged me to become a nurse and then to pursue an advanced degree. Her commitment to the patients she nursed and the students she taught inspired my career. Her death from a stroke during the early part of my doctoral program has given unexpected meaning to my research.

I would like to further dedicate this work to my husband Mike. Thank you for helping me to reach for my dreams. I could not have done this without you.

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ABSTRACT

Elizabeth A. Johnson

FACTORS ASSOCIATED WITH POST-STROKE DEPRESSIVE SYMPTOMS AND QUALITY OF LIFE

Stroke is the leading cause of adult disability with over 5 million American adults experiencing physical, psychological, and/or social limitations related to stroke. Although depressive symptoms and poor quality of life (QOL) are key outcomes for stroke survivors, little is understood about how these outcomes are affected by stroke survivors' evaluation of their experience. The concept of cognitive appraisal, an evaluation of the meaning of a situation for one's well-being, may explain some of the factors associated with post-stroke depressive symptoms and QOL. The purpose of this study was to determine factors associated with post-stroke depressive symptoms and QOL using a conceptual model derived from the transactional theory of stress originally proposed by Lazarus and Folkman. Three aims guided this study: to determine whether (a) depressive symptoms at 4 months after stroke are predictive of stroke-specific QOL at 10 months; (b) perceived social support, self-esteem, and optimism at 1 month after stroke predict depressive symptoms among stroke survivors at 4 months; and (c) threat appraisal at 1 month after stroke is a mediating variable between perceived social support, self-esteem, and optimism at 1 month after stroke and depressive symptoms at 4 months. A secondary analysis of data from

392 stroke survivors in the Randomized Trial of Treatment for Post-stroke Depression (AIM study) was conducted. Using a descriptive correlational design and multiple regression analyses, longitudinal associations among perceived social support, self-esteem, optimism, threat appraisal, depressive symptoms and stroke-specific QOL were examined. Perceived social support, self-esteem, and optimism were significantly associated with threat appraisal. Threat appraisal was significantly associated with post-stroke depressive symptoms. Stroke-specific QOL was found to be stable between 4 and 10 months. Partial mediation of the relationship between the explanatory variables and depressive symptoms by threat appraisal at one month post-stroke was demonstrated. In conclusion, threat appraisal is an important factor to consider in future research and intervention development in relation to post-stroke depressive symptoms.

Tamilyn Bakas, DNS, RN, FAHA, FAAN

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1. NATURE OF THE STUDY

Introduction

An estimated 5.7 million American adults suffer from some level of negative physical, psychological, and/or social limitations related to stroke, a leading cause of adult disability and the third leading cause of death in the United States (Rosamond et al., 2007). Daily living activities are significantly limited for many of these individuals because of stroke-related motor, sensory, vision, affective, cognitive, and language impairments (Kelly-Hayes et al., 1998). However, degree of physical limitation does not completely explain why some individuals with severe impairments adapt well while others with little impairment are severely disabled (Kelly-Hayes et al., 1998). What is meant by recovery from stroke and what constitutes good quality of life have been shown to differ among health care providers, researchers, and stroke survivors (Doolittle, 1988; Duncan, Wallace, Studenski, Lai, & Johnson, 2001; Secrest & Thomas, 1999; Williams, Weinberger, Harris, Clark, & Biller, 1999). Furthermore, little is understood about how stroke survivors' interpretation of their experience affects longer term outcomes such as depressive symptoms or stroke-specific quality of life (QOL). Stroke survivors who report depressive symptoms at 1 month post-stroke have a 2.4 times increased likelihood of death at 12 and 24 months post-stroke, even after adjusting for stroke severity and age (House, Knapp, Bamford, & Vail, 2001). Depressive symptoms have also been found to be the most important predictor of QOL among stroke survivors (Astrom & Asplund, 2002; Bays, 2001; King, 1996).

Stroke, a major public health problem with societal and personal implications (Kelly-Hayes, 2004), was expected to incur an estimated $62.7 billion in direct and indirect costs in 2007 (Rosamond et al., 2007). First year mean costs for individual outpatient stroke services and medications have been estimated at $16,175 (SD $10,310) (Wasserman, Godwin, & Ostwald, 2006) with a mean lifetime cost of $140,048 per stroke survivor (Rosamond et al., 2007). For a substantial proportion of stroke survivors, devastating and life-long effects require significant adjustments in physical, emotional, and social domains of life (Dowswell et al., 2000; Kelly-Hayes, 2004; King, 1996). Among adults over the age of 65 who have experienced an ischemic stroke, 50% have some level of hemiplegia, 30% are limited in their mobility, 26% experience difficulty with basic activities of daily living, and 19% are unable to communicate normally because of aphasia (Rosamond et al., 2007). In addition, at least 35% of stroke survivors experience depressive symptoms (Rosamond et al., 2007), although estimations as high as 68% have been reported (Kelly-Hayes, 2004). Loss of pre-stroke social roles, deteriorating social life, and low perceived social support after stroke contribute to the risk of depressive symptoms (Bendz, 2003; Dowswell et al., 2000; Spencer, Tompkins, Schulz, & Rau, 1995). Stroke survivors view these physical, emotional, and social effects as interrelated and as the cause of radical changes to their QOL (Dowswell et al., 2000).

Few studies have considered the stroke survivors' perspective of the impact of stroke over time on adaptational outcomes important to them (Bendz, 2003; Dowswell et al., 2000; Wyller & Kirkevold, 1999). The stroke survivor's

perspective is critical to consider, particularly in reference to depressive symptoms and QOL. Post-stroke depression is, in part, related to how stroke survivors interpret their circumstances (Narushima & Robinson, 2002). Furthermore, stroke survivors have indicated dissatisfaction with their QOL even when their functional recovery is high (Duncan et al., 2001). Although factors beyond neurological impairment are known to influence survivors' adaptation to the effects of stroke (Kelly-Hayes et al., 1998; Sturm, Dewey et al., 2002), there are few conceptual models that identify those variables amenable to nursing intervention or those that need to be controlled as interventions are developed to target stroke survivors most at risk for increased depressive symptoms and decreased QOL.

Purpose

The purpose of this study was to determine factors associated with depressive symptoms and QOL using the conceptual model proposed in Figure 1 on page 14. To accomplish this purpose, a secondary analysis of an existing longitudinal database of 392 stroke survivors was planned. These findings will help to (a) identify stroke survivors who are at risk for depressive symptoms and poor QOL; (b) determine factors associated with depressive symptoms and QOL that may be amenable to nursing interventions; and (c) provide support for a conceptual model that may later be used to guide future interventions.

Conceptual and Operational Definitions

Stroke-specific Quality of Life

Conceptual definition. Although the improvement of QOL is becoming one of the primary aims of post-stroke rehabilitation, there is still some question as to how this multidimensional concept is best defined and measured (Buck, Jacoby, Massey, & Ford, 2000; Ones, Yilmaz, Cetinkaya, & Caglar, 2005; Secrest & Thomas, 1999; Sturm, Dewey et al., 2002; Sturm, Osborne et al., 2002; von Steinbuechel, Richter, Morawetz, & Riemsa, 2005). The finding that 72% of a group of 1,572 British health care professionals defined quality of life in terms of "happiness" illustrates the confusion underlying this concept (McKeavitt, Redfern, La-Placa, & Wolfe, 2002).

The broadest definition for quality of life comes from the World Health Organization. This multidimensional definition is subjective in nature and places individuals' goals, expectations, standards, and concerns within the context of their culture and various value systems (WHOQOL Group, 1998). Objective measures of QOL, in contrast, assume that there are widely shared opinions and values as to the elements of good quality of life. These commonly assumed elements can be used to prioritize resource distribution. This approach may be more appropriate for program and policy evaluation than for the measurement of dimensions that impact daily living (Dijkers, 1999).

A more specific definition has been found useful in health care. The narrower context of health-related quality of life (HRQOL) specifically addresses an individual's evaluation of the impact of changes in health status. Physical

function, psychological well-being, social functions and roles, general health, and cognitive function are all considered (Ferrans, Zerwic, Wilbur, & Larson, 2005; Németh, 2006; Williams, 2001; Wilson & Cleary, 1995). Generic HRQOL scales are applicable to many different populations and can be used to compare QOL across various disease states (Krančiukaitė & Rastenytė, 2006; Testa & Simonson, 1996). Disease-specific HRQOL scales focus on domains that are particularly relevant to a given condition and, therefore, are considered to have more content and discriminant validity and to be more responsive to change (Testa & Simonson, 1996; Williams, 2001). Of particular interest in stroke research is the ability to capture residual impairments, disabilities, and handicaps described by stroke survivors as affecting their quality of life but not measured by generic instruments (Duncan et al., 2001; Williams, Weinberger, Harris, & Biller, 1999). For this study, stroke-specific quality of life was conceptualized as those physical, psychological, and social dimensions of life that are subjectively evaluated by stroke survivors and that may be influenced by the experience of stroke.

Operational definition. Stroke-specific quality of life was operationalized using a disease-specific measure specifically developed to include more sensitive stroke outcomes than are found in generic measures such as the SF-36. The Stroke-Specific Quality of Life (SS-QOL) scale is a 49-item instrument that measures 7 domains of health-related QOL important to stroke survivors: physical function, vision, language, thinking, mood, role function, and energy (Williams, Weinberger, Harris, Clark, et al., 1999). An average score is also

computed. Higher scores indicate better QOL. Key to the subjective nature of HRQOL, subjective experiences of stroke survivors were used to develop the SS-QOL (Williams, Weinberger, Harris, Clark et al., 1999).

Depressive Symptoms

Conceptual definition. The terms “depressive symptoms” and “depression” are sometimes used interchangeably in the cardiovascular and stroke literature to describe emotional states that have a negative impact on the outcomes of individuals in these populations (Everson-Rose & Lewis, 2005). Post-stroke depressive symptoms were conceptually defined for this study as the endorsement after stroke of any of the nine depressive symptoms included in the DSM-IV criteria for a depression diagnosis (Kroenke, Spitzer, & Williams, 2001).

Operational definition. Post-stroke depressive symptoms were measured with the depression module of the Patient Health Questionnaire (PHQ-9). The PHQ-9 scores each of the nine DSM-IV criteria on a 4-point scale from 0 (*not at all*) to 3 (*nearly every day*). Points are totaled to determine an overall score. Severity of symptoms is measured using established cut points: minimal, 0 to 4; mild, 5 to 9; moderate, 10 to 14; moderately severe, 15 to 19; and severe, 20 to 27 (Kroenke et al., 2001). Among stroke survivors, PHQ-9 scores have been found to discriminate well between those with and without depressive symptoms regardless of age, gender, or ethnicity (Williams et al., 2005).

Demographics

Conceptual definition. Social and personal factors that could influence study variables were measured to provide a detailed description of the sample. These variables included age, gender, race, and education.

Operational definition. These variables were identified on an investigator-developed demographic form addressing the characteristics described above.

History of Depression

Conceptual definition. History of depression was conceptualized for this study as evidence of depression prior to the stroke.

Operational definition. Documentation of a positive history of depression was measured by retrospective self-report of stroke survivors and/or close informants or medical chart review (Astrom & Asplund, 2002; Pohjasvaara et al., 1998). Because the availability of pre-stroke medical record documentation of depression diagnosis is inconsistent, depression history for this study was defined on the basis of a positive participant response to any of three questions including (1) have you ever been told by a doctor or other professional that you have depression, (2) have you ever taken medication for depression, (3) have you ever received counseling for depression.

Stroke Severity

Conceptual definition. Stroke was defined as neurological dysfunction caused by a focal disturbance of the brain producing symptoms of varying severity that continue beyond 24 hours (American Heart Association/American Stroke Association, 2006). Stroke severity in this study was conceptually defined

as the degree of neurological deficits observed after the occurrence of an acute stroke (Spilker et al., 1997).

Operational definition. Stroke severity was measured with the National Institutes of Health Stroke Scale (NIHSS). The NIHSS, a widely used measurement of stroke severity with established inter-rater reliability and validity, is a 15-item instrument addressing the severity of a cerebral infarction (Brott et al., 1989; Kasner et al., 1999; Spilker et al., 1997). The score represents observed levels of wakefulness, vision, sensation, movement, language function, and perception. Total scores can range between 0 – 42 with higher scores indicative of increased severity (Spilker et al., 1997).

Functional Activity

Conceptual definition. Functional activity was defined within the context of the International Classification of Functioning, Disability, and Health (ICF). The term “disability” has been replaced in the ICF classification by the term “activity” (Salter et al., 2005). Within this context, activity is defined as “the execution of a task by an individual” and includes difficulties that might be experienced by that individual in the completion of a desired activity (Salter et al., 2005). Therefore, functional activity was conceptually defined in this study as the degree of difficulty experienced by an individual in the completion of a desired task.

Operational definition. Functional activity was operationalized using the modified Rankin scale (mRS). The mRS is a stroke-specific measure of level of functional independence as compared with pre-stroke activity. A score of 0 – 5 is

assigned with scores indicating the stroke survivor's disability level from "no symptoms" (0) to "severe disability" (5) (Salter et al., 2005).

Perceived Social Support

Conceptual definition. The concept of social support was "based on active social participation with members of one's social network and reciprocal social obligations and mutual exchanges with confiding partners" (Yang, 2006). Social support can be conceived as having two constructs. Structural or objective support is defined as the existence and quantity of an individual's social network. However, numbers of contacts may result from factors that are not correlated with subjective support (Sherbourne & Stewart, 1991). Measurement of perceived support, rather than structural support, may lead to a better understanding of the effects of social support (Krause, 2001). For this study, social support was defined as perceived social support, also referred to in the literature as functional or subjective support. Perceived support goes beyond the existence of quantifiable social contacts to the perception that one is loved, valued, and able to count on others for support if needed (Everson-Rose, & Lewis, 2005; Friedland & McColl, 1992). Major subtypes of perceived social support are emotional, instrumental, and informational support (Friedland, & McColl, 1992; Sherbourne & Stewart, 1991).

Operational definition. Perceived social support was measured in this study using the Medical Outcomes Study - Social Support Survey (MOS-SSS), a 20-item instrument developed to measure perceived social support in chronically ill individuals. One item measures structural support, but was not included in the

subscales or total score. Four subscales measure affectionate, emotional/informational, tangible, and positive social interaction support. Higher scores reflect perceptions of greater available social support over the previous 4 weeks. A total score was calculated as the measure of perceived social support.

Self-esteem

Conceptual definition. Self-esteem was conceptualized as a personality disposition reflective of an individual's feelings about self-worth, self-respect, and potential for growth (Rosenberg, 1989). Thought to be predominantly stable across time, self-esteem can also fluctuate with the experience of success or failure (Crocker, Brook, Niiya, & Villacorta, 2006). These thoughts and feelings about the self give meaning to life experiences and enable people to react to such experiences (Swann, Chang-Schneider, & McClarty, 2007). Although self-esteem has conceptual overlap with optimism, self-esteem is distinguished by an intrinsic tie between self-worth and positive outcomes (Scheier, Carver, & Bridges, 1994).

Operational definition. The 10-item Rosenberg Self-esteem Scale (RSE) provides a global measure of favorable or unfavorable attitudes about one's self (Rosenberg, 1989). Study participants were asked to respond to five positively phrased and five negatively phrased statements using a 1 (*strongly disagree*) to 5 (*strongly agree*) response scale. Negatively phrased items were reverse coded. Scores could range from 10 to 50 with higher scores indicating higher levels of self-esteem (Rosenberg, 1989). The RSE scale, originally developed for use with adolescents, has been used in diverse populations including individuals with rheumatoid arthritis (Covic, Tyson, Spencer, & Howe, 2006), individuals with

chronic fatigue and fibromyalgia (Michielsen, van Houndenhove, Leirs, Vandenbroeck, & Onghena, 2006), stroke survivors (Nir, Zolotogorsky, & Sugarman, 2004) and their caregivers (Bakas & Burgener, 2002; Bakas & Champion, 1999). Furthermore, the RSE scale has been the standard against which other instruments have been tested (Blascovich & Tomaka, 1991).

Optimism

Conceptual definition. A second personality disposition, optimism is related to, but separate from, self-esteem (Scheier, Carver, & Bridges, 1994). Optimism can be regarded as a style of information processing that informs situational evaluations in a positive manner (Schweizer, Beck-Seyffer, & Schneider, 1999). Optimism may also contribute to a characteristic style of managing the emotions that arise from anticipated threats and demands (Schweizer et al., 1999). Optimism is differentiated from benefit appraisals. Benefit appraisals are an outcome of a cognitive process that determines the significance of an event for one's well-being. Optimism, however, is a personality disposition that contributes to the expectation of positive situational evaluations (Scheier et al., 1994). Supporting this differentiation is the finding that optimism is negatively correlated with depression ($r = -.43$, $p < .01$) (Schweizer et al., 1999). Lazarus (1991) views optimism as the confidence that things will work out positively. For this study, optimism was conceptually defined as the expectation that information will be processed in a positive or confident manner.

Operational definition. The Revised Life Orientation Test (LOT-R), a 10-item scale with 4 filler items, was used to measure the personality disposition of

optimism. Three items are positively worded and three items are negatively worded. Responses to items range from 0 (*strongly disagree*) to 4 (*strongly agree*). Negatively worded items were reverse coded and filler items are not used in the total score. Scores could range from 0 to 24 with high scores representing greater optimism.

Threat Appraisal

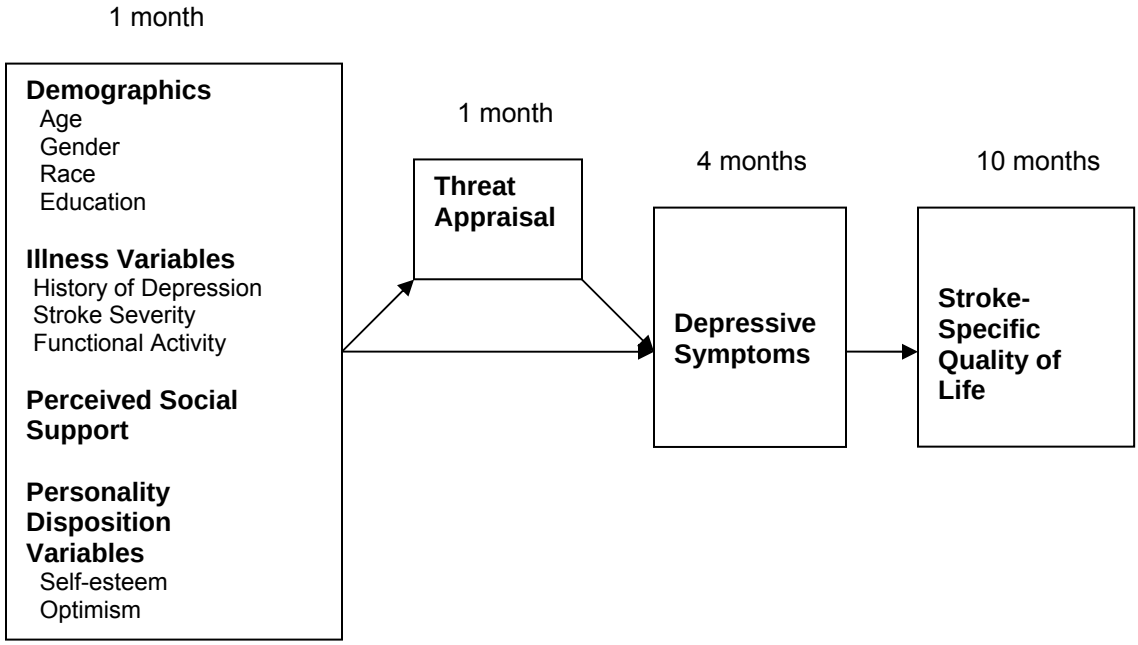
Conceptual definition. Appraisal was defined within the context of Lazarus' transactional approach to stress as the evaluation of the meaning or future significance of a situation in relation to one's well-being. Threat appraisal specifically has to do with the stressful anticipation of future harm, loss, or negative consequences (Lazarus, 1966; Lazarus & Folkman, 1984). Threat appraisal is conceptually different from coping, defined as constantly changing cognitive and behavioral efforts to manage stressful conditions (Lazarus & Folkman, 1984).

Operational definition. Threat appraisal was operationalized using the threat subscale of the Appraisal of Health scale (AHS). The AHS measures threat, benign, and benefit appraisals by addressing elements of primary and secondary reappraisal and reappraisal (Oberst, 1991, Johnson, Bakas, & Lyon, 2008; Johnson, Bakas, Lyon, & Williams, 2008). The threat subscale contains 12 items that are rated on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*) with higher scores indicating more threat. The responses were summed to obtain a total threat score.

Conceptual Model

Figure 1 depicts a model derived from Lazarus' transaction-based approach to stress (Lazarus, 1966; Lazarus, 1991; Lazarus & Folkman, 1984) and from the work of Bakas and colleagues who explored factors associated with emotional distress and adaptational outcomes in family caregivers of stroke survivors (Bakas & Burgener, 2002; Bakas & Champion, 1999; Bakas, Champion, Perkins, Farran, & Williams, 2006). Lazarus and colleagues (Lazarus, 1991; Lazarus & Folkman, 1984) hypothesized that antecedent situational and personality disposition variables are mediated by cognitive appraisal to produce emotional and adaptational outcomes in the stress process experienced by individuals. In the model depicted in Figure 1, antecedents including demographics, illness variables, and perceived social support represent situational factors experienced by stroke survivors. As in Bakas' models, self-esteem (Bakas & Champion, 1999) and optimism (Bakas et al., 2006) represent personality disposition factors. Threat appraisal represents cognitive appraisal. Depressive symptoms represent emotional outcomes as in the model depicted by Bakas et al. (2006), and stroke-specific QOL represents adaptational outcomes experienced by stroke survivors.

Figure 1. Conceptual Model



The proposed model was used to guide an exploration of the multiple relationships that may significantly affect depressive symptoms and stroke-specific QOL outcomes in stroke survivors. As depicted in the model, depressive symptoms 4 months after stroke were hypothesized to predict stroke-specific QOL at 10 months. Controlling for demographic and illness variables, perceived social support, self-esteem, and optimism at 1 month after stroke were hypothesized to predict depressive symptoms at 4 months. Threat appraisal at 1 month after stroke was hypothesized to mediate the relationships between the antecedents of perceived social support and personality disposition variables at 1 month and the outcome of depressive symptoms at 4 months.

Previous studies have been conducted in which a model designed for stroke caregivers was adapted for stroke survivors (Schulz, Tompkins, & Rau, 1988; Spencer et al., 1995). This study also adapted a model designed for stroke

family caregivers. The model developed by Bakas and Burgener (2002) and refined by Bakas et al., (2006) was originally derived from Lazarus' transaction-based approach to stress (Lazarus, 1966; Lazarus & Folkman, 1984), and has been empirically supported. In the initial model, caregiver low self-esteem, high perceived task difficulty, and high threat appraisal were significant predictors of emotional distress (R^2 = .48, p < .001) (Bakas & Burgener, 2002). In addition, emotional distress, low benefit appraisal, high task difficulty, and high threat appraisal in caregivers were significant predictors of poor stroke-related caregiving outcomes (R^2 = .45, p < .001). Although the Bakas and Burgener model was based on cross-sectional data from 104 family caregivers of stroke survivors, the findings did support key relationships that were consistent with Lazarus' theory. More recent support for the relationships in Figure 1 was provided by the Bakas et al. (2006) study in which 36% of the variance in caregiver adaptational outcomes was accounted for by survivor impairment, caregiver gender, caregiver difficulty with tasks, appraisal, and depressive symptoms. Although not correlated with caregiver adaptational outcomes, optimism was significantly correlated with threat appraisal (r = -.30, p < .001) and with depressive symptoms (r = -.30, p < .001).

The strength of this study is that it has built upon the work of Bakas and colleagues by using a similar model derived from Lazarus' transaction-based approach to stress to identify factors that are associated with depressive symptoms and stroke-specific QOL in stroke survivors. A secondary analysis was carried out using data from an existing data base of 392 stroke survivors.

Specific Aims and Hypotheses

Specific Aim 1: To determine whether depressive symptoms at 4 months after stroke are predictive of stroke-specific QOL at 10 months, after controlling for relevant demographic and illness variables.

Hypothesis 1a: Depressive symptoms at 4 months after stroke will predict stroke-specific QOL at 10 months.

Specific Aim 2: To determine whether perceived social support, self-esteem, and optimism at 1 month after stroke predict depressive symptoms among stroke survivors at 4 months, after controlling for relevant demographic and illness variables.

Hypothesis 2a: Higher levels of perceived social support, self-esteem, and optimism at 1 month after stroke will predict lower depressive symptoms in stroke survivors at 4 months after stroke.

Specific Aim 3: To determine whether threat appraisal at 1 month after stroke is a mediating variable between perceived social support, self-esteem, and optimism at 1 month after stroke and depressive symptoms at 4 months, after controlling for relevant demographic and illness variables.

Hypothesis 3a: Perceived social support, self-esteem, and optimism will be negatively associated with threat appraisal.

Hypothesis 3b: Threat appraisal will be positively associated with depressive symptoms.

Hypothesis 3c: The associations of perceived social support, self-esteem, and optimism with depressive symptoms will be attenuated when controlling for threat appraisal.

Assumptions

1. The conceptual model derived from the work of Lazarus and from work with family caregivers of stroke survivors by Bakas and colleagues is applicable to the survivors.
2. Stroke survivors responded accurately and honestly to the interview questions.
3. The investigators for the Randomized Trial of Treatment for Post-stroke Depression (AIM) study built adequate quality control activities into the data collection plan, collected precise measurements, and put procedures into place to minimize incomplete data.
4. Interventions to improve post-stroke depressive symptoms and quality of life can be developed from the conceptual model being tested in this study.

Limitations

1. The variables chosen for this study were limited to those used in the original study.
2. The sample for this study was limited to those individuals who participated in the AIM study. Because one of the primary purposes of the AIM study was to test an intervention for post-stroke depression, the proportion of stroke survivors with depressive symptoms did not reflect the actual occurrence of depressive symptoms in the broader population of stroke survivors.

3. As in the original study, stroke survivors with severe aphasia or moderate to severe cognitive impairment were excluded. Therefore, findings cannot be generalized to stroke survivors with these conditions.

4. There are potential threats to internal validity inherent in the study design.

These limitations were considered to be within acceptable limits. Although variables and instruments chosen for this study were limited to those found in the AIM study, there were a variety of stress-related variables available. Personality disposition and appraisal variables, not usually found in stroke studies, were included in the AIM database. The inclusion of a non-depressed control group helped to balance the proportion of stroke survivors with depressive symptoms. In contrast to the exclusion criteria for some studies, survivors with mild to moderate aphasia or cognitive impairment were eligible to participate. Threats to internal validity such as attrition, history or maturation, and intervention effects were assessed during data analysis.

The next section will discuss Lazarus' and Folkman's transactional theory of stress, the significance of the model to nursing, and a review of research literature addressing stroke-specific quality of life, depressive symptoms, demographic variables, history of depression, stroke severity, functional activity, perceived social support, self-esteem, optimism, and threat appraisal. The third chapter provides a detailed description of the methodology proposed for the study. Data analyses are presented in chapter four. A discussion of the results and implications for theory, research, and practice are presented in the fifth chapter.

2. REVIEW OF LITERATURE

Chapter 1 provided an overview of this study including the purpose, conceptual and operational definitions, conceptual model, research aims and hypotheses, assumptions, and limitations. Chapter 2 provides a more detailed discussion of the theoretical and empirical literature pertinent to the study.

Overview of Lazarus' Transactional Theory of Stress

The conceptual model for this study was derived from the transactional theory of stress in which psychological stress is defined as a relationship between a person with unique characteristics and an environmental encounter that is judged by that person as taxing or exceeding available resources and endangering well-being (Lazarus & Folkman, 1984). The judgment that a given person-environmental encounter is stressful results from a dynamic cognitive appraisal process. Three types of evaluation occur in the cognitive appraisal process: primary and secondary appraisals and reappraisal. Primary appraisal evaluates whether something of relevance to one's well-being has occurred and whether or not the encounter is potentially beneficial or threatening. Benign or irrelevant appraisals have no particular implication for an individual's well-being. Beneficial appraisals carry the potential of enhancing well-being. If the encounter is determined to be stressful, harm/loss or threat appraisals may occur. Harm/loss appraisals reflect damage that has already occurred. Threat appraisals occur in anticipation of possible future harm, loss, or negative consequences (Lazarus & Folkman, 1984; Lyon, 2000).

Secondary appraisal and reappraisal occur with stressful appraisals. Secondary appraisal is interdependent with primary appraisal. In secondary appraisal, threatening encounters are evaluated in terms of what, if anything, can be done and the possible effects of such actions (Lazarus & Folkman, 1984). Secondary appraisal is necessary to define the full adaptational significance of the encounter (Lazarus, 1991). Reappraisal, reflective of the ongoing nature of the appraisal process, refers to a changed appraisal based on new information. Reappraisal differs from primary or secondary appraisal only in that the source of information comes from environmental feedback related to previous appraisals (Lazarus & Folkman, 1984). Reappraisal continues until adaptation to the stressor occurs (Scott, Oberst, & Dropkin, 1980).

Cognitive appraisals are hypothesized to (a) integrate person-environmental encounters into a meaning that is relevant to an individual's well-being and (b) mediate the relationship between those encounters and adaptational outcomes including emotional reactions (Lazarus & Folkman, 1984; Lazarus, 1991). Emotions, therefore, are proposed to flow from an individual's appraisal of encounters between that individual and the environment (Lazarus, 2000). Depending on the dynamics underlying the effort to adapt, a complex of emotions can occur. Positive emotions include happiness, love, pride, and relief. Negative emotions that are part of the adaptational struggle include sadness, guilt, shame, anxiety, and anger (Lazarus, 1991). Depression, a complex emotional response that includes elements of each of these negative emotions,

extends beyond sadness to a sense of hopelessness that is centered on the implications of a loss for one's entire life (Lazarus, 1991).

Adaptational outcomes result from the appraisal process. Lazarus and Follkman (1984) describe three types of adaptational outcomes: social functioning, life satisfaction or morale, and somatic health. Social functioning is defined as how an individual fulfills various work and social roles and is partially determined by the effective management of appraisals. Morale involves life satisfaction and subjective well-being. Satisfaction with life is dependent on the appraisal of encounters as challenges to be managed or which can produce growth rather than as unmanageable threats to one's well-being. Somatic health is concerned with the effect of stress on perceived health. The effectiveness with which person-environment relationships are managed determines the overall quality of social functioning, life satisfaction, and somatic health. These outcomes describe, in essence, quality of life.

In this study, antecedent variables included in the person-environment relationship were framed within the context of surviving a stroke. These variables included demographics, history of depression, stroke severity, functional activity, perceived social support, self-esteem, and optimism. Threat appraisal represented the stressful appraisal associated with the complex emotional response of depressive symptoms. Threat appraisal is concerned with potential harm that may occur as a result of anticipated stroke-related losses. Depressive symptoms represented the emotional reaction, and stroke-specific quality of life represented adaptational outcomes of the stroke survivor.

The selection of these variables was based on their representativeness of constructs within transactional theory of stress and on their importance in the empirical literature describing life after stroke. The next section discusses the significance to nursing of the conceptual model supporting this study (see Figure 1, p. 14). A detailed review of literature related to post-stroke depressive symptoms, post-stroke quality of life, threat appraisal, and antecedent variables follows.

Significance to Nursing

The concept of cognitive appraisal is consistent with nursing's view of human interaction (Lyon & Werner, 1987). Cognitive appraisal reflects the transactions between "a person with certain distinctive characteristics…and an environment whose characteristics must be predicted and interpreted" (Lazarus & Folkman, 1994, p. 24). The cognitive appraisal process is particularly important in the post-stroke period when an individual faces multiple threats to personal well-being in the attempt to return to previous levels of physical, social, and emotional functioning (Bays, 2001; Bendz, 2003). An individual's perception of the situation influences his or her emotional responses to that situation and, subsequently, quality of life (Bennett, 1993). Exploration of the relationships between antecedent variables, threat appraisal, post-stroke depressive symptoms and stroke-specific quality of life will lend support to a conceptual model that can be used to identify stroke survivors at risk for post-stroke depressive symptoms and decreased quality of life, identify factors that may be

amenable to nursing intervention, and provide a theoretical basis for the development of future nursing interventions.

Nurses assist individuals with chronic health problems and their families during diagnosis, through rehabilitation, and in the challenges of daily living. Interventions that focus on adaptation in these areas are, in essence, interventions that promote quality of life (Harrison, Juniper, & Mitchell-DiCenso, 1996). Nurses can have a significant role in interventions that reconnect stroke survivors with their lives (Secrest & Thomas, 1999). However, survivors and health care providers have divergent goals and expectations of life after stroke (Bendz, 2003). Survivors' expectations include not only biomedical outcomes, but also psychological and social outcomes. Health care providers, instead, focus primarily on functional outcomes (Bendz, 2003). In a rather disconcerting finding, Secrest and Thomas (1999) reported that survivors, when asked to describe what experiences stood out for them since having a stroke, did not mention nurses. For survivors, it was as if the nurses "did not exist" (Secrest & Thomas, 1999).

Effective nursing interventions will need to place priority on goals that are important to the survivor in order to help survivors and their families integrate new skills into meaningful experiences (Secrest & Thomas, 1999). Assisting stroke survivors and their families to achieve a quality of life that is acceptable to them is an important nursing goal (Kelly-Hayes, 2004). Interventions that take into account the needs and concerns of stroke survivors have been reported in small studies to improve self-esteem (Lai, Woo, Hui, & Chan, 2004; Nir,

Zolotogorsky, & Sugarman, 2004), decrease depressive symptoms (Morrison, Johnston, MacWalter, & Pollard, 1998; Nir et al., 2004; Rimmer et al., 2000; Williams et al., 2007) and improve life satisfaction (Lai et al., 2004; Rimmer et al., 2000).

Other variables proposed in this study may also be amenable to nursing intervention. The importance of social support interventions as part of a comprehensive post-stroke rehabilitation program is highlighted in both American and Canadian clinical practice guidelines (Duncan et al., 2005; Teasell, Foley, Bhogal, Bagg, & Jutai, 2006). The intensity of threat appraisal may be decreased with problem-focused strategies such as creating and/or maintaining social support, using positive self-talk, or establishing realistic expectations (Lyon, 2002). Threat appraisal may also be amenable to change with cognitive-behavioral therapy (CBT), a psychotherapeutic technique that confronts uncertainty about the future by identifying and changing appraisals (Chen, Lu, Chang, Chu, & Chou, 2006). Cognitive behavioral therapy has been reported as effective in decreasing depression in the general population (Gloaguen, Cottraux, Cucherat, & Blackburn, 1998), in older adults (Thompson, 1996), and more recently in chronically ill adults (Dobkin, Allen, & Menza, 2007; Fisher, Thorpe, DeVellis, & DeVellis, 2007; Himelhoch, Medoff, & Oyeniyi, 2007; Logsdon, McCurry, & Teri, 2007). Components of CBT including cognitive restructuring, pleasurable activity, and problem-solving techniques have been demonstrated to be effective in reducing depressive symptoms in stroke survivors when combined with anti-depressant medication therapy (Mitchell et al., 2008). Interventions that

are intended to improve depressive symptoms and poor QOL are also important in that these outcomes have been shown to influence knowledge and behavior change in relation to stroke risk (Miller & Spilker, 2003).

Knowledge of psychosocial variables is an important component of QOL outcomes research (Mitchell, 1998). Using a large sample, this theory-based study will help identify relationships among psychosocial variables. These relationships may be important in identifying stroke survivors at risk for poor outcomes such as depressive symptoms or poor QOL. This information will become the foundation for developing and evaluating future theoretically based behavioral and educational interventions by identifying variables amenable to potential intervention, as well as potential confounding variables that will need to be controlled in future studies.

The remaining sections of this chapter provide a detailed review of research literature related to stroke-specific quality of life and depressive symptoms; antecedent variables of history of depression, stroke severity, functional activity, perceived social support, self-esteem, optimism; and the mediating variable of threat appraisal. The review will support the model constructs underlying this proposal.

Review of Research Literature

The following sections address a review of the empirical literature related to stroke-specific quality of life, depressive symptoms, factors associated with post-stroke depressive symptoms, and threat appraisal. In reviewing the empirical literature, a total of 94 studies were cited and are summarized in

alphabetical order in Table 1 in the appendix. MedLine and CINAHL databases were searched using such key words as stroke, quality of life, depression, depressive symptoms, social support, self-esteem, optimism, and cognitive appraisal. Key words were used individually and in combination with each other. Reference lists from journal articles were also incorporated into the search, which generally covered the years from 1985 through 2008.

Stroke-specific Quality of Life

Quality of life and stroke. Health-related quality of life (HRQOL) is considered to be a significant supplement to traditional clinical and psychological measures of an individual's health status (Németh, 2005). For some individuals, QOL is seen as the most important determinant in decisions related to treatment priorities and appropriate interventions (Ones et al., 2005). HRQOL has been reported to be significantly lower among stroke survivors than the non-stroke population as measured by mental health, physical health, health utility, and self-rating instruments ($p < .01$) (Xie et al., 2006).

Because stroke survivors describe the physical, emotional, and social aspects of post-stroke life as interconnected (Dowswell et al., 2000), the measurement of all dimensions is necessary to obtain a complete picture of stroke-specific QOL. Limiting the concept of QOL to the measurement of functional outcomes may poorly represent survivors' evaluations of the impact of stroke on their lives (Kissela, 2006). Furthermore, survivors with similar levels of functional activity have reported differences in post-stroke QOL (Samsa & Matchar, 2004). In this study, stroke-specific QOL was defined as the stroke

survivor's interpretation of stroke-related changes in his or her health status in specific physical, psychological, and social dimensions of life.

Qualitative studies underscore the importance of measuring multiple QOL domains. Loss and effort form the background against which post-stroke QOL is measured (Secrest & Thomas, 1999). Rather than using objective measurement standards, survivors have been found to use personal pre- or post-stroke reference points (Wyller & Kirkevold, 1999). In their efforts to move toward independence and to regain an active lifestyle, some survivors experience unapparent cognitive and physical dysfunction that both threaten and harm the self (Carlsson, Möller, & Blomstrand, 2004). Even among survivors with little obvious impairment in their functional activity and who are considered to be independent in their daily activities, QOL can be perceived as being seriously affected (Carlsson et al., 2004; Clarke, Marshall, Black, & Colantonio, 2002; Krančiukaitė & Rastenytė, 2006; Ones et al., 2005; Paul et al., 2005; Wyller & Kirkevold, 1999; Xie et al., 2006).

Impaired QOL appears to begin early in the recovery process and extends far beyond the initial rehabilitation period. At one month post-stroke, more than half (52%) of a group of highly recovered stroke survivors reported overall HRQOL as being worse than before the stroke (Williams, Weinberger, Harris, & Biller, 1999). At the end of the first year post-stroke, life satisfaction as measured with the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) was worse for 66% of a sample of German survivors (N = 144) than life before the stroke (Suenkeler et al., 2002).

Decreased QOL has been found to continue beyond the first year of recovery. Two years after stroke, QOL remained significantly lower for Australian stroke survivors who had good functional recovery (mean Barthel Index 17.8/20) (Sturm et al., 2004). Among these survivors, the mean Assessment of Quality of Life score was .47 (possible range -1 to +1; 95% CI .42 to .52) compared with a mean score of .86 for healthy older adults. Almost 25% of this sample had an AQoL score < .1 indicative of dependence in daily living, difficulty in fulfillment of family roles, and decreased psychological well-being. Only 3% of the general population in Australia scored at this level (Paul et al., 2005). As long as 6 years post-stroke, some dimensions of QOL as measured by SF-36 remained significantly lower for New Zealand stroke survivors (N = 639) than for a matched healthy control group (Hackett, Duncan, Anderson, Broad, & Bonita, 2000). Specifically, the lower dimensions included physical function, general health, and role limitations resulting from physical and emotional problems ($p < .0001$). These studies illustrate that even among stroke survivors with good functional recovery, QOL may be reduced.

Post-stroke QOL has been reported to not only be lower than QOL in the non-stroke population, but also to decrease further in the first year after stroke. Among stroke survivors from Hong Kong (N = 303), a significant decrease was found in psychological, social interaction, and environment domains of the World Health Organization QOL brief assessment (WHOQOL-BREF) at both 6 and 12 months ($p < .025$ with Bonferroni adjustment) (Kwok et al., 2006). Similar results were reported for a sample of Norwegian survivors (N = 144) using the SF-36

scale (Suenkeller et al., 2002). Naess, Waje-Andreassen, Thomassen, Nyland, and Myhr (2006) hypothesized that, based on findings from their cross-sectional study of younger survivors' long-term outcomes, subscale scores of the SF-36 may vary over the recovery time course.

Factors associated with QOL. A number of factors have been reported to be associated with quality of life after stroke. Using a small cross-sectional design (N = 86), King (1996) found that depression (r = -.53, p < .001), social support (r = .48, p < .001), and functional activity (r = -.20, p < .05) were associated with overall post-stroke QOL. The overall model was highly significant (p < .001) and accounted for 40% of variance in QOL as measured by the Quality of Life Index – Stroke Version. Similarly, Robinson-Smith, Johnston, and Allen (2000) reported that the Functional Independence Measure score at discharge from rehabilitation accounted for 20% of the variance in QOL at 6 months post-stroke. The larger (N = 356), 2-year North East Melbourne Stroke Incidence Study (NEMESIS) identified baseline age, female gender, initial NIHSS score, hemispheric neglect, and low socioeconomic status as predictors of 2-year QOL (Sturm et al., 2004). However, the predictor variables in the NEMESIS study were limited to stroke-related demographics, co-morbidities, functional activity, and risk factors. Psychosocial variables such as post-stroke rehabilitation, social support, or depressive symptoms were not measured (Paul et al., 2005). Depressive symptoms have been reported as the most significant indicator of negative QOL in both the population at large (Netuveli, Wiggins, Hildon,

Montgomery, & Blane, 2006) and among stroke survivors (Bays, 2001; Diehr et al., 2006; Paolucci, Gandolfo, Provinciali, Torta, & Toso, 2006).

Quality of life and depressive symptoms. Depressive symptoms are one of the most important independent predictors of poor QOL in stroke survivors (Astrom & Asplund, 2002; Bays, 2001; Carod-Artal et al., 2000; Gokkaya, Aras, & Cakci, 2005; King, 1996; Ones et al., 2005; Sturm et al., 2004). The Italian multi-center depression in stroke (DESTRO) study (N = 1,064) found that post-stroke depression as measured by clinical observation and the Beck Depression Inventory had more impact on SF-36 scores than did the stroke alone (ES = -.55 for physical health to -1.40 for mental health) (Paolucci et al., 2006). In a review of 39 QOL studies from the years 1979 through 2000, stroke survivor QOL was found to be consistently lower than that of healthy older adults (Bays, 2001). In Bays' review, post-stroke depression was the strongest predictor of QOL, accounting for 28% to 40% of the variance. Regardless of which QOL measurement approach or research design is used, significant inverse relationships have been reported between depressive symptoms and QOL as early as 1 month and as long as 2 years post-stroke (Carod-Artal et al., 2000; Clarke, Black, Badley, Lawrence, & Williams, 2002; Jönsson, Lindgren, Hallström, Norrving, & Lindgren, 2005; King, 1996; Ones et al., 2005; Robinson-Smith et al., 2000; Sturm et al., 2004; Sturm, Osborne et al., 2002). A similar relationship was demonstrated in older chronically ill adults living in the community (Walke, Byers, Gallo, Endrass, & Fried, 2007). Four studies specifically explored the longitudinal relationship between post-stroke depressive

symptoms and quality of life and found that increased depressive symptoms were predictive of decreased QOL over time (Kwok et al., 2006; Paolucci et al., 2006; Secrest & Zeller, 2007; Suenkeller et al., 2002). These findings underscore the importance of exploring depressive symptoms in relation to stroke-specific QOL. This study used longitudinal data to test the relationship between depressive symptoms at 4 months and QOL at 10 months after stroke as illustrated in the model.

Limitations in quality of life literature. A major challenge in reviewing the literature related to quality of life in general and, more specifically, stroke-specific quality of life is inconsistent definition and measurement of the concept (Hickey, Barker, McGee, & O'Boyle, 2005). In a review of stroke-related QOL literature, Bays (2001) found 17 different QOL measures used in 39 studies and raised concerns about instrument psychometrics and consistency of statistical processes. Generic measures, most commonly the SF-36 and the Nottingham Health Profile, provide broad information that can be compared across different populations. However, the use of the SF-36 and the SF-12 with stroke survivors has been called into question on the basis of inadequate psychometric properties with the stroke population. In one study of 90 Australian stroke survivors, each scale, except for vitality, was found to have acceptable internal consistency reliability ($\alpha \geq .70$) (Anderson, Laubscher, & Burns, 1996). Construct validity was also demonstrated for each scale except the social functioning scale. However, further testing in a larger sample ($N = 177$) suggested significant floor and ceiling effects, limited applicability for 5 of the 8 scales, and questionable reliability and

validity of the physical and mental health summary scores (Hobart, Williams, Moran, & Thompson, 2002).

Health utility scales, such as the Assessment of Quality of Life scale, address QOL from a different perspective, asking respondents to consider their present life and state of health in relation to perfect health or death (Sturm, Osborne et al., 2002). These measures, derived from econometric theory, are not designed to assess change over time (Williams, 2001). However, they may be used as an adjunct HRQOL measure. Generic measures, such as the SF-36, SF-12, and AQoL, lack specificity related to stroke-specific deficits.

Only in the last few years have investigators begun to study QOL from the stroke survivor's perspective. Stroke-specific measures address areas pertinent to stroke survivors that are not covered by more generic instruments. Two stroke-specific QOL measures have been developed and found to have acceptable psychometric properties (Duncan et al., 2001; Williams, Weinberger, Harris, Clark, & Biller, 1999). Using focused interviews with stroke survivors, Williams and colleagues (1999) derived the domains for the Stroke-Specific Quality of Life Scale (SS-QOL): physical function, vision, language, thinking, mood, role function, and energy. Duncan and colleagues (2001) created a measure of stroke-specific QOL outcomes, the Stroke Impact Scale (SIS), with the specific intention of incorporating survivor and caregiver-derived QOL goals. The self-report instrument is based on the World Health Organization's model of disablement, which identifies limitations occurring as a result of the disability (Duncan et al., 2001). Although both tools were developed from the perspective

of the stroke survivor, the domains in Williams' SS-QOL more closely match the contextual variables and outcomes being investigated in Figure 1; therefore, the SS-QOL was used to measure QOL for this study.

In summary, stroke-specific QOL has been found to be significantly lower in comparison with the general population. Even among survivors with minimal residual effects, QOL may still be reduced. Furthermore, post-stroke QOL has been reported to decrease over time in studies that used generic QOL tools. The use of stroke-specific instruments will further address QOL domains, such as language, vision, and thinking, which are not captured by generic or utility measures. Although there are several factors associated with stroke-specific QOL, depressive symptoms have been consistently associated with decreased quality of life.

Depressive Symptoms

Description. Depression, used as a general term in some of the literature to refer to depressive symptoms, minor depression (dysthymia), or major depression (a DSM-IV diagnosis), has been described as the most serious and common emotional disorder following stroke (Narushima & Robinson, 2002). This section will address important aspects of depressive symptoms in stroke survivors including prevalence, mortality risk, and etiological models. Further complicating efforts to clearly describe post-stroke depressive symptoms is the complex etiology underlying the diagnosis (Johnson, Bakas, & Williams, 2007; Whyte & Mulsant, 2002).

Prevalence data. The reported prevalence of post-stroke depressive symptoms varies widely as a result of methodological differences between studies. These differences include when depressive symptoms are measured after the stroke; sample selection; and which diagnostic criteria are used (Gainotti & Marra, 2002; King et al., 2002; Turner-Stokes & Hassan, 2002). Measurement instruments used and cut-points chosen also contribute to a wide variation in prevalence rates (Bogousslavsky, 2006; Robinson, 2003). A large proportion of stroke survivors may be affected by depressive symptoms with estimates ranging between 25% and 75% in the months following stroke (Duncan et al., 2005; Williams, 2005). Pooled data from international studies have demonstrated a prevalence rate for major depression of 23.3% in samples of community-dwelling stroke survivors (Robinson, 2003). As demonstrated in a review of 14 studies describing the occurrence of major depressive disorder (MDD), time since stroke is an important factor in describing prevalence rates (Whyte & Mulsant, 2002). In these studies, prevalence rates peaked in the first 6 months after stroke, ranging between 9% and 37%, fell to between 5% and 16% at 1 year, and increased again to a rate of 19% to 21% at 2 years. There is a concern that, for a large percentage of stroke survivors, depressive symptoms experienced in the early post-stroke period may become chronic. In an 18 month longitudinal study, Berg, Palomaki, Lehtihalmes, Lonnqvist, and Kaste (2003) found that, 46% of the stroke survivors who reported depressive symptoms at 2 months post-stroke continued to report the symptoms at 12 months or beyond.

Mortality. An increased risk of mortality independently associated with post-stroke depressive symptoms has been demonstrated in several studies. Among the stroke survivors in Robinson's seminal study, the occurrence of depression symptoms during the acute post-stroke phase was found to be significantly associated with mortality within the first 5 years post-stroke (OR = 3.4, 95% CI = 1.4 to 8.4, p = .007) (Morris, Robinson, Andrzejewski, Samuels, & Price, 1993). After 5 years, the survival curve between depressed and non-depressed survivors was parallel. Severity of depressive symptoms was not associated with mortality in this sample. Although these early findings were limited by the small sample sizes for the depression group (N = 37) and the non-depressed group (N = 54), larger studies have since supported the findings. The relationship between depressive symptoms, depression, and mortality was explored in a large sample of 448 stroke survivors (House et al., 2001). The presence of depressive symptoms as measured by the depression subscale of the General Health Questionnaire significantly predicted mortality at both 12 and 24 months post-stroke (OR = 2.0, 95% CI = 1.0 to 4.1, $p < .05$) after adjusting for other risk factors. An important finding in this study was that a psychiatric diagnosis of major depression established by the Present State Examination was not significantly associated with increased mortality, suggesting the possibility that mortality may be more closely associated with self-reported depressive symptoms than with the clinical diagnosis of major depression. Findings from a more recent study of a large cohort (N = 51,119) of American military veterans, including ischemic stroke survivors, also support the relationship between post-

stroke depression and mortality (Williams, Ghose, & Swindle, 2004). The prevalence rate in this sample of men (> 98% of the total sample) was low (5%); however, this may be related to a lower incidence of depression among men than women in the general population. In this study, post-stroke depression was found to independently increase the risk of death in stroke survivors by 13% over a 3-year period after controlling for cardio-vascular risk factors and overall mortality risk.

Etiological models of post-stroke depressive symptoms. Given the high prevalence rate of post-stroke depressive symptoms, increased mortality risk, and increased use of health care resources, an understanding of the etiology of depressive symptoms after stroke is important. Two conflicting models exist concerning the etiology of post-stroke depressive symptoms. A third multifactorial model may resolve the differences between the first two models.

The first model, in which post-stroke depressive symptoms are primarily neurobiological in nature and are associated with the location and extent of the neurological insult, is based on the early work of Robinson and colleagues (Robinson, Bolduc, & Price, 1987; Robinson & Price, 1982; Robinson, Starr, Kubos, & Price, 1983; Robinson, Starr, Lipsey, Rao, & Price, 1984). Further cross-sectional and longitudinal work proposes that the association between lesion characteristics and post-stroke depressive symptoms is strongest during the acute phase (Astrom, Adolfsson, & Asplund, 1993; Singh et al., 2000; Vataja et al., 2004), but is hypothesized to disappear within the first months of recovery (Andersen, Vestergaard, Ingemann-Nielsen, & Lauritzen, 1995; Astrom,

Adolfsson, & Asplund,1993; Spalletta et al., 2006). One cross-sectional report indicated that the odds of the occurrence of depressive symptoms at 3 to 4 months post-stroke were increased (OR = 3.2, 95% CI 1.0 to 10.1) with lesions that affected the left, prefrontal, subcortical neurological circuits (Vataja et al., 2001). However, psychosocial characteristics of the sample were not included with anatomical correlates in the analyses. In older adults without clinical history of stroke, a significant relationship was found between depressive symptoms as measured by the Center for Epidemiological Studies depression scale and lesions other than those located in the basal ganglia (Sato, Bryan, & Fried, 1999).

A second model challenges the proposition that lesion characteristics and depressive symptoms are related. Systematic literature reviews report that no relationship can be demonstrated across studies (Bhogal, Teasell, Foley, & Speechley, 2004; Carson et al., 2000; Gainotti & Marra, 2002). The hypothesis that association between post-stroke depressive symptoms and lesion location occurs primarily in the first months after stroke was disputed by findings from two studies (Nys et al., 2005; Sinyor et al., 1986). In contrast with Robinson's work, the relationship between initial lesion characteristics and later depressive symptoms is also challenged. No significant differences were found between survivors with and without depressive symptoms in a cross-sectional study at 3 months post-stroke (Pohjsvaara et al., 1998). Similar results have been reported in longitudinal studies (Berg et al., 2003; Cassidy, O'Connor, & O'Keane, 2004; Paolucci et al., 2005; Spalletta, Ripa, & Caltagirone, 2005). Lesion characteristics

were primarily identified in these studies through computerized tomography or magnetic resonance imaging techniques.

This second model suggests that, rather than being a unique biological effect secondary to stroke, post-stroke depressive symptoms are more likely a psychological response to the multiple stressors associated with the recovery of post-stroke function and quality of life (Whyte & Mulsant, 2002). For example, there were significant group differences between level of depressive symptoms and the ability to perform desired tasks (modified Barthel Index $p < .003$, modified Rankin Scale $p < .004$) (Nys et al., 2005). However, there were no significant differences between lesion side or location and depressive symptoms. In the large DESTRO study (N = 1,064), significant risk factors for the occurrence of post-stroke depressive symptoms included female gender, previous stroke, history of depression, and a modified Rankin score > 3 (Paolucci et al., 2005). Site of lesion did not enter into univariate or multivariate analyses.

The ongoing debate between these two conflicting models may be resolved by a third model. In this model, the neurological and psychosocial effects of stroke are hypothesized to both decrease a stroke survivor's affective reserve and to expose pre-existing susceptibility toward depression (Whyte & Mulsant, 2002). This third model is consistent with other literature suggesting that post-stroke depressive symptoms are the result of complex relationships among multiple neurobiological and psychological factors (Aben et al., 2003; Astrom et al., 1993; Dieguez, Staub, Bruggimann, Bogousslavsky, 2004; Leentjens, Aben, Lodder, & Verhey, 2006). Post-stroke depressive symptoms may be comparable

to depression found with other disease processes and in the general population (Whyte & Mulsant, 2002). This biopsychosocial model is also supported by qualitative findings that describe survivors' perspectives of the physical, emotional, and social aspects of post-stroke recovery as being interconnected rather than separate (Dowswell et al., 2000). In contrast to Robinson's early conclusions about the primary etiology of post-stroke depressive symptoms, researchers now acknowledge the complex, multifactorial origin of post-stroke depressive symptoms (Andersen et al., 1995; Astrom et al., 1993; Dieguez et al., 2004; Hackett & Anderson, 2006; Nys et al., 2005). The present study used a multifactorial approach in the analysis of relationships between post-stroke depressive symptoms and the disease-specific and psychosocial variables. These variables are discussed in the following section.

Factors Associated with Post-stroke Depressive Symptoms

A variety of factors have been associated with depressive symptoms in the literature. The relationships between post-stroke depressive symptoms and demographics, history of depression, stroke severity, functional ability, perceived social support, self-esteem, and optimism are described in the following sections.

Demographics. Associations between demographic variables and depressive symptoms are unclear. Although several studies reported significant relationships between age and depressive symptoms (Berg et al., 2003; Chiu, Chen, Huang, & Mau, 2005; King et al., 2002; Robinson et al., 1983), most findings have been non-significant (Andersen et al., 1995; Astrom et al., 1993; Burvill, Johnson, Jamrozik, Andersen, & Stewart-Wynne, 1997; Hackett &

Anderson, 2006; Nys et al., 2005; Paolucci et al., 2005; Robinson et al., 1984; Spalletta et al., 2005; Vataja et al., 2001). However, comparison of results must take into account age exclusions in some studies. For example, Berg and colleagues (2003) found a significant correlation in univariate analysis (r = .24, p < .05) between "older age" and depressive symptoms in the first 2 months post-stroke. In this case, the mean age was 56.25 years (SD = 10.6); survivors older than 70 years of age were excluded.

As with age, findings are mixed for the relationship between gender and depressive symptoms. Some studies have found significant relationships with female survivors reporting more depressive symptoms (Carod-Artal et al., 2000; Cassidy et al., 2004; Chiu et al., 2005; Leentjens et al., 2006; & Paolucci et al., 2005). Contrary to these findings, one study reported that male survivors had significantly more depressive symptoms (p < .001) at 18 months post-stroke (Berg et al., 2003). Other researchers have found no relationship between gender and depressive symptoms (Astrom et al., 1993; Burvill et al., 1997; Hackett & Anderson, 2006; Nys et al., 2005; Pohjsvaara et al., 1998; Pohjasvaara et al., 2001; Spalletta et al., 2005).

Similarly, the relationship between education level and depressive symptoms is unclear in the literature. In studies focused on stroke survivors, no relationship has been found between education and depressive symptoms (Andersen et al., 1995; Nys et al., 2005; Pohjsvaara et al., 1998; Pohjasvaara et al., 2001; Spalletta et al., 2005; Vataja et al., 2001). Higher education levels have been associated with increased depressive symptoms in chronically ill Chinese

individuals, including stroke survivors, who live in cities (Chiu et al., 2005) and in individuals hospitalized with heart failure (Yu, Lee, Woo, & Thompson, 2004). In contrast, community-dwelling adults over the age of 60 with less than a high school education have been reported to have more sad, blue, or depressed days than adults who are college-educated (Keyes et al., 2005).

Evidence about relationships between depressive symptoms and race and ethnicity of participants is limited (Everson-Rose & Lewis, 2005). Minority under-representation is a significant problem in stroke clinical trials (Stansbury et al., 2005). The few studies of post-acute outcomes that have looked at race or ethnicity suggest a greater ongoing burden for minorities (Stansbury, Jia, Williams, Vogel, & Duncan, 2005). In reports on depressive symptoms in the community-dwelling general population, gender and socioeconomic status appear to be more important variables than race (Blazer, Landerman, Hays, Simonsick, & Saunders, 1998; Jackson-Triche et al., 2000). However, in a more recent study exploring racial differences in depressive symptoms among older adults, the effect of race on depressive symptoms remained significant ($\beta = .225$, $p < .001$) when controlling for age, gender, education, and income (Skarupski et al., 2005). Demographic variables such as age, gender, education, and race were screened for inclusion in the regression analyses.

History of depression. Documentation of a positive history of depression is dependent on retrospective self-report of stroke survivors and/or close informants or medical chart review (Astrom & Asplund, 2002; Pohjasvaara et al., 1998). Although two studies found no association between a previous history of

depression and post-stroke depressive symptoms (Astrom et al., 1993; Cassidy et al., 2004), other studies have reported that a history of depression is an important predictor of post-stroke depressive symptoms (Hackett & Anderson, 2006; Leentjens et al., 2006; Paolucci et al., 2005; Paolucci et al., 2006; Pohjsvaara et al., 1998). Odds ratios for the development of post-stroke depressive symptoms have been reported to range between 2.14 in the Auckland Regional Community Stroke study (ARCOS) (Hackett & Anderson, 2006) and 3.97 in the DESTRO study (Paolucci et al., 2005) when survivors have a history of depression. The probability of developing post-stroke depressive symptoms appears to increase exponentially when history of depression is taken into account. The DESTRO group calculated a 25% probability of depressive symptoms in men having a first stroke, with no prior history of depression, and mild limitations in functional ability. Women with previous stroke history, severe limitations in functional ability, and a history of depression had a 90% probability of experiencing post-stroke depressive symptoms. Self-reported history of depression was controlled in this study.

Stroke severity. Stroke severity is the objective degree of neurological impairment as measured by standard scales such as the National Institutes of Health Stroke Scale (NIHSS) or the Scandinavian Stroke Scale (SSS), has been reported to be significantly related to depressive symptoms although the relationship is not strong. Cross-sectional studies have reported that survivors with depression had significantly more severe strokes than non-depressed survivors (Vataja et al., 2001; Vataja et al., 2004). A longitudinal study reported

that stroke severity at the acute phase was a significant, but weak predictor of depressive symptoms at both 12 months (r = .11, p < .05) and at 18 months (r = .12, p < .05), but not at 6 months post-stroke (Berg et al., 2003). Findings from a larger cross-sectional study (N = 277) supported the association OR = 1.1, 95% CI 1.03 to 1.14) between stroke severity and depressive symptoms at 3 to 4 months post-stroke (Pohjsvaara et al., 1998). Stroke severity was addressed with the NIHSS in this study.

Functional activity. Functional activity is a concept referred to in earlier literature as disability, addresses the stroke survivor's ability to perform the tasks and activities of everyday life (Salter et al., 2005; Williams, 2001). Narushima and Robinson (2002) suggested that increased difficulty with activities of daily living is a risk factor for the occurrence of post-stroke depressive symptoms. Empirical support for this relationship is found in both cross-sectional (Burvill et al., 1997; Chiu et al., 2005; Nys et al., 2005; Pohjsvaara et al., 1998; Vataja et al., 2004) and longitudinal studies (Astrom et al., 1993; Chemerinski, Robinson, & Kosier, 2001; Hackett & Anderson, 2006; House et al., 2001; Leentjens et al., 2006; Paolucci et al., 2006; Parikh et al., 1990; Pohjasvaara et al., 2001; Robinson et al., 1987; Singh et al., 2000). The relationship between functional ability and depressive symptoms appears to start during the acute phase of stroke recovery (Nys et al., 2005), and may continue for 12 months (Leentjens et al., 2006) or perhaps up to 24 months post-stroke (Parikh et al., 1990).

In contrast to the number of studies describing a significant relationship between functional activity limitation and post-stroke depressive symptoms, three

studies reported no association between these variables (Andersen et al., 1995; Cassidy et al., 2004; King et al., 2002). Several factors may account for this apparent contradiction. Small sample size of survivors with depressive symptoms (Cassidy et al., 2004; King et al., 2002) could result in insufficient power to demonstrate a relationship. The age range of the sample in the Andersen (1994) study was very broad; the lack of findings may be reflective of a wide variance in the functional activities normally performed by survivors whose ages ranged from 25 years to 80 years of age. Finally, the potential effect of treatment with medication for depression or “nerves” on functional activity was not accounted for in two studies (Cassidy et al., 2004; King et al., 2002). One-month functional activity for this proposed study was measured by the modified Rankin scale (mRS) and will be controlled for in the analyses predicting four-month depressive symptoms.

Perceived social support. Although there are two common approaches to measuring social support (objective, social network characteristics and perceived support), this study focused on perceived social support. Perceived social support captures the qualitative aspects of social interaction (Everson-Rose & Lewis, 2005) and goes beyond the existence of quantifiable social contacts to the perception that one is loved, valued, and able to count on others for support if needed (Friedland & McColl, 1992). Major subtypes of perceived social support include emotional, instrumental, and informational support (Friedland & McColl, 1992; Sherbourne & Stewart, 1991). Perceived social support appears to have a significant inverse relationship with depressive symptoms in stroke survivors and

may be amenable to interventions for decreasing post-stroke depressive symptoms (Narushima & Robinson, 2002). Both early studies (Andersen et al., 1995, Boynton de Sepulveda & Chang, 1994; Morris et al., 1993; Robinson et al., 1983; Spencer et al., 1995) and more recent work (Carod-Artal et al., 2000; King et al., 2002) report significant associations between low perceived social support and increased depressive symptoms in all stages of stroke recovery. For older adults, the perceived need for social support after stroke may be more pronounced than for those in the general population. In a population survey of Canadian adults 65 years of age and older (N = 5,395), stroke survivors living in the community were found to have lower mental health scores and to express a greater need for social support than their counterparts without stroke even though both groups had similarly sized social networks (Clarke et al., 2002). From a qualitative perspective, stroke survivors view perceived support as an important aspect in the attempt to regain a sense of continuity with who they were prior to the stroke (Secrest & Thomas, 1999). This relationship can also be seen in younger adults under the age of 40 who have a history of depression or major depressive disorder (Choenarom, Williams, & Hagerty, 2005; Leskelä et al., 2006) as well as in older adults over 60 years of age who are in the general population, hospitalized, receiving home care, or in different cultures (Keyes et al., 2005; Rowe, Conwell, Schulberg, & Bruce, 2006; Yang, 2006; Yu et al., 2004).

The relationship between perceived social support and depressive symptoms may also have varying effects across time. High perceived support

was associated with lower depressive symptoms at 1 month (p = .004) and at 3 months (p = .013), but not at 6 months in a small sample (N = 43) of Greek stroke survivors (Tsouna-Hadjis, Vemmos, Zakapoulos, & Stamatelopoulos, 2000). Although one study found no relationship between social support and depressive symptoms at 2 years post-stroke (Parikh et al., 1990), this relationship has been reported to extend over time with lower initial perceived social support negatively impacting depressive symptoms from 1 to 3 years later (Astrom et al., 1993; King et al., 2002; Robinson et al., 1987). Few social ties and greater depressive symptoms may also have an additive effect on 10-year mortality; survivors with both few ties and greater depressive symptoms had a 92% mortality rate contrasted with survivors with many ties and no depressive symptoms who had a 38% mortality rate 10 years post-stroke (Morris et al., 1993).

The above findings should be carefully interpreted because of differences in conceptual and operational definitions of social support and depressive symptoms. Contrasting findings also may be attributable to cultural differences in sample populations. Furthermore, many of the above studies exploring perceived social support in stroke survivors have been limited by sample sizes smaller than 100 participants. Given the potential importance of perceived social support in connection with depressive symptoms, this variable was included in this study as a predictor of depressive symptoms (see Figure 1, Chapter 1).

Self-esteem and optimism. Although in other contexts self-esteem and optimism have been negatively correlated with depressive symptoms as

measured by the Beck Depression Inventory (Scheier et al., 1994), relationships of self-esteem and optimism to post-stroke depressive symptoms have been explored in only a few studies. Self-esteem is defined as a personality disposition reflective of an individual's feelings about self-worth, self-respect, and potential for growth (Rosenberg, 1989). Four studies that measured self-esteem among stroke survivors were identified in this literature review. Citing a lack of studies examining the relationship between self-esteem and depressive symptoms, Fung, Lui, and Chau (2006) conducted a small (N = 73) correlational descriptive study among Chinese stroke survivors to explore this relationship. Greater global self-esteem was significantly associated with fewer depressive symptoms (r = -.59, $p < .05$). Self-esteem was negatively correlated with depressive symptoms (r = -.49, $p < .05$) in a sample of 25 men with acquired brain injury including stroke (Howes, Edwards, & Benton, 2006). The same relationship was found in the matched community-dwelling control group of men without brain injury. Two intervention studies have demonstrated improvement in stroke survivor self-esteem. A pilot study (N = 19) testing the effectiveness of an 8-week videoconferencing community-based rehabilitation program found significant improvement in state self-esteem between baseline and program completion scores ($p < .001$) among Chinese survivors (Lai et al., 2004). Global self-esteem was found to improve in Israeli stroke survivors (N = 73) who completed a theory based, 8-week individualized nursing intervention as compared with a control group (N = 82) who completed the usual rehabilitation program (Nir et al., 2004).

Self-esteem has been explored in other populations. Yang (2006) reported that self-esteem had a greater effect on depressive symptoms than functional activity or perceived social support among older adults (Yang, 2006). In a small sample of 82 Japanese post-gastrectomy patients, self-esteem had a significant bivariate correlation (r = -.606, p < .01) with depressive symptoms and was also a significant independent predictor in multiple regression analysis (β = -.596, p = .022) (Maeda, Onuoha, & Munakata, 2006). A similar relationship between self-esteem and depressive symptoms was found in samples of individuals with fibromyalgia and/or chronic fatigue syndrome (Michielsen et al., 2006), in individuals with rheumatoid arthritis (Covic et al., 2006), and in family caregivers of stroke survivors (Bakas & Burgener, 2002).

Optimism, a separate but related construct from self-esteem (Scheier et al., 1994), is defined as the generalized expectation of a positive outcome (Schweizer et al., 1999). The relationship between optimism and depressive symptoms is not clear from the two stroke-related studies that included self-esteem as a variable. In the early weeks following stroke, optimism in combination with threat appraisal was found to contribute 32% of the variance in depression (CES-D) among 87 survivors (p < .03) (Spencer et al., 1995). However, in a different study, the relationship between optimism and post-stroke depressive symptoms was not found to remain over time (King et al., 2002). In other populations, greater levels of optimism have been associated with lower levels of depressive symptoms. Self-esteem and optimism were bivariately associated with depressive symptoms among a sample of 123 British adults

diagnosed with venous thrombosis (Moore, Norman, Harris & Makris, 2006). However, in hierarchical multiple regression, only optimism remained as a significant independent predictor of depressive symptoms (r = -.37, p < .001) in a model that explained 24% of the variance. The negative association between optimism and depressive symptoms has also been reported in adults with osteoarthritis (Ferreira & Sherman, 2007) and in women with early stage breast cancer (Bardwell et al., 2006). Given small sample sizes and the limited amount of data about the relationships of optimism and self-esteem to post-stroke depressive symptoms, these variables were included in the model to determine relationships with threat appraisal and with depressive symptoms over time.

Threat Appraisal

Cognitive appraisal. Threat appraisal is the stressful anticipation of future harm, loss, or negative consequences. The broader concept of cognitive appraisal has been explored with family caregivers (Bakas & Burgener, 2002; Bakas & Champion, 1999; Carey, Oberst, McCubbin, & Hughes, 1991; Oberst, Thomas, Gass, & Ward, 1989) and has been associated with emotional distress in individuals with cancer (Ahmad, Musil, Zauszniewski, & Resnick, 2005; Mishel & Sorenson, 1991; Oberst, Hughes, Chang, & McCubbin, 1991). In stroke, investigators have also explored appraisal, and more specifically, threat appraisal. Cognitive appraisal statements from the Appraisal of Health scale were found to have face validity in a small pilot study of four stroke survivors who had experienced a stroke 6 to 12 months earlier (Johnson, Bakas, & Lyon, 2008). Using two questions to assess the threat associated with future care and the

potential of another stroke, King and colleagues (2002) found that concern about ability to care for oneself in the future did not change over a 2 year period, but that concern about having another stroke decreased significantly between 6 months and 1 year after discharge from rehabilitation ($p < .01$). Qualitative studies also suggest that threats to personal well-being may occur after a stroke as survivors attempt to find continuity with previous levels of physical function, social activity, and emotional health (Bendz, 2003; Secrest & Thomas, 1999).

Threat appraisal and depressive symptoms. A relationship between threat appraisal and depressive symptoms has been reported by other investigators. In an early longitudinal study, stroke survivors at risk for depression were more concerned about a future stroke than non-depressed survivors ($p = .01$) (Spencer et al., 1995). Depressed stroke survivors were reported to have significantly more negative ($p < .01$) and fewer positive cognitions ($p < .05$) than stroke survivors who were not depressed (Nicholl, Lincoln, Muncaster, & Thomas, 2002). Negative cognition items were worded similarly to items in the threat subscale of the Appraisal of Health Scale. Boynton de Sepulveda and Chang (1994) found that higher threat appraisal, as measured by a 7-item measure of threat appraisal derived from Folkman's Ways of Coping Checklist, was significantly correlated with decreased functional status ($r = -.38$), decreased perception of social support ($r = -.32$), and increased depression ($r = .33$). In a larger (N = 394), cross-sectional study, threat appraisal was significantly correlated with depressive symptoms ($\beta = .21$, $p < .001$) within the first month post-stroke after controlling for history of depression, self-esteem, age, and functional activity (R^2

= .43, $p < .001$) (Johnson, Bakas, Lyon, & Williams, 2008). These studies were limited by the use of one or two items to measure a multidimensional concept (King et al., 2002; Spencer et al., 1995), small sample size (Johnson, Bakas, & Lyon, 2008; King et al., 2002; Nicholl et al., 2002), cross-sectional design (Boynton de Sepulveda & Chang, 1994; Johnson, Bakas, & Lyon, 2008) and/or the lack of reported evidence for reliability and validity of measurement instruments (Boynton de Sepulveda & Chang, 1994).

Although associated with antecedent variables and the outcome variable of depression in small samples of stroke survivors, the mediating effect of threat appraisal in stroke is not known. Therefore, in this study, the mediating effects of threat appraisal between the key explanatory variables of perceived social support and personality disposition variables, and the emotional outcome of depressive symptoms were examined using a larger sample. The hypothesized mediating effect of threat appraisal on depressive symptoms would provide support for the use of stress management interventions among stroke survivors.

Summary and Critique

The preceding review of literature has provided an overview of (1) Lazarus' and Folkman's transactional theory of stress, (2) the significance of this proposed study to nursing, and (3) a review of the research literature. The literature review focused on the outcome variables of stroke-specific quality of life and depressive symptoms; antecedent variables including demographic variables (age, gender, education, and race), history of depression, stroke severity,

functional activity, perceived social support, self-esteem, and optimism; and the mediating variable of threat appraisal.

In the overview of Lazarus and Folkman's transactional theory of stress, relationships and concepts were explained. In the context of the transactional theory of stress, variables affecting the person-environment interaction included demographics, history of depression, stroke severity, functional activity, perceived social support, self-esteem, and optimism. Threat appraisal represented the mediating effect of appraisal on the relationship between antecedent variables and the emotional and adaptational outcomes of depressive symptoms and stroke-specific quality of life.

In the significance to nursing section, arguments for the importance of a stroke survivor's appraisal of the post-stroke person-environment interaction in the outcomes of depressive symptoms and stroke-specific quality of life were made. Cognitive appraisal as described by the transactional theory of stress is consistent with nursing's view of human interaction with the environment. The importance of placing priority on goals that are important to stroke survivors was discussed in light of findings that stroke survivors do not include nurses as significant in their recovery process and that health care providers in general may have different goals than do survivors. Interventions by nurses, either independently or as part of interdisciplinary teams, have the potential to improve stroke survivor self-esteem, depressive symptoms and/or quality of life. Research findings support the possibility of interventions related to improving social support and altering threat appraisal. Improvement in depressive symptoms and quality

of life may enhance knowledge and behavior changes related to the risks for subsequent strokes.

In the review of research literature, research findings pertinent to the study variables were presented. Variables that were discussed included stroke-specific quality of life, post-stroke depressive symptoms, demographic information, history of depression, stroke severity, functional activity, perceived social support, self-esteem, optimism, and threat appraisal. Existing research support for relationships among the constructs in the conceptual model was provided. Quality of life has been examined in both quantitative and qualitative studies. The importance of this adaptational variable as an outcome was established and significant evidence for the relationship between quality of life and depressive symptoms in stroke survivors was presented. Post-stroke depressive symptoms have been the focus of many studies over the last 25 years. Although early studies documented correlations between lesion location and depression, more recent evidence supports a multifactorial etiology that includes emotional and social variables as well as physiological factors. Findings are mixed regarding a relationship between demographic variables, such as age, gender, education, and race and the emotional reaction of depressive symptoms in both stroke survivors and the general population. Two multi-site studies reported increased odds for the occurrence of post-stroke depressive symptoms for female survivors with a history of depression as compared with male survivors. A weak relationship between stroke severity and depressive symptoms was found in the literature. Although no relationship between depressive symptoms and functional

activity was found in three studies of stroke survivors, the relationship was supported by both other cross-sectional and longitudinal studies. From both a qualitative and quantitative perspective, perceived social support was found to be related to depressive symptoms in stroke survivors as well as the general population. However, results from these studies should be carefully interpreted based on varying conceptual definitions of social support. Few studies have examined the concepts of self-esteem and optimism in stroke survivors. However, beginning support for the relationship between these two variables and depressive symptoms was found in other populations. Cognitive appraisal has been reported to be a mediating variable in studies of cancer survivors and family caregivers. Threat appraisal has been found to be significantly correlated with post-stroke depressive symptoms; however, the mediating effect is not known in the stroke population.

In reviewing the empirical literature, a total of 94 studies were cited and are summarized in alphabetical order in Table 1 in the appendix. The following critique of the literature will summarize types of studies included, discuss sampling methods, and address common limitations. Gaps in the literature will be reviewed and implications for the proposed study will be addressed.

Summary of Types of Studies

Of the 94 studies included in this review, conceptual model variables as found in other populations were addressed in 22 studies including cancer survivors (Ahmad et al., 2005; Mishel & Sorenson, 1991), caregivers (Bakas & Burgener, 2002; Bakas & Champion, 1999; Carey et al., 1991; Oberst et al.,

1989), individuals with chronic illness (Covic et al., 2006; Ferreira & Sherman, 2007; Michielsen et al., 2006; Moore et al., 2006; Walke et al., 2007; Yu et al., 2004), individuals with depression (Choenarom et al., 2005; Diehr et al., 2006; Leskelä et al., 2006), post-surgery patients (Maeda et al., 2006), and the general population (Blazer et al., 1998; Keyes et al., 2005; Netuveli et al., 2006; Rowe et al., 2006; Skarupski et al., 2005; Yang, 2006); the remainder of the studies were specific to stroke. Different types of studies can be found among those reviewed for this study. Although most studies were non-experimental in nature, five were intervention studies addressing important variables in this study (Lai et al., 2004; Miller & Spilker, 2003; Nir et al., 2004; Rimmer et al., 2000; Williams et al., 2007). There were four qualitative studies included (Bendz, 2003; Dowswell et al., 2000; Secrest & Thomas, 1999; Wyller & Kirkevold, 1999). Measurement of the mediating variable of threat appraisal was examined in five studies (Bakas & Burgener, 2002; Bakas & Champion, 1999; Johnson, Bakas & Lyon, 2008; Johnson et al., 2007; Oberst et al., 1989) and measurement of the emotional and adaptational outcomes of depressive symptoms and quality of life was examined in six studies (Anderson et al., 1996; Hobart et al., 2002; Sturm, Osborne et al., 2002; Williams et al., 2005; Williams et al., 1999; Williams, Weinberger, Harris, Clark et al., 1999).

Sampling Procedures

Adequate sample size is critical to the ability to show significant relationships between variables or to produce significant treatment effects (Tabachnick & Fidell, 2007). Of the stroke specific studies, there were 29 studies

with sample sizes ≤ 100, 16 studies with sample sizes between 101 and 250, 8 studies with sample sizes between 251 and 500, and 10 studies with sample sizes > 500. Of the studies with fewer than 100 participants, 6 had between 21 and 50 (Cassidy et al., 2004; Lai et al., 2004; Morrison et al., 1998; Nicholl et al., 2002; Rimmer et al., 2000; Tsouna-Hadjis et al., 2000). Of the largest studies, two studies (Paolucci et al., 2005; Paolucci et al., 2006) were drawn from the Italian multi-site depression in stroke (DESTRO) sample (N = 1,064). The remaining eight studies were large population-based surveys (Clarke et al., 2002; Hackett & Anderson, 2006; Hackett et al., 2000; Sato et al., 1999; Skarupski et al., 2005; Williams et al., 2004; Xie et al., 2006). Power analyses were rare with the noted exception of four studies (Ahmad et al., 2005; Miller & Spilker, 2003; Rimmer et al., 2000; Williams et al., 2007). The study conducted by Rimmer and colleagues illustrates the benefits of conducting a power analysis to determine adequate sample size. Although this study had only 35 participants, an effect size of 0.35 with 80% power was achieved with only 16 participants in each group.

In order to be able to generalize findings to the larger population, samples need to be representative of that population. However, random sample selection is relatively uncommon and is considered to be impractical in behavioral research (Kerlinger & Lee, 2000; Shadish, Cook, & Campbell, 2002). Except for the extremely large population-based epidemiologic studies, non-probability convenience sampling procedures were widely used. To compensate for the lack of random selection, some investigators used different procedures. For example,

Rimmer and colleagues (2000) randomly selected participants for their intervention study from a pool of eligible individuals. Participants were then randomly assigned to either the treatment group or the control group that later received the same intervention. One qualitative study utilized strategic sampling from a larger group of stroke survivors (Carlsson et al., 2004). Choenarom et al. (2005) attempted to obtain a wide range of individuals with depression by including a geriatric clinical site in their sampling plan. Nevertheless, convenience sampling limited the generalizability of many studies to distinct racial or socioeconomic groups. Seminal research findings related to post-stroke depression were based on a sample of primarily black men from socio-economically disadvantaged backgrounds (Robinson et al., 1987; Robinson & Price, 1982; Robinson et al., 1983; Robinson et al., 1984; Parikh et al., 1990). Findings from other more recent studies are limited to white stroke survivors with higher levels of education (Boynton de Sepulveda & Chang, 1994; Choenarom et al., 2005; Robinson-Smith et al., 2000; Rowe et al., 2006).

Other Limitations

Inclusion and exclusion criteria also affect the representativeness of study findings. In stroke research, participants with significant communication disorders or limited levels of functional activity are excluded from most studies. Findings are therefore generalizable only to a more highly functional population. To address this limitation, ten studies included survivors who could use alternate methods of communication or who were only mildly to moderately impaired in their function or communication (Andersen et al., 1995; Cassidy et al., 2004;

Gokkaya et al., 2005; Paolucci et al., 2005; Paolucci et al., 2006; Secrest & Thomas, 1999; Secrest & Zeller, 2007; Williams et al., 2005; Williams et al., 2006; Williams et al., 2007). Other studies chose to use proxy responses to obtain otherwise unobtainable data about survivors with cognitive or speech impairments and low functional abilities (Chiu et al., 2005; Hackett & Anderson, 2006; Hackett et al., 2000; Paul et al., 2005; Sturm et al., 2004; Sturm, Osborne et al., 2002; Xie et al., 2006). In this group of studies, proxies provided responses for between 18.5% (Paul et al., 2005) and 26.4% (Hackett et al., 2000; Xie et al., 2006) of the survivors. The use of proxy respondents, however, also has limitations. In stroke, only modest agreement between survivor-proxy assessments of QOL has been reported, varying by level of survivor depressive symptoms and proxy perception of burden (Williams et al., 2006).

Another concern is the wide variation in length of time between the initial stroke and data collection. Changes occurring over the course of time can introduce uncontrolled variance that may influence post-stroke outcomes such as quality of life or depressive symptoms. Baseline measurements for longitudinal studies reviewed varied from “onset” of stroke (Hackett & Anderson, 2006) to admission to rehabilitation many months after the occurrence of a stroke (Cassidy et al., 2004). Cross-sectional samples included survivors at given time points from stroke to ranges of years. Short-term outcomes were measured at time points varying from 3 weeks post-stroke (Fung et al., 2006; Nys et al., 2005) to 1 month (Morrison et al., 1998) and 3 months (Pohjasvaara et al., 1998). Other cross-sectional studies included survivors who had experienced a stroke anytime

within 3 years (Boynton de Sepulveda & Chang, 1994; King, 1999) to ranges of 1 to 7 years (Lai et al., 2004) and less than 6 months to 15 years (Robinson & Price, 1982). Three studies explored long-term outcomes at 5 years (Paul et al., 2005), 6 years (Hackett et al., 2000) and 10 years (Morris et al., 1993) post-stroke. Attention must be paid to whether the samples are appropriate for the research question and whether the results are interpreted according to when the samples were collected.

A further limitation is noted in that the majority of these studies did not report an underlying theory supporting their work. Theory and research exist in a symbiotic relationship with each informing the other. Theories guide the research about propositions between variables, which then support evidence-based practice (Peterson, 2004). Of the 94 studies reviewed, only 19 reported a supporting theory, model, or framework. The most widely used model was Lazarus' and Folkman's transactional theory of stress (Ahmad et al., 2005; Bakas & Burgener, 2002; Bakas & Champion, 1999; Boynton de Sepulveda & Chang, 1994; Carey et al., 1991; Carlsson et al., 2004 Johnson, Bakas, & Lyon, 2008; Johnson et al., 2007). Other conceptual models used by investigators included a stress and coping framework (Choenarom et al., 2005), Taylor's theory of cognitive adaptation (Moore et al., 2006), the cognitive theory of depression (Nicholl et al., 2002), and Moos' and Tsu's crisis of physical illness model (King et al., 2002). Aben et al. (2003) were guided by the general diasthesis-stress model and Yang (2006) used Pearlin's stress process theory. Robinson-Smith's et al. (2000) exploration of self-care self-efficacy was guided by Bandura's self-

care efficacy theory. Using qualitative methodology, Secrest and Thomas (1999) developed the model of continuity and discontinuity that has been used to inform Secrest's more recent work (2007). Three intervention studies reported using conceptual models to guide the intervention development. Prochaska's stages of change model was used in two studies (Miller & Spilker, 2003; Rimmer et al., 2000) and Orem's Self-Care Deficit Theory of Nursing guided a small nursing intervention study (Nir et al., 2004). By using theoretical frameworks or models, the above investigators were able to more clearly define their variables and more easily predict possible relationships.

Gaps in the Literature and Implications for this Study

Several gaps exist in the literature concerning the relationships between depressive symptoms and quality of life, antecedent variables, and threat appraisal as a mediating variable. Although a number of studies examined the relationship between depressive symptoms and QOL from a cross-sectional perspective, few studies have examined the longitudinal relationship between these variables. Further evidence of the effect of depressive symptoms on QOL over time is needed. Relationships between demographic variables and depressive symptoms are mixed in the literature and need to be further clarified. A gap in knowledge exists regarding the relationships between self-esteem, optimism, and depressive symptoms. Another gap exists related to the mediating effect of threat appraisal in stroke.

Guided by a conceptual model derived from the theoretical work of Lazarus and Folkman, this study addressed a number of the above gaps using a

longitudinal research design and a sample of 392 stroke survivors. Although survivors with aphasia were excluded from a number of the reviewed studies, these individuals were not categorically excluded from the AIM study. Unless the aphasia was severe enough to preclude completion of study questionnaires and interviews, such individuals were eligible for participation. The sample population that will be used for this proposed study, therefore, includes survivors with mild aphasia. Inclusion of survivors with some level of aphasia also increases the generalizability of the findings to a broader group. This study also addressed concerns related to wide variations in the length of time between the initial stroke and study enrollment. Baseline assessments for all participants were made at approximately 1 month post-stroke during the first outpatient follow-up visit.

Stroke survivors continue to indicate dissatisfaction with their quality of life even when functional recovery appears to be high. Although factors beyond neurological impairment are known to influence survivors' adaptation to stroke, there are few conceptual models that identify the relationships between clinical outcomes such as quality of life, post-stroke depressive symptoms, and the associated psychosocial variables that may be amenable to nursing intervention. Furthermore, there are few models to help identify potential confounding variables that may need to be controlled for in intervention studies. Knowledge of psychosocial variables in addition to neurological function is an important component of research looking at QOL outcomes (Mitchell, 1998). Findings from this study will help to (a) identify stroke survivors who are at risk for post-stroke depressive symptoms or poor QOL; (b) determine factors associated with

depressive symptoms and QOL that may be amenable to nursing interventions; and (c) provide support for a conceptual model that may be used to guide future intervention studies.

This chapter has provided a discussion of the theoretical and empirical literature pertinent to this study and of the significance of this study to nursing. Literature related to study variables as found in stroke and other populations was critiqued. Gaps in the literature were identified with respect to this proposal. The next chapter will provide information about the proposed methodology for this study. Detailed descriptions of the design, sample, procedures, protection of human subjects, operationalization of variables, and data analysis will be provided.

3. METHODOLOGY

This chapter provides information about the proposed methodology for this study. Included are detailed descriptions of the design, sample, procedures, protection of human subjects, operationalization of variables, and data analysis.

Design

Study aims were accomplished through secondary analysis of an existing longitudinal database compiled for the Randomized Trial of Treatment for Post-stroke Depression (R01 NS39571). Permission for use of a de-identified data base from this trial was obtained from the principal investigator, Linda Williams, MD, and approved by the Indiana University-Purdue University, Indianapolis/Clarian Institutional Review Board (See appendices A & B). The purpose of the original randomized clinical trial was to test a three-part case management model in which stroke survivors were **A**ctivated to awareness and treatment for post-stroke depression, treatment was **I**nitiated, and the survivor **M**onitored for compliance and treatment effectiveness (AIM). The primary purpose was to test the hypothesis that the AIM intervention would significantly improve outcomes in patients diagnosed with post-stroke depression at 1 month post-stroke compared to an attention control group. This study is different from the original study in that the overall aim was to test the existence of relationships, including a hypothesized mediational effect of threat appraisal, in the model underlying the AIM trial. The entire sample of intervention, depressed control, and non-depressed stroke survivors were used to evaluate the model while controlling for intervention effects.

Secondary Data Analysis

Secondary data analysis, a useful strategy for learning the research process, can be defined as the reanalysis of existing data to answer new questions (Abel & Sherman, 1991; Stewart & Kamins, 1993). The use of secondary information facilitates the research process by limiting the cost incurred by research funding institutions and protecting the pool of potential research participants. In contrast to other sources of secondary data, research data bases are likely to have quality control activities built into the data collection plan, measurements are precisely collected, and procedures are in place to minimize incomplete data (Nail & Lange, 1996). However, limitations, such as sampling criteria inherent in the original study design can introduce the same types of bias into the secondary analysis. The original data set should be examined in terms of purpose, sample selection, methods, and instruments (Graves, 2006). Secondary analysis for this study capitalized on the availability of an existing longitudinal database containing a rich array of stress-related variables to test the proposed model in Figure 1.

Design of AIM Study

All patients with acute ischemic stroke admitted to four study hospitals between the April, 2001 and February, 2005 were approached prior to discharge to participate in the AIM study. The original study was approved by an institutional review board for the protection of human subjects. Informed consent was obtained from all who agreed to participate. Baseline data were collected by a research assistant at the first clinic visit approximately 1 month after stroke.

Stroke survivors diagnosed with depression at this visit as determined by the Structured Clinical Interview-Depression were randomly assigned to either the AIM intervention group or to a usual care control group using a stratified randomization scheme based on attending physician and site. An equal number of non-depressed survivors were purposively selected for physician and enrollment site and enrolled into a non-depressed group. All survivors were followed in interviews at 4 and 10 months after stroke using the same set of measures. The data were collected by a research assistant who was blinded to group assignment. Depressed stroke survivors randomly assigned to the AIM intervention also received bi-weekly interventional case management telephone calls from RNs between data collection points; depressed control survivors received telephone calls on the same schedule but only to inquire about stroke symptoms. Non-depressed survivors did not receive telephone calls between data collection time points. The case management intervention occurred between the baseline data collection and the 4 month interviews.

Sample

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria for this study were the same as for the AIM study. Inclusion criteria included 1st time ischemic stroke, 21 years of age or older, English speaking, able to hear and understand normal conversation, able to use a telephone, willingness to participate in the study, and life expectancy greater than 6 months. Patients on antidepressants at baseline screening were also included to more closely approximate usual clinical populations. Exclusion

criteria included moderate to severe cognitive deficits, severe communication deficits, pre-stroke history of dementia, history of alcohol or drug abuse, prisoners, or pregnant women.

Sample Size and Composition

This sample for this study included the entire sample of 392 stroke survivors from the AIM study. There were no significant demographic differences between the two depressed groups in the original study (Williams et al., 2007). Children were not included because of age-related differences in their coagulation, vascular, and neurological systems as well as major differences in the risk factors and outcomes from stroke (Kuhle et al., 2006). Generalizability was enhanced in the AIM study by enrollment from four hospitals.

Procedures

Protection of De-identified Data

De-identified data collected between April 2001 and February 2005 were obtained from Dr. Williams, the principal investigator of the AIM study (R01 NS39571) including information regarding sample characteristics, measurement scores, and responses to the intervention. De-identified data excluded the following identifying information: name, social security number, address, birth date, phone number, e-mail address, account numbers, or other characteristics that could distinguish an individual. The database was kept on a computer system that is secure according to university policies and was stored as a protected file. Access to identifiers was not available for this study. Any paper

documents generated for this project were kept in locked file cabinets in a locked office.

Demographic information and responses to a schedule of patient assessments were recorded as part of the AIM trial. Data were also collected for those subjects randomized to the intervention group regarding patient response to the previously described case management intervention. The longitudinal data base included de-identified sample characteristics, medical co-morbidities, responses to questions about history of depression, and scores from instruments measuring stroke severity, functional ability, perceived social support, self-esteem, optimism, appraisal, severity of depressive symptoms, depression diagnosis, and both generic and stroke-specific QOL among other variables. Screening scores for depressive symptoms and cognitive ability were also available.

Protection of Human Subjects

Data collection for the AIM study was completed with no further stroke survivors being enrolled during this secondary study. De-identified data as described above were used and there was no access to any identifiable information from the AIM study database for this study. The safety of the de-identified data base was closely monitored by the dissertation chairperson who ensured that it was securely kept on a password-protected computer system that is backed up nightly by the university. Training in the responsible conduct of research was been obtained by the doctoral candidate and members of the dissertation committee. Although there was minimal risk of loss of confidentiality,

this event was considered highly unlikely because the database was de-identified prior to giving access to the doctoral candidate. No new or additional data were collected for this secondary analysis.

Exemption 4 (E-4) applied to this particular study and, therefore, the study was not considered to be clinical research. Exemption 4 means that the research involved only the study of existing data gathered from Dr. Linda Williams' AIM study (R01 NS39571). The data for the AIM study is not publicly available, and the data base provided to the doctoral candidate and dissertation chairperson was recorded in such a manner that the subjects could not be identified directly or through identifiers linked to the subjects. Therefore, the research proposed in this application was exempt under 45 CFR 46.101 (b) (4) from all 45 CFR part 46 requirements. An application explaining the exemption 4 for this study was approved by the Indiana University-Purdue University/Clarian Institutional Review Board (see Appendix).

Variables Measured and Instruments

The variables measured in this study included stroke-specific quality of life, depressive symptoms, demographics (age, gender, race, and education), history of depression, stroke severity, functional activity, perceived social support, self-esteem, optimism, and threat appraisal. The following sections provide detailed descriptions of instruments used to operationalize the variables under study.

Stroke-specific Quality of Life

Stroke-specific quality of life was conceptualized as those physical, psychological, and social dimensions of life that are subjectively evaluated by stroke survivors and that may be influenced by the experience of stroke. Stroke survivor QOL was measured using the Stroke Specific Quality of Life Scale (SS-QOL). Psychometric testing suggests that the SS-QOL scale is a valid and reliable measure of stroke-specific health-related QOL among mild to moderately impaired stroke survivors (Williams, Weinberger, Harris, Clark et al., 1999). Items were developed from stroke survivor interviews, thereby establishing content validity; internal consistency reliability was supported by Cronbach's alpha scores ≥ .73 for all individual domains (Williams, Weinberger, Harris, & Biller, 1999). A notable ceiling effect was reported for the vision domain (63%); a 17% floor effect was reported for energy. Construct validity was established against individual SF-36 subscales, NIHSS scores, the Beck Depression Inventory, and the Barthel Index (Williams, Weinberger, Harris, Clark et al., 1999).

This 49-item instrument measured 7 domains of health-related QOL important to stroke survivors: physical function, vision, language, thinking, mood, role function, and energy. The first 3 domains were scored on a 5-point response scale (1 = *couldn't do at all* to 5 = *no trouble at all*); the remainder were scored on a similar 5-point response scale (1 = *strongly agree* to 5 = *strongly disagree*). Each domain score was an average of the items contained in the domain. In addition, a summary score was calculated as the average of the 7 domain scores. The SS-QOL summary score was used for this study.

Depressive Symptoms

Depressive symptoms were conceptualized as the endorsement after stroke of any of the nine depressive symptoms included in the DSM-IV criteria for a depression diagnosis. Depressive symptoms were measured by the Primary Health Questionnaire – 9 (PHQ-9). The PHQ-9 has been validated among 3000 internal medicine/family practice patients and 3000 obstetric/gynecological patients (Kroenke et al., 2001). Furthermore, mean PHQ-9 scores were similar among African-American, Chinese American, Latino, and non-Hispanic White groups demonstrating the usefulness of the scale among the major ethnic groups in the United States (Huang, Chung, Kroenke, Delucchi, & Spitzer, 2006). Among stroke survivors with any degree of depression, the PHQ-9 has been found to have excellent discriminatory power (Area under Curve = .96) especially for scores ≥ 10. (Williams et al., 2005). For any depression diagnosis in stroke survivors, sensitivity was 78% and specificity was 96%. Performance of the PHQ-9 was not affected by age, gender, or ethnicity. The PHQ-9 can be used as a diagnostic instrument or to measure severity of symptoms.

The PHQ-9 is a brief 9-item self-administered instrument. Respondents indicated how often they were bothered by any of nine problems during the last 2 weeks. The response scale ranged from “not at all” (0) to “nearly every day” (3). All responses were summed to produce scores that range from 0 (no symptoms) to 27 (all symptoms occur on daily basis). For this study, severity of depressive symptoms was measured as continuous data using a total PHQ-9 score.

Demographics

Demographic variables were selected for their potential influence on key study variables. Included were age, gender, race, and educational level. An investigator-developed form to document age, gender, race, and educational level was used to document demographic variables that may influence the variables of threat appraisal and depressive symptoms.

History of Depression

History of depression was conceptualized as any self-reported history of depression prior to the stroke. History of depression was determined by participant self-report of three items including whether the participant had ever been told by a health care professional that he or she had depression, taken medication for depression, or received counseling for depression.

Stroke Severity

Stroke severity was conceptualized as the degree of neurological deficits observed after the occurrence of an acute stroke. Stroke severity was measured using the National Institutes of Health Stroke Scale (NIHSS). The NIHSS, a widely used measurement of stroke severity with established reliability and validity, is a 15-item instrument addressing the severity of a cerebral infarction (Brott et al., 1989; Kasner et al., 1999; Spilker et al., 1997). The scale documents wakefulness, vision, sensation, movement, language function, and perception (Spilker et al. 1997). Higher scores are indicative of increased severity. Initial inter-rater reliability for the NIHSS was high ($\kappa = .69$); test-retest reliability was also high (mean $\kappa = .66$ to .77) and did not differ significantly by the type of health

care professional administering the scale (Brott et al., 1989). The NIHSS is reported to have some predictive value with a score at 7 days post-stroke corresponding to 3-month clinical outcomes (Brott et al. 1989). The NIHSS has also been used as a measure of criterion validity in other instruments (Sturm, Osborne et al., 2002).

The NIHSS items were individually scored as determined by a scoring guide and then summed to produce a total score. Scores can range from 0 to 42. A score ≤ 5 indicates little to no neurological deficit; a score > 20 indicates severe deficits (Kasner et al., 1999).

Functional Activity

Functional activity was conceptualized as the difficulty experienced by an individual in the completion of a desired task. Functional activity was measured with the modified Rankin Scale (mRS). The mRS is stroke specific measure of global functional independence as compared with pre-stroke activity. A score of 0-5 is assigned to the single item with scores indicating the stroke survivor's disability level. Each level represents clinically distinct levels of functional activity (Kwon et al., 2004). Scores represent "no symptoms" (0) to "severe disability" (5) (Salter et al., 2005). Inter-rater reliability for outpatient groups has been reported as K = .82 (van Swieten, Koudstaal, Visser, Schouten, & van Gijn, 1988) and test-retest reliability of K_w = .95 (Wolfe, Taub, Woodrow, & Burney, 1991). Evidence for convergent and discriminant validity was provided by strong correlations with subscales of the Sickness Impact Profile and the Barthel Index (de Haan, Limburg, Bossuyt, van der Meulen, & Aaronson, 1995).

Perceived Social Support

Perceived social support was conceptualized as the perception that one is loved, valued, and able to count on others for support if needed. The Medical Outcomes Study Social Support Survey (MOS-SSS) was used to measure perceived social support (Sherbourne & Stewart, 1991). The MOS-SSS, developed to measure social support in chronically ill individuals, is composed of 19 items that measure perceived support and 1 item that measures structural support. The single structural support item is not included in scoring. Sherbourne & Stewart (1991) identified four subscales by analysis of a multitrait correlation matrix; confirmatory factor analysis yielded the same four subscales. Internal consistency reliability for the affectionate, emotional/informational, tangible, and positive social interaction support subscales ranged from Cronbach alphas of .91 to .96; reliability for the total survey score was .97. Evidence for validity of the total score was also found in principal components factor analysis. High loadings for each of the items (.67 to .88) supported an overall social support index. Internal consistency reliability is also reported to be high in specific chronic illness populations including heart failure (Bennett, Pressler, Hays, Firestine, & Huster, 1997), osteoarthritis (Ferreira & Sherman, 2007), and stroke (Johnson, Bakas, Lyon, & Williams, 2008).

Respondents in the present study were asked to indicate how often different types of support are available. A 5-point response scale was used with 1 indicative of “none of the time” and 5 indicative of “all of the time.” Each subscale was totaled and then rescaled to a 0 to 100 score range (Sherbourne & Stewart,

1991). A total score was calculated as an average of the four subscales. Higher scores are indicative of greater perceived social support (Sherbourne & Stewart, 1991). A total score was used as the measure of perceived social support for this study.

Self-esteem

Self-esteem was conceptualized as a personality disposition reflective of an individual's feelings about self-worth, self-respect, and potential for growth. The Rosenberg Self-esteem Scale (RSE) was used to measure self-esteem. Initial reliability and unidimensionality were reported by Rosenberg (1989). Evidence of internal consistency reliability (α = .77 to .88), test-retest reliability (*r* = .82 to .85), convergent and discriminant validity was provided by Blascovich and Tomaka (1991) in various populations. Furthermore, the RSE has become the standard against which other instruments are measured (Blascovitch & Tomaka, 1991). Internal consistency reliability has been reported as .86 with stroke family caregivers (Bakas & Burgener, 2002) and .87 with stroke survivors (Johnson, Bakas, Lyon, & Williams, 2008). The 10-item RSE is scored on a 5-point response scale (1 = *strongly disagree*, 5 = *strongly agree*) with higher scores indicative of higher self-esteem. Five items were recoded. Items were then summed resulting in a possible range of scores from 10 to 50.

Optimism

Optimism was conceptualized as the expectation that information will be processed in a positive or confident manner. The Revised Life Orientation Test (LOT-R) was used to measure optimism. The LOT-R is a 10-item scale with 4

filler items with documented reliability and validity (Scheier et al., 1994). Construct validity was initially evidenced by a one-factor solution after principal components factor analysis; all items loaded within a range of .58 to .79. Item-scale correlations ranged between .43 to .63 indicative of the same underlying construct. Cronbach's alpha of .78 has been reported for the 6 items. Four-month test-retest reliability was reported to be .68 (Scheier et al., 1994). Internal consistency reliability in a sample of adults with osteoarthritis was .76 (Ferreira & Sherman, 2007). Among stroke survivors, coefficient alphas have been reported from .70 to .84 using the original 12-item LOT scale (King et al., 2002) and .68 with the LOT-R (Johnson, Bakas, Lyon, & Williams, 2008).

The items of the LOT-R were scored on a 4-point response scale ranging from "strongly disagree" (0) to "strongly agree" (3). When computing the total score of the LOT-R, the four filler items were deleted. Three items were recoded and all items were then summed for the total score ranging between 0 and 24. Higher scores indicated greater levels of optimism.

Threat Appraisal

Threat appraisal was conceptualized as the stressful anticipation of future harm, loss, or negative consequences. The threat subscale of the Appraisal of Health Scale (AHS) was used to measure the concept of threat appraisal. Psychometric testing of the entire AHS suggested that, for this study, the threat subscale was the more appropriate measure of appraisal. Content validity of the AHS was examined in a pilot study (Johnson, Bakas, & Lyon, 2008). Acceptable evidence was found for the threat and benefit subscales, but not the benign

subscale. In further psychometric testing, AHS items demonstrated good variability in relation to their means and mean item-to-total correlations ranged from .44 for the benefit subscale to .68 for the threat subscale (Johnson, Bakas, Lyon, & Williams, 2008). Cronbach's alphas were .92 for the threat subscale, .85 for the benign subscale, and .73 for the benefit subscale. However, two factors, labeled threat and benefit, emerged from principal axis factoring and were confirmed with confirmatory factor analysis. Benign items loaded negatively with the threat appraisal items and, because they were theoretically inconsistent with threat, were discarded. Evidence of construct validity was strongest for the threat subscale. Threat appraisal was significantly associated with depressive symptoms after controlling for history of depression, self-esteem, age, and disability ($p < .001$). Overall, model constructs accounted for 43% of the variance [$F (9, 380) = 31.60$, $p < .001$] in depressive symptoms. Although the benefit subscale appeared to be a distinct factor, it did not contribute significantly to the prediction of depressive symptoms. This finding, however, is conceptually consistent in that an outcome such as depressive symptoms would not be expected to be associated with a positive appraisal (Johnson, Bakas, Lyon, & Williams, 2008). For these reasons, the threat subscale was used to measure appraisal in the proposed study.

The 12 items of the AHS threat subscale were rated on a 5-point response scale. The responses ranged from "strongly disagree" (1) to "strongly agree" (5). No items were recoded and the score was the sum of all 12 items. Higher scores were indicative of greater threat.

Data Analysis

The data analysis plan for the study included data cleaning procedures, evaluation of assumptions, calculation of descriptive statistics, and analysis of the research aims and hypotheses.

Data Cleaning Procedures

Although the dataset was initially cleaned prior to release of the de-identified data, data were screened with a SPSS 15 statistical software package for missing values, outliers, normality, linearity, and homoscedasticity using procedures outlined by Tabachnick and Fidell (2007). Cases with missing values were excluded listwise from the analysis. Multicollinearity and singularity were assessed according to procedures described by Tabachnick and Fidell (2007).

Description of Sample and Instruments

Using SPSS 15 software, descriptive statistics were calculated to describe the sample and the instruments used in the study. Means and standard deviations were calculated for demographic variables of age and education. Frequencies were calculated for demographic variables of gender and race and for history of depression. Means, standard deviations, medians, and ranges were calculated for instruments. Internal consistency reliability for the SS-QOL, PHQ-9, NIHSS, mRS, MOS-SSS, RSE, LOT-R, and AHS threat subscale instruments were estimated using Cronbach's alpha.

Data analysis was organized around the research aims and hypotheses. The level of significance for statistical tests was set at .05 unless otherwise

stated. The above instruments all yielded continuous data. The following sections describe the data analyses planned for each aim or hypothesis.

Specific Aims and Hypotheses

All aims below were assessed using a standard multiple linear regression approach. In all models, the prior value of the outcome was included as a covariate. For example, in Aim 1, the outcome was stroke-specific QOL at 10 months. In this case, stroke-specific QOL at 4 months was included as a covariate. In addition, all potentially relevant demographic and illness variables were also included in all models. Tabachnick and Fidell (2007) state that regression works optimally when each independent variable is strongly correlated with the dependent variable, but uncorrelated with the other independent variables. In order to select the smallest group of demographic and illness variables that were most relevant and strongly correlated with the outcomes, each variable was screened for possible inclusion in the regression equation. Continuous variables were correlated with the outcome using Pearson *r*, and discrete variables were analyzed for differences using MANOVA. Variables were selected for inclusion based on significance at the $p < .05$ level using a two-tailed test. Independent variables were also assessed for high correlations with other independent variables ($r > .70$) (Tabachnick & Fidell, 2007). Relevance was examined separately for depressive symptoms at 4 months and stroke-specific QOL at 10 months. In addition, all models were examined to determine whether the proposed relationships differed among the three survivor groups (depressed-intervention, depressed-attention control, and non-depressed-usual care) by

including interaction terms between survivor group and the explanatory variable and testing for significance. Interaction terms were removed from any models in which they were not significant but the main effect for survivor group remained in all models. Finally, for Aims 2 and 3, each of the three situational and personality disposition variables were investigated separately. Therefore, to address multiplicity issues, we used a significance level of .05/3 = .017 when testing these variables for significance (Munro, 2005).

Specific Aim 1. To determine whether depressive symptoms at 4 months after stroke are predictive of stroke-specific QOL at 10 months, after controlling for relevant demographic variables and illness variables.

Hypothesis 1a: Depressive symptoms at 4 months after stroke will predict stroke-specific QOL at 10 months.

A regression model was fit with stroke-specific QOL at 10 months as the outcome and depressive symptoms at 4 months, survivor group, and their interaction as the key explanatory variables as well as relevant demographic and illness variables and prior outcome as covariates.

Specific Aim 2. To determine whether perceived social support, self-esteem, and optimism at 1 month after stroke predict depressive symptoms among stroke survivors at 4 months, after controlling for relevant demographic and illness variables.

Hypothesis 2a: Higher levels of perceived social support, self-esteem, and optimism at 1 month after stroke will predict lower levels of depressive symptoms in stroke survivors at 4 months after stroke.

Regression models were fit with depressive symptoms at 4 months as the outcome, and perceived social support, self-esteem, or optimism at 1 month, survivor group, and their interaction as the key explanatory variables as well as relevant demographic and illness variables and prior outcome as covariates.

Specific Aim 3. To determine whether threat appraisal at one month after stroke is a mediating variable between perceived social support, self-esteem, and optimism at 1 month after stroke and depressive symptoms at 4 months, after controlling for relevant demographic and illness variables.

Hypothesis 3a. Perceived social support, self-esteem, and optimism will be negatively associated with threat appraisal.

Hypothesis 3b. Threat appraisal will be positively associated with depressive symptoms.

Hypothesis 3c. The associations of perceived social support, self-esteem, and optimism with depressive symptoms will be attenuated when controlling for threat appraisal.

The standard regression approach of Baron and Kenny (1986) was planned to assess the mediation effects of threat appraisal. For Hypothesis 3a, threat appraisal at 1 month was the outcome, and perceived social support, self-esteem, or optimism at 1 month were explanatory variables. Survivor group and the interaction of survivor group and the explanatory variable were also included as well as relevant demographic and illness variables. Hypothesis 3b was tested in the same manner, now with depressive symptoms at 4 months as the outcome and threat appraisal as the explanatory variable. For Hypothesis 3c, additional

models were planned in the same manner for each situational and personality disposition variable. Each model was to include depressive symptoms at 4 months as the outcome and perceived social support, self-esteem, or optimism at 1 month the explanatory variable. Threat appraisal was also to be included as a predictor. The significance of the situational and personality disposition variables was then to be compared between these models and the corresponding models in Aim 2 that did not include threat appraisal. For any of the three situational and personality disposition variables, all three hypotheses (3a, b, and c) would need to hold to support the mediation effect of threat appraisal.

4. RESULTS

This chapter details the results of data analyses guided by the conceptual model presented in Chapter 1. A description of data cleaning procedures is provided, followed by a description of the sample and instruments, screening for independent variables, and the results specific to each aim and hypothesis. A post-hoc analysis of 1-month cross-sectional data is also presented. SPSS 15.0 was used for all statistical procedures in this study.

Data Cleaning Procedures

The de-identified data base from the AIM intervention, a Randomized Trial of Treatment for Post-stroke Depression, was obtained in an SPSS format from the principal investigator Dr. Linda Williams. Data were initially checked for accuracy by Dr. Williams' research team. Prior to the start of data analyses for this study, out-of-range values, means, and standard deviations were evaluated using univariate statistical procedures. No more than 5% of the data were missing from any variable except for years of education and the distal outcome variable of 10-month stroke-specific quality of life. A total of 5.6% of the data were coded as missing for years of education. At 10 months, 12.2% of the data were coded as missing for the 10-month QOL variable. This was comparable to 12% of the data missing for the PHQ-9 at the same time period and attributed to attrition. The only significant difference ($p < .05$) between those who completed the study and those who did not complete was that completers had slightly higher years of education (mean = 12.36 years) than non-completers (mean = 11.18 years). Missing cases were not included in the analyses.

Normality was assessed for all independent and dependent variables by inspection of histograms and the Kolmogorov-Smirnov (K-S) test with a significance level of $p < .001$ (Mertler & Vannatta, 2005). Histograms for the NIHSS, 1-month PHQ-9 and 4-month PHQ-9 were positively skewed. Non-normal distributions for years of education, NIHSS, modified Rankin Scale, MOS-SSS, 1-month and 4-month PHQ-9 were significant using the K-S test. The MOS-SSS was negatively skewed. Following recommendations by Tabachnick and Fidell (2007), the MOS-SSS variable was reflected to a positive skew and then transformed using a square root transformation. Square root transformations were also computed for NIHSS, 1-month PHQ-9, and 4-month PHQ-9 and resulted in normal distributions as indicated by non-significant K-S tests. Even with the transformation of these variables, three cases were identified as multivariate outliers ($p < .001$, $df = 11$, $X^2 > 31.26$) in the data set. Multivariate outliers are defined by Tabachnick and Fidell (2007) as "cases with an unusual combination of scores on two or more variables" (p. 73). There was one case from each of the three groups. These cases represented individuals who had more severe strokes, one individual who had a 6th grade education, and one individual with a lower quality of life score at 10 months post-stroke. Because multivariate outliers may distort the results of multiple regression analyses, these three cases were deleted as recommended by Tabachnick and Fidell (2007). Correlations and regression analyses were then computed using the transformed variables. Assumptions for multivariate normality, homoscedasticity,

multicollinearity, and singularity were evaluated prior to multiple regression analyses and are reported with the regression findings.

Sample Characteristics

Stroke survivor demographic and illness variable data are presented in Table 1. Survivors' ages ranged from 27 to 91 years with a mean age of 62.03 years. The sample was almost evenly split between men and women. The racial composition included 60.5% White, 36.7% Black, and 2.9% other. The mean level of education of 12.22 years indicated a well-educated sample. A positive history of pre-stroke depression was reported by 38.8% of the survivors. Stroke severity was not high as indicated by a mean NIHSS score of 2.38 with a possible range of 0 – 15. Functional activity also indicated a fairly high functioning sample of survivors with a mean modified Rankin score of 1.76 out of a possible 0 – 5 score (low score means better function). Descriptive statistics for the NIHSS and modified Rankin are presented in Table 2 with other instruments used to measure independent variables.

Table 1

Sample characteristics

	n	Frequency (%)	Mean (SD)	Median	Range (Possible)
Demographics					
Age	392		62.03 (12.91)	63.00	27 – 91
Gender	392				
Female		195 (49.7)			
Male		197 (50.3)			
Race	392				
White		237 (60.5)			
Black		144 (36.7)			
Other		11 (2.9)			
Years of education[a]	370		12.22 (2.72)	12.00	3 – 21
Illness Variables					
Positive history of depression	392	152 (38.8)			
NIHSS[a]	391		2.38 (2.28)	2.00	0 –15 (0 – 42)
modified Rankin Scale[a]	392		1.76 (1.07)	2.00	0 – 5 (0 – 5)

[a] Significant one-sample Kolmogorov-Smirnov test at .001 level

Instruments

Descriptive statistics for the instruments used to measure the independent baseline variables of stroke severity, functional activity, perceived social support, self-esteem, and optimism are presented in Table 2. As described above, the baseline measures for stroke severity using the NIHSS and functional activity using the modified Rankin scale indicated that the stroke survivors in this sample were not severely impaired.

Stroke survivors' perception of social support as measured by the MOS-SSS was fairly high. The mean score was 78.46 with a possible range of 0 to 100. Self-esteem, as measured with the Rosenberg Self-esteem Scale (RSE) was also fairly high. The mean RSE score was 37.67 with a possible range of 10 to 50. Optimism was measured with the Revised Life Orientation Test (LOT-R). The mean LOT-R score was 14.7 out of a possible range of 0 to 24. Cronbach's alphas for each instrument were > .70 except for the NIHSS (α = .48) and the LOT-R (α = .68). The NIHSS is a clinical measure of stroke severity, rather than a research instrument, and has a measurement scale that varies from item to item. Because the Cronbach's alpha was only .48, this variable was not included in further analyses. Although internal consistency reliability for the original 12-item LOT has been reported as low as .70 among stroke survivors, the LOT-R contains only 6 items that are scored. The decreased number of items could contribute to a slightly lower coefficient alpha. The decision was made to retain the LOT-R as a measure of optimism despite the marginal alpha.

Table 2

Descriptive statistics for instruments measuring independent variables

Scale	*N*	Mean (SD)	Median	Range (Possible)	Cronbach's Alpha
Stroke Severity (NIHSS[a])	391	2.38 (2.28)	2.00	0 –15 (0 – 42)	.48
Functional Activity (modified Rankin[a])	392	1.76 (1.07)	2.00	0 – 5 (0 – 5)	NA
Perceived Social Support (MOS-SSS[a])	390	78.46 (21.07)	84.99	3.91 – 100 (0 – 100)	.96
Self-esteem (RSE)	390	37.67 (7.03)	38.00	14 – 50 (10 – 50)	.87
Optimism (LOT-R)	391	14.7 (4.00)	15.00	3 – 24 (0 – 24)	.68

[a] Significant one-sample Kolmogorov-Smirnov test at .001 level
NIHSS: National Institutes of Health Stroke Scale
modified Rankin: Modified Rankin Scale
MOS-SSS: Medical Outcomes Survey Social Support Survey
RSE: Rosenberg Self-esteem Scale
LOT-R: Revised Life Orientation Test

Descriptive statistics for the mediator variable of threat, the outcome variables of 4-month depressive symptoms and 10-month stroke-specific QOL and their respective prior outcomes are presented in Table 3. At 1 month post-stroke, the survivors in this sample appraised their perceived threat at a moderate level as indicated by mean Appraisal of Health (AHS) score of 31.66. The possible range of scores for the AHS was 12 to 60. The overall sample had a mean PHQ-9 score of 8.79 at 1-month post-stroke indicating mild depression (Kroenke et al., 2001). The PHQ-9 uses the following cut-offs to define level of depression severity: minimal, 0 to 4; mild, 5 to 9; moderate, 10 to 14; moderately severe, 15 to 19; and severe, 20 to 27. Depressive symptoms improved over time as indicated by a mean PHQ-9 score of 5.56 at 4 months. Stroke-specific

QOL between 4 and 10 months was fairly high and remained stable. The mean score at 4 months was 3.93 with a possible 1.0 to 5.0. The mean 10-month SS-QOL score of 3.95 was almost unchanged from the 4-month scores. Cronbach's alphas for each of these variables were > .70 indicating satisfactory internal consistency reliability.

Table 3

Descriptive statistics for mediator variable, outcome variables, and respective prior outcomes

Scale	*N*	Mean (SD)	Median	Range (Possible)	Cronbach's Alpha
Threat appraisal (AHS threat)	388	31.66 (9.93)	31.00	12 – 57 (12 – 60)	.92
Depressive symptoms at 1 month (1-month PHQ-9[a])	392	8.79 (6.78)	8.00	0 – 27 (0 – 27)	.82
Depressive symptoms at 4 months (4-month PHQ-9[a])	372	5.56 (5.44)	4.00	0 – 22 (0 – 27)	.80
Stroke-specific QOL at 4 months (4-month SS-QOL)	372	3.93 (.72)	4.04	1.9 – 5.0 (1 – 5)	.94
Stroke-specific QOL at 10 months (10-month SS-QOL)	344	3.95 (.75)	4.05	1.83 – 5.0 (1 – 5)	.94

[a] Significant one-sample Kolmogorov-Smirnov test at .001 level
AHS threat: Appraisal of Health Scale, threat subscale
PHQ-9: Patient Health Questionnaire-9
SS-QOL: Stroke-specific Quality of Life Scale

Screening for Independent Variables

Categorical Variables

Categorical variables were screened for inclusion in the multiple regression analyses using MANOVA. A dummy variable was created for survivor groups to control for the effects of the AIM intervention. To determine potential independent variables for the regression equations, individual MANOVAs were

run for each of the four categorical variables. A significance level of .05 was used to test for group differences for race, gender, history of depression, and survivor group in relation to the dependent variables of 1-month threat appraisal, 4-month depressive symptoms, and 10-month stroke-specific QOL. Screening for race revealed a significant difference in threat appraisal between black and non-black survivors with non-black survivors experiencing higher levels of threat appraisal. There were no significant differences in depressive symptoms or stroke-specific QOL based on race. The MANOVA results for race are presented in Table 4.

Table 4

Screening for group differences in 1-month threat appraisal, 4-month depressive symptoms, and 10-month stroke-specific QOL based on race using MANOVA

Scale	Black vs. non-black	*N*	Mean (SD)	Univariate *F* (1,335)
AHS Threat Score	Non-black	213	32.25 (9.74)	
	Black	124	29.96 (9.79)	
	Total	337	31.41 (9.80)	4.32***
4-month PHQ-9†	Non-black	213	1.91 (1.26)	
	Black	124	1.94 (1.28)	
	Total	337	1.93 (1.26)	.00
10-month SSQOL	Non-black	213	3.96 (.73)	
	Black	124	3.94 (.77)	
	Total	337	3.95 (.74)	.05

† transformed variable
* $p < .05$ ** $p < .01$ *** $p < .001$ Multivariate *F*: *Wilk's Lambda* (1,335) = 1.81, $p = .15$

Screening for gender revealed no significant differences in threat appraisal, 1-month depressive symptoms, or 10-month stroke-specific QOL based on gender. These results are presented in Table 5. There were significant differences in threat appraisal, 1-month depressive symptoms, and 10-month stroke-specific QOL based on history of depression ($p < .001$). Table 6 illustrates these differences. Similarly, there were significant differences in threat appraisal,

1-month threat appraisal, and 10-month stroke-specific QOL based on survivor group ($p < .001$). These differences are presented in Table 7.

Table 5

Screening for group differences in 1-month threat appraisal, 4-month depressive symptoms, and 10-month stroke-specific QOL based on gender using MANOVA

Scale	Gender	*N*	Mean (SD)	Univariate *F* (1,335)
AHS Threat Score	Female	171	31.62 (9.70)	
	Male	166	31.19 (9.93)	
	Total	337	31.41 (9.80)	.16
4-month PHQ-9†	Female	171	1.98 (1.25)	
	Male	166	1.89 (1.28)	
	Total	337	1.93 (1.26)	.49
10-month SS-QOL	Female	171	3.94 (.73)	
	Male	166	3.96 (.76)	
	Total	337	3.95 (.74)	.09

† transformed variable

* $p < .05$ ** $p < .01$ *** $p < .001$ Multivariate *F: Wilk's lambda* (1,335) = .18, $p = .91$

Table 6

Screening for group differences in 1-month threat appraisal, 4-month depressive symptoms, and 10-month stroke-specific QOL based on history of depression using MANOVA

	History of depression	*N*	Mean (SD)	Univariate *F* (1,335)
AHS Threat Score	No	206	29.63 (9.49)	
	Yes	131	34.21 (9.67)	
	Total	337	31.41 (9.80)	18.39***
4-month PHQ-9†	No	206	1.59 (1.16)	
	Yes	131	2.47 (1.24)	
	Total	337	1.93 (1.26)	43.37***
10-month SS-QOL	No	206	4.09 (0.71)	
	Yes	131	3.73 (0.75)	
	Total	337	3.95 (0.74)	20.00***

† transformed variable

* $p < .05$ ** $p < .01$ *** $p < .001$ Multivariate *F: Wilk's lambda* (1,335) = 16.52, $p < .001$

Table 7

Screening for group differences in 1-month threat appraisal, 4-month depressive symptoms, and 10-month stroke-specific QOL based on survivor group using MANOVA

	Survivor group	*N*	Mean (SD)	Univariate *F* (2,334)
AHS Threat Score	Control	73	37.92 (8.71)	
	Intervention	84	35.14 (9.70)	
	Match-control	180	27.02 (7.94)	
	Total	337	31.41 (9.80)	52.56 ***
4-month PHQ-9†	Control	73	2.73 (1.24)	
	Intervention	84	2.19 (1.17)	
	Match-control	180	1.49 (1.12)	
	Total	337	1.93 (1.26)	32.06***
10-month SSQOL	Control	73	3.60 (0.75)	
	Intervention	84	3.78 (0.77)	
	Match-control	180	4.17 (0.66)	
	Total	337	3.95 (0.74)	19.74***

† transformed variable

* $p < .05$ ** $p < .01$ *** $p < .001$ Multivariate *F: Wilk's lambda* (2,334) = 21.93, $p < .001$

Continuous Variables

Multiple regressions best reveal significant relationships among variables when the independent variables are highly correlated with the dependent variable, but uncorrelated with other independent variables (Tabachnick & Fidell, 2007). Continuous variables were, therefore, screened for significant associations according to the hypothesized conceptual model. Table 8 presents the results of the Pearson *r* correlations among all continuous variables including the prior outcomes of depressive symptoms and QOL. All correlations were in the expected direction. The seemingly opposite correlations between social support and other study variables resulted from reflecting the variable during transformation. Interpretation of associations between perceived social support and other variables must take into account the effect of reflection.

Correlations between demographic and illness variables and the dependent variables of threat appraisal, 4-month depressive symptoms, and 10-month stroke-specific QOL were examined for inclusion in multiple regression analyses. The demographic variables of education and age at time of stroke were not correlated with other independent variables except for a low correlation between education and self-esteem ($r = .17$, $p < .05$) and between education and optimism ($r = .27$, $p < .01$). Years of education did not correlate significantly with any of the dependent variables. Age correlated significantly with the dependent variable of 4-month depressive symptoms. The illness variable of functional activity was represented by the modified Rankin score. Functional activity was significantly correlated with self-esteem ($p < .01$), but this correlation was very

low (r = -.22). Correlations among functional activity and dependent variables were significant at the .01 level. Threat appraisal (r = .16) and 4-month depressive symptoms (r = .25) were low, but the correlation of functional activity with 4-month and 10-month stroke-specific QOL were moderate (r = -.42, -.41) reflecting some possible conceptual overlap.

Correlations among the key explanatory variables of perceived social support, self-esteem, and optimism and the dependent variables of threat appraisal and 4-month depressive symptoms were also examined. The results are displayed in Table 8. Each of the key explanatory variables correlated significantly (p < .01) with each other and with the dependent variables. Perceived social support had a moderate correlation with self-esteem (r = -.32) and a low correlation with optimism (r = -.26). Because perceived social support was reflected and transformed, these correlations were in the expected direction. Self-esteem and optimism were also moderately correlated (r = .60). When correlations were examined among the key explanatory variables and the dependent variables, perceived social support was moderately correlated with threat appraisal (r = .34). However, the correlation of perceived social support and 4-month depressive symptoms was low (r = .20). Self-esteem was moderately correlated with both threat appraisal (r = -.68) and 4-month depressive symptoms (r = -.35). Optimism, similar to perceived social support, correlated moderately with threat appraisal (r = -.50) but only at a low level with 4-month depressive symptoms (r = -.22).

In summary, all independent variables were screened as described above for inclusion in the following regression equations. The modified Rankin scale, history of depression, survivor group, 4-month SSQOL, and 4-month PHQ-9 were significantly correlated with the dependent variable of 10-month stroke-specific QOL. Age, modified Rankin score, history of depression, survivor group, perceived social support, self-esteem, optimism, threat appraisal, and 1-month depressive symptoms all correlated significantly with 4-month depressive symptoms. Significant correlations were also found among the independent variables of race, history of depression, modified Rankin score, survivor group, perceived social support, self-esteem, and optimism and the dependent variable of threat appraisal.

Table 8

Screening for continuous variables for inclusion in multiple regression analyses

	Education	Age	modified Rankin	MOS-SSS†	RSE	LOT-R	AHS Threat	4-month PHQ-9†
Age	-.14**							
modified Rankin	-.08	.05						
MOS-SSS†	-.02	-.14**	.02					
RSE	.17*	.06	-.22**	-.32**				
LOT-R	.27**	.05	-.10	-.26**	.60**			
AHS Threat	-.10	-.02	.16**	.34**	-.68**	-.50**		
4-month PHQ-9†	-.01	-.13*	.25**	.20**	-.35**	-.22**	.36**	
10-month SS-QOL	.10	.01	-.41**	-.16**	.44**	.20**	-.36**	-.55**

† transformed variable
* $p < .05$ ** $p < .01$

Specific Aims and Hypotheses

Specific Aim 1

To determine whether depressive symptoms at 4 months after stroke are predictive of stroke-specific QOL at 10 months, after controlling for relevant demographic and illness variables.

Demographic and illness variables were screened as reported in Tables 4 through 8 above to determine the smallest number of independent variables contributing the greatest amount of variance in 10-month stroke-specific QOL. None of the demographic variables were significantly correlated with 10-month stroke-specific QOL. Illness variables that were significantly correlated with 10-month stroke-specific QOL included functional activity as measured by the modified Rankin scale (r = -.41, p < .01) and history of depression (F = 20.00, p < .001). Survivor group was also significant (F = 19.74, p < .001). In addition, depressive symptoms at 4 months correlated significantly with the dependent variable of 10-month QOL (r = - .55, p < .01). The 4-month stroke-specific QOL score was also significantly correlated (r = .71, p < .01) with the 10-month outcome. It was also noted that a high correlation (r = -.74, p < .01) existed between the independent variables of 4-month depressive symptoms and 4-month SS-QOL. Therefore, depressive symptoms at 4 months, survivor group, and the interaction of survivor group with 4-month stroke-specific QOL were entered in a regression model as key explanatory variables with functional activity, history of depression, and the prior stroke-specific QOL outcome as covariates.

Hypothesis 1a. Depressive symptoms at 4 months after stroke will predict stroke-specific QOL at 10 months.

Hypothesis 1a was not supported. Prior to analyzing the regression results, the scatterplot of standardized residuals versus predicted values was examined to test the multivariate assumptions of normality, linearity, and homoscedasticity. The residuals scatterplot was well-distributed; the assumptions appeared to be met. No multivariate outliers were identified (X^2 = 22.46, *df* = 6, $p < .001$). Multicollinearity and singularity were not an issue. One condition index of 31.74 exceeded the criteria of 30; however, none of the variance proportions for that dimension were greater than .50 (Tabachnick & Fidell, 2007).

All variables were entered into the regression equation in one step, as shown in Table 9. Interaction effects between survivor group and 4-month stroke-specific QOL were not significant. The regression was rerun without the interaction effects. The model accounted for 52% (51% adjusted) of the variance in 10-month stroke-specific QOL [$F = 60.44(6,333)$, $p < .001$]. However, the only significant individual predictors in the model were modified Rankin scores indicating functional activity ($p = .001$) and 4-month stroke-specific QOL ($p < .001$). The 4-month stroke specific QOL score was by far the strongest predictor with a beta of .61. Of particular interest is the lack of change in SS-QOL scores between 4 months and 10 months as illustrated in Figure 2. Despite a moderate correlation ($r = -.55$) between depressive symptoms at 4 months and quality of life at 10 months, the transformed PHQ-9 score did not contribute significantly to

the model and was, therefore, not considered to be predictive of 10-month stroke-specific QOL. Specific Aim 1 was not supported.

Table 9

Multiple regression with 4-month depressive symptoms predicting 10-month stroke-specific QOL

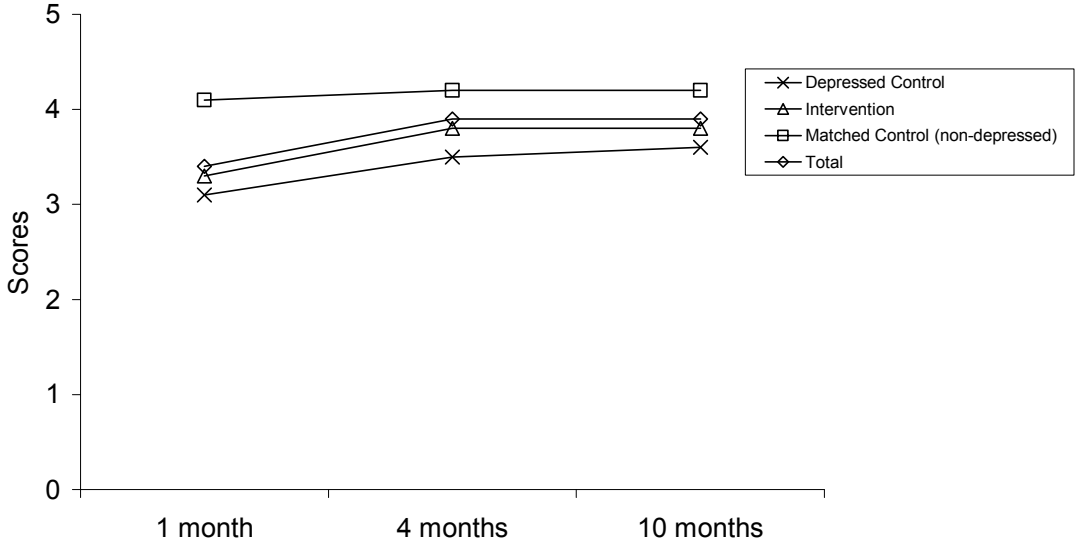
Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
modified Rankin Scale	-.09	-.14	-3.24***	.00	-.40**	.01
History of depression	-.00	-.00	-.07	.95	-.24***	.00
Intervention group	-.06	-.03	-.76	.45	-.13**	.00
Control group	-.04	-.02	-.45	.66	-.25***	.00
4-month SS-QOL	.63	.61	9.85***	.00	.71**	.14
4-month PHQ-9 score†	-.03	-.05	-.80	.42	-.55**	.00

† transformed variable

$R = .72$ $R^2 = .52$ Adjusted $R^2 = .51$ $F = 60.44(6,333)$, $p < .001$

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

Figure 2. SS-QOL Scores Over Time



Specific Aim 2

To determine whether perceived social support, self-esteem, and optimism at 1 month after stroke predict depressive symptoms among stroke survivors at 4 months, after controlling for relevant demographic and illness variables.

Demographic and illness variables were first screened for inclusion in the regression equation as displayed in Tables 4 through 8 above. Of the demographic and illness variables, only age (r = -.13, p < .05) and functional activity (r = .25, p < .01) were significantly correlated with 4-month depressive symptoms. History of depression was the only significant discrete demographic or illness variable [F = 43.37(1,335), p < .001]. Survivor group [F = 32.06(2,334), p < .001] and the prior 1-month outcome for depressive symptoms (r = .51, p < .01) were also significant. The key explanatory variables of perceived social support (r = .20, p = .01), self-esteem (r = -.35, p < .01), and optimism (r = -.22, p < .01) were significantly correlated with the outcome variable of 4-month depressive symptoms as shown in Table 8. Because of the correlations between the key explanatory variables and particularly between self-esteem and optimism (r = .60), separate regression models were fit for perceived social support, self-esteem, and optimism. The significant demographic and illness variables, prior outcome for depressive symptoms, and survivor group and group interactions with 1-month depressive symptoms as covariates were included in each model with depressive symptoms at 4 months as the outcome variable. To address multiplicity, a significance level of .05/3 = .017 was used to determine significance in these regression equations.

Hypothesis 2a: Higher levels of perceived social support, self-esteem, and optimism at 1 month after stroke will predict lower levels of depressive symptoms in stroke survivors at 4 months after stroke.

Hypothesis 2a was not supported. Prior to analyzing the regression results, scatterplots of standardized residuals versus predicted values for each key explanatory variable were examined to test the multivariate assumptions of normality, linearity, and homoscedasticity. The residuals scatterplots using the square root transformation of the PHQ-9 and the reflected and square root transformation of the MOS social support scale were better distributed than for the untransformed variables; the assumptions for multivariate analysis appeared to be met. No multivariate outliers (X^2 = 24.32, *df* = 7, $p < .001$) were identified in the regression equations for the key explanatory variables of perceived social support, self-esteem, or optimism. Multicollinearity and singularity were not an issue. Condition indices for each of the key explanatory variables did not exceed 30 and none of the dimensions had more than one variance proportion greater than .50 (Tabachnick & Fidell, 2007).

The first model was fit with perceived social support as the key explanatory variable and 4-month depressive symptoms as the outcome variable. All covariates were entered in the same step as perceived social support, survivor group, and interaction effects. Interaction effects between survivor group and depressive symptoms at 1 month were not significant. A second model was run with the interaction effects removed and is presented in Table 10. The model explained 33% of the variance (32% adjusted) in 4-month depressive symptoms

[F = 25.26(7,359), p < .001]. Using a significance level of .017, history of depression (p = .001) and the 1-month prior outcome of depressive symptoms (p = .000) were significant independent predictors of depressive symptoms at 4 months. Functional activity approached significance (p = .02). However, perceived social support did not achieve significance (p = .14) as an independent predictor of 4-month depressive symptoms.

Table 10

Multiple regression with social support as key explanatory variable and 4-month depressive symptoms as the outcome, controlling for 1-month depressive symptoms, non-significant interaction effects removed

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Age	-.00	-.02	-.34	.73	-.13*	.00
modified Rankin Scale	.13	.11	2.33	.02	.24**	.00
History of depression	.42	.16	3.31**	.00	.35***	.02
Intervention group	-.41	-.14	-2.24	.03	.08	.00
Control group	.27	.09	1.45	.15	.37***	.00
1-month PHQ-9†	.38	.41	5.90***	.00	.51**	.07
MOS Social Support Scale†	.04	.07	1.46	.14	.20**	.00

† transformed variable
R = .57 R^2 = .33 Adjusted R^2 = .32 F = 25.26(7,359), p < .001
** p < .017 *** p < .001

A separate model was fit with self-esteem as the key explanatory variable. All covariates and self-esteem were again entered in one step. Interaction effects between survivor group and depressive symptoms at 1 month were not significant in this model. The interaction effects were deleted and another regression model was run. The results are displayed in Table 11. This model also explained 33% of the variance (32% adjusted) in 4-month depressive symptoms [F = 25.61(7,359), p < .001]. Using a significance level of .017, history of depression (p = .001) and the prior outcome of depressive symptoms (p = .000)

were significant independent predictors of 4-month depressive symptoms. Membership in the intervention group closely approached significance (p = .02). Self-esteem was not an independent predictor (p = .08).

Table 11

Multiple regression with self-esteem as key explanatory variable and 4-month depressive symptoms as the outcome, controlling for 1-month depressive symptoms, non-significant interaction effects removed

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Age	-.00	-.02	-.47	.64	-.12*	.00
modified Rankin Scale	.11	.09	2.06	.04	.24**	.01
History of depression	.42	.16	3.31***	.00	.36***	.02
Intervention group	-.44	-.15	-2.37	.02	.08	.01
Control group	.21	.01	1.12	.26	.38***	.00
1-month PHQ-9†	.36	.40	5.64***	.00	.51**	.06
Rosenberg Self-esteem Scale	-.02	-.09	-1.75	.08	-.35**	.01

† transformed variable
R = .58 R^2 = .33 Adjusted R^2 = .32 F = 25.61(7,359), p < .001
* p < .05 ** p < .01 *** p < .001

A final model was fit with optimism as the key explanatory variable. All covariates and optimism were entered into the regression in one step. Interaction effects between survivor group and depressive symptoms at 1 month were not significant in this model. The interaction effects were deleted and the regression model rerun. The results are displayed in Table 12. This model also explained 33% of the variance (32% adjusted) in 4-month depressive symptoms [F = 25.051(7,360), p < .001]. Using a significance level of .017, history of depression (p = .001) and the prior outcome of depressive symptoms (p = .000) remained as significant independent predictors of 4-month depressive symptoms. Membership in the intervention group closely approached significance (p = .018). Optimism was not an independent predictor (p = .35). Specific Aim 2 was not supported.

Table 12

Multiple regression with optimism as key explanatory variable and 4-month depressive symptoms as the outcome, controlling for 1-month depressive symptoms, non-significant interaction effects removed

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Age	-.002	-.02	-.51	.61	-.12*	.00
modified Rankin Scale	.12	.11	2.29	.02	.24**	.01
History of depression	.43	.16	3.39***	.00	.35***	.02
Intervention group	-.42	-.14	-2.28	.02	.07	.01
Control group	.25	.08	1.34	.18	.37***	.00
1-month PHQ-9†	.38	.41	5.96***	.00	.51**	.07
Optimism	-.01	-.04	-.94	.35	-.21**	.00

† transformed variable
R = .57 R^2 = .33 Adjusted R^2 = .32 F = 25.051(7,360), p < .001
** p < .017 *** p < .001

Specific Aim 3

To determine whether threat appraisal at one month after stroke is a mediating variable between perceived social support, self-esteem, and optimism at 1 month after stroke and depressive symptoms at 4 months, after controlling for relevant demographic and illness variables.

In order to test the mediation effect of threat appraisal on the relationship between the key explanatory variables of perceived social support, self-esteem, and optimism, and the outcome variable of depressive symptoms at 4 months post-stroke, four sets of equations must be examined (Baron & Kenny, 1986). First, a significant association must be demonstrated between the key explanatory variables and 4-month depressive symptoms. Second, the key explanatory variables must significantly correlate with threat appraisal. Third, threat appraisal must be shown to significantly correlate with 4-month depressive symptoms. Mediation is then tested by examining whether the associations

between the key explanatory variables and depressive symptoms are attenuated when controlling for threat appraisal.

Because significant relationships were not found in Specific Aim 2 between the key explanatory variables of perceived social support, self-esteem, and optimism and the dependent variable of 4-month depressive symptoms, mediation was not supported. However, the associations between perceived social support, self-esteem, optimism, and threat appraisal as described in hypothesis 3a and the association between threat appraisal and 4-month depressive symptoms as described in hypothesis 3b were still examined. Furthermore, because significant correlations between the key explanatory variables, threat appraisal, and 1-month depressive symptoms were found and because threat appraisal has been found to be a mediating variable at specific time points in other populations, a post-hoc cross-sectional analysis was performed to determine if threat appraisal mediated these relationships at 1 month post-stroke.

Prior to analyzing the regression results, scatterplots of standardized residuals versus predicted values for each key explanatory variable were examined to test the multivariate assumptions of normality, linearity, and homoscedasticity. The residuals scatterplots using the square root transformation of the PHQ-9 and the reflected and square root transformation of the MOS social support scale were better distributed than for the untransformed variables; the assumptions for multivariate analysis appeared to be met for each hypothesis. No multivariate outliers were identified in the regression equations for hypothesis

3a (X^2 = 22.46, *df* = 6, *p* < .001), 3b (X^2 = 24.32, *df* = 7, *p* < .001), or 3c (X^2 = 26.13, *df* = 8, *p* < .001) using only the 1 month post-stroke data. Multicollinearity and singularity were not an issue. The condition index for one dimension for the regression that included self-esteem in hypothesis 3c was 38.99, but none of the dimensions had more than one variance proportion greater than .50 (Tabachnick & Fidell, 2007).

Hypothesis 3a: Perceived social support, self-esteem, and optimism will be negatively associated with threat appraisal.

Hypothesis 3a was supported by the data. As displayed in Tables 4 through 8, demographic and illness variables were screened for inclusion in the regression equation. Neither years of education nor age at time of stroke was significantly correlated with threat appraisal. The illness variable of functional activity as measured by the modified Rankin score was significantly correlated with threat appraisal (*r* = .16, *p* < .01), although the strength of the correlation was minimal. As determined by previous MANOVAs, race [*F* = 4.32(1, 335), *p* < .05], history of depression [*F* = 18.39(1,335), *p* < .001], and survivor group [*F* = 52.26(2,334), *p* < .001] were also included in the equation. Significant correlations between the key explanatory variables of perceived social support (*r* = .34, *p* < .001), self-esteem (*r* = -.68, *p* < .001), and optimism (*r* = -.50, *p* < .001) and threat appraisal were also noted.

Separate regression models were fit for perceived social support, self-esteem, and optimism including the significant demographic and illness variables, prior outcome for depressive symptoms, and survivor group with threat

appraisal as the outcome variable. To address multiplicity, a significance level of .05/3 = .017 was used to determine significance in these regression equations.

The first model was fit with perceived social support as the key explanatory variable and threat appraisal as the outcome variable. All covariates were entered in the same step with perceived social support and survivor group. Table 13 presents the regression model. The model explained 33% of the variance (32% adjusted) in threat appraisal [F = 31.17(6,378), p < .001]. Using a significance level of .017, race (p = .002), perceived social support (p < .001), intervention group (p < .001) and control group (p < .001) were significant independent predictors of threat appraisal.

Table 13

Multiple regression predicting 1-month threat appraisal; 1-month social support as key explanatory variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Race	-2.66	-.13	-3.06**	.00	-.13***	.02
History of depression	.22	.01	.24	.81	.23***	.00
modified Rankin Scale	.66	.07	1.64	.10	.18***	.01
MOS Social Support†	1.17	.27	6.23***	.00	.35***	.07
Intervention Group	6.76	.29	6.15***	.00	.20***	.07
Control Group	9.26	.40	8.45***	.00	.36***	.13

† transformed variable

R = .58 R^2 = .33 Adjusted R^2 = .32 F = 31.17(6,378), p < .001

** p < .017 *** p < .001

A separate model was fit with self-esteem as the key explanatory variable. Again, all co-variates that were significantly correlated with threat appraisal were entered in the same step with survivor group and self-esteem. The results of this regression are displayed in Table 14. The model explained 51% (51% adjusted) of the variance in threat appraisal [F = 66.35(6,378), p < .001]. At a significance

level of .017, self-esteem ($p < .001$) and both the intervention and control groups ($p < .001$) were significant independent predictors of threat appraisal.

Table 14

Multiple regression predicting 1-month threat appraisal; 1-month self-esteem as key explanatory variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Race	-1.22	-.06	-1.64	.10	-.13***	.00
History of depression	.05	.00	.06	.95	.23***	.00
modified Rankin Scale	-.13	-.01	-.38	.70	.18***	.00
Rosenberg Self-esteem Scale	-.81	-.58	-13.95***	.00	-.68***	.25
Intervention Group	4.17	.18	4.34***	.00	.22***	.03
Control Group	4.95	.21	4.94***	.00	.36***	.03

$R = .72$ $R^2 = .51$ Adjusted $R^2 = .51$ $F = 66.35(6,378)$, $p < .001$
** $p < .017$ *** $p < .001$

A final model was fit with optimism as the key explanatory variable. Co-variates that were significantly correlated with threat appraisal were entered in the same step with survivor group and optimism. The results are presented in Table 15. This model accounted for 41% (40% adjusted) of the variance in threat appraisal [$F = 43.73(6,378)$, $p < .001$]. Again using a significance level of .017, race ($p = .004$), optimism ($p < .001$), and both intervention and survivor group ($p < .001$) were independently associated with threat at 1 month post-stroke.

Table 15

Multiple regression predicting 1-month threat appraisal; 1-month optimism as key explanatory variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Race	-2.39	-.12	-2.93**	.00	-.13***	.02
History of depression	.79	.04	.91	.37	.23***	.05
modified Rankin Scale	.43	.05	1.12	.26	.18***	.03
LOT-R Optimism Score	-1.00	-.40	-9.72***	.00	-.51***	.26
Intervention group	5.93	.26	5.71***	.00	.20***	.04
Control group	7.73	.33	7.35***	.00	.36***	.13

R = .64 R^2 = .41 Adjusted R^2 = .40 F = 43.73(6,378), p < .001
** p < .017 *** p < .001

Hypothesis 3b: Threat appraisal will be positively associated with depressive symptoms.

The longitudinal association between threat appraisal and 4-month depressive symptoms was supported by the data. As displayed in Tables 4 through 8, demographic and illness variables were screened for inclusion in the regression equation using MANOVA and Pearson *r* correlations. A regression model was fit with significant demographic and illness variables, 1-month depressive symptoms as prior outcome, survivor group, and interaction effects between survivor group as covariates. Significant covariates included age (r = -.13, p < .05), functional activity (r = .25, p < .001), history of depression [F = 43.37(1,335), p < .001], and survivor group [F = 32.06(2,334), p < .001]. The interaction between survivor group and 1-month depressive symptoms was not significant. Threat appraisal was entered at the same time as the key explanatory variable and was significantly correlated with depressive symptoms at 4 months (r = .36, p < .01). A second regression model without interaction effects was

tested. The results of the second regression analysis are presented in Table 16. A significance level of .05 was used for this regression. History of depression (p = .001), functional activity as measured with the modified Rankin scale (p < .04), depressive symptoms at 1 month (p < .001), and membership in the intervention group (p = .007) were significant independent predictors of 4-month depressive symptoms. The model accounted for 35% (33% adjusted) of the variance in 4-month depressive symptoms [F = 26.90(7,357), p < .001]. Threat appraisal was positively associated with depressive symptoms at 4 months post-stroke.

Table 16

Multiple regression predicting 4-month depressive symptoms; threat appraisal as the key explanatory variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Age	-.00	-.03	-.65	.51	-.12*	.00
History of depression	.44	.17	3.48***	.00	.36***	.02
modified Rankin Scale	.11	.09	2.06*	.04	.24**	.01
1-month PHQ-9†	.36	.39	5.56***	.00	.52***	.02
Intervention group	-.50	-.17	-2.71**	.00	.08	.01
Control group	.17	.06	.87	.38	.38***	.00
Threat appraisal	.02	.14	2.75**	.01	.37**	.02

† transformed variable
R = .56 R^2 = .35 Adjusted R^2 = .33 F = 26.90(7,357), p < .001
* p < .05 ** p < .01 *** p < .001

Hypothesis 3c: The associations of perceived social support, self-esteem, and optimism with depressive symptoms will be attenuated when controlling for threat appraisal.

Hypothesis 3c was not fully tested. According to the standard approach to testing for mediation as outlined by Baron and Kenny (1986), the independent

variable must be shown to significantly affect the dependent variable. The associations between the key explanatory variables of perceived social support, self-esteem, and optimism and the outcome variable of 4-month depressive symptoms in hypothesis 2a were not significant when controlling for the prior outcome of depressive symptoms. Therefore, mediation cannot be tested using and Aim 3 is not supported.

Post-hoc Analysis

Significant correlations between the key explanatory variables and 1-month depressive symptoms suggested that these data were similar to the cross-sectional findings reported in the literature. Therefore, post-hoc testing for mediation was performed using a cross-sectional approach with 1-month depressive symptoms as the outcome variable.

Screening Independent Variables

To determine which variables to include in the cross-sectional regression models, significant associations and group differences between demographic and illness variables and 1-month threat appraisal and depressive symptoms were examined. Significant Pearson *r* correlations ($p < .01$) were found between all continuous variables and 1-month depressive symptoms except for education: age ($r = -.23$); modified Rankin ($r = .29$); MOS-SSS, transformed ($r = .22$); RSE ($r = -.47$); LOT-R ($r = -.26$); and AHS threat appraisal ($r = .46$). MANOVAs were used to test for group differences in discrete variables. The results are displayed in Tables 17 through 19. Sample size was larger for the cross-sectional data than for the longitudinal data; however, this is attributable to attrition between the 1

month and 4 month time points. In contrast with the longitudinal analyses, group differences were noted at 1 month between men and women for depressive symptoms. Women reported significantly more depressive symptoms than men. Regression models were fit with gender, age, history of depression, and functional ability as measured with the modified Rankin score as covariates. Because the cross-sectional analyses used data measured prior to the intervention, survivor groups were not included.

Table 17

Screening for group differences in 1-month threat appraisal and 1-month depressive symptoms based on race using MANOVA

Scale	Black vs. non-black	*N*	Mean (SD)	Univariate *F* (1,387)
AHS Threat Score	Non-black	246	32.64 (9.72)	
	Black	142	30.11 (10.0)	
	Total	388	31.71(9.89)	5.95***
1-month PHQ-9†	Non-black	246	2.70 (1.40)	
	Black	142	2.48 (1.34)	
	Total	388	2.62 (1.38)	2.34

† transformed variable
* $p < .05$ ** $p < .01$ *** $p < .001$ Multivariate *F*: *Wilk's Lambda* (1,387) = 3.08, $p = .05$

Table 18

Screening for group differences in 1-month threat appraisal and 1-month depressive symptoms based on gender using MANOVA

Scale	Gender	*N*	Mean (SD)	Univariate *F* (1,387)
AHS Threat Score	Female	194	31.87 (9.73)	
	Male	194	31.56 (10.06)	
	Total	388	31.71 (9.89)	.09
1-month PHQ-9†	Female	194	2.77 (1.28)	
	Male	194	2.47 (1.46)	
	Total	388	2.62 (1.38)	4.64*

† transformed variable
* $p < .05$ ** $p < .01$ *** $p < .001$ Multivariate *F*: *Wilk's Lambda* (1,387) = 2.61, $p = .08$

Table 19

Screening for group differences in 1-month threat appraisal and 1-month depressive symptoms based on history of depression using MANOVA

Scale	History of Depression	*N*	Mean (SD)	Univariate *F* (1,387)
AHS Threat Score	No	238	29.86 (9.41)	
	Yes	150	34.65 (9.94)	
	Total	388	31.71 (9.89)	22.85***
1-month PHQ-9†	No	238	2.18 (1.35)	
	Yes	150	3.33 (1.11)	
	Total	388	2.62 (1.38)	77.14***

† transformed variable

* $p < .05$ ** $p < .01$ *** $p < .001$ Multivariate *F*: *Wilk's Lambda* (1,387) = 39.52, $p < .001$

Associations among Key Explanatory Variables and 1-month Depressive Symptoms

The first set of regressions examined the association between the key explanatory variables and 1-month depressive symptoms. The discrete variables of gender [$F = 4.64(1,387)$, $p < .05$] and history of depression [$F = 77.14(1,387)$, $p < .01$] were entered with the significant continuous variables of age ($r = -.23$, $p = .01$) and functional ability as measured by the modified Rankin scale ($r = .29$, $p < .01$). Separate regression models with these significant co-variates were fit for perceived social support, self-esteem, and optimism. To address multiplicity concerns, a significance level of .05/3 = .017 was used to determine significance in these regression equations. The assumptions for multivariate analysis were tested as for the earlier hypotheses and appeared to be met. Multicollinearity and singularity were not an issue. No condition indices exceeded 30 and none of the dimensions had more than one variance proportion greater than .50.

The first model was fit with perceived social support as the key explanatory variable and 1-month depressive symptoms as the outcome variable.

All covariates were entered in the same step as perceived social support. The results are presented in Table 20. The model explained 28% of the variance (27% adjusted) in 1-month depressive symptoms [F =29.31(5,381) p < .001]. Using a significance level of .017, age (p = .00), history of depression (p = .00), and functional activity as measured with the modified Rankin scale (p = .00) were significant variables. Controlling for these demographic and illness variables, perceived social support remained as a significant independent predictor (p = .00) of depressive symptoms at 1 month.

Table 20

Cross-sectional multiple regression with perceived social support as key indicator variable and 1-month depressive symptoms as the dependent variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Gender	-.09	-.03	-.74	.46	-.11**	.00
Age	-.02	-.18	-4.09***	.00	-.23***	.03
History of depression	.93	.33	7.14***	.00	.42***	.10
modified Rankin scale	.30	.23	5.24***	.00	.28***	.05
MOS Social Support†	.08	.13	2.92***	.00	.22***	.02

† transformed variable
R = .53 R^2 = .28 Adjusted R^2 = .27 F = 29.31(5,381) p < .001
** p < .017 *** p < .001

A separate model was fit with self-esteem as the key explanatory variable. All covariates and self-esteem were again entered in one step. The results are displayed in Table 21. This model explained 37% of the variance (37% adjusted) in 1-month depressive symptoms [F = 45.40(5,381), p < .001]. Using a significance level of .017, age, history of depression, and modified Rankin score were significant independent predictors of 1-month depressive symptoms (p =

.00). Controlling for these variables, self-esteem was also an independent predictor (p = .00).

Table 21

Cross-sectional multiple regression with self-esteem as key indicator variable and 1-month depressive symptoms as the dependent variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Gender	-.09	-.03	-.76	.45	-.11*	.00
Age	-.02	-.19	-4.51***	.00	-.23***	.03
History of depression	.77	.27	6.33***	.00	.42***	.07
modified Rankin scale	.22	.17	3.97***	.00	.29***	.03
Rosenberg Self-esteem Scale	-.07	-.35	-8.20***	.00	-.47***	.11

R = .61 R^2 = .37 Adjusted R^2 =.37 F = 45.40 (5,381) p <.001
* p < .05 ** p < .017 *** p < .001

Using the same process, a third model was fit with optimism as the key explanatory variable. The results are displayed in Table 22. The third model explained 30% of the variance (29% adjusted) in 1-month depressive symptoms [F = 32.30(5,382), p = .00]. The co-variates of age, history of depression, modified Rankin scale, intervention group and control group were all highly significant at p = .00. Controlling for these co-variates, optimism remained as a significant, independent predictor (p = .00) of depressive symptoms at 1 month.

Table 22

Cross-sectional multiple regression with optimism as key indicator variable and 1-month depressive symptoms as the dependent variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Gender	-.09	-.03	-.77	.44	-.11**	.00
Age	-.02	-.20	-4.37***	.00	-.23***	.04
History of depression	.94	.33	7.39***	.00	.42***	.10
modified Rankin scale	.28	.22	4.92***	.00	.28***	.04
LOT-R Optimism	-.07	-.19	-4.41***	.00	-.26***	.04

R = .55 R^2 = .30 Adjusted R^2 =.29 F = 32.30 (5,382) p = .00
** p < .017 *** p < .001

To test the mediation effect of threat appraisal between the key explanatory variables and 1-month depressive symptoms, separate regression models were fit as described above for perceived social support, self-esteem, and optimism. Each model was highly significant. Of the co-variates, gender was not a significant independent predictor of 1-month depressive symptoms in any of the three models. Age, history of depression, and functional activity were significant. Controlling for these significant co-variates, each of the key explanatory variables emerged as a significant independent predictor of 1-month depressive symptoms. The first requirement that there be significant relationships between the independent and dependent variables was satisfied.

Associations among Key Explanatory Variables and Threat Appraisal

The second required set of equations examined the correlations among the key explanatory variables and threat appraisal. As in hypothesis 3a, significant co-variates were entered with each key explanatory variable into separate regression equations. However, as in the first set of post-hoc equations, survivor group was not included as a co-variate. A significance level of .017 was

used. The results are displayed in Tables 23 through 25. Although the model for perceived social support was highly significant, it explained little of the variance in 1-month depressive symptoms (R^2 = .19). Perceived social support was a significant independent predictor in the model (p = .00). The model including self-esteem was also highly significant and explained 47% of the variance in depressive symptoms. In this case, self-esteem was the only significant predictor accounting for 38% of the model variance. The co-variates were non-significant at the .017 level. The regression model with optimism as the key explanatory variable was also highly significant explaining 31% of the variance. All co-variates were significant. Controlling for race, history of depression and functional activity, optimism remained as a significant independent predictor of depressive symptoms at 1 month accounting for the majority of the variance explained by the model. All key explanatory variables were significantly related to threat appraisal. Therefore, the second requirement for mediation was met.

Table 23

Cross-sectional multiple regression with social support as key indicator variable and 1-month threat appraisal as the dependent variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Race	-2.62	-.13	-2.74**	.01	-.13**	.02
History of depression	2.63	.13	2.70**	.01	.23***	.02
modified Rankin scale	1.39	.15	3.20**	.00	.18***	.02
MOS Social Support†	1.42	.33	6.96***	.00	.35***	.10

† transformed variable

R = .43 R^2 = .19 Adjusted R^2 = .18 F = 22.07(4,380) p < .001

** p < .017 *** p < .001

Table 24

Cross-sectional multiple regression with self-esteem as key indicator variable and 1-month threat appraisal as the dependent variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Race	-.99	-.05	-1.28	.20	-.13**	.00
History of depression	1.23	.06	1.56	.12	.23***	.00
modified Rankin scale	.12	.01	.32	.75	.18***	.00
Rosenberg Self-esteem Scale	-.93	-.66	-16.76***	.00	-.68***	.38

R = .69 R^2 = .47 Adjusted R^2 =.47 F = 85.63(4,380) p <.001
** p < .017 *** p < .001

Table 25

Cross-sectional multiple regression with optimism as key indicator variable and 1-month threat appraisal as the dependent variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Race	-2.30	-.11	-2.62**	.01	-.13**	.01
History of depression	2.88	.14	3.24***	.00	.23***	.02
modified Rankin scale	.97	.11	2.43**	.01	.18***	.01
LOT-R Optimism	-1.19	-.48	-11.19***	.00	-.51***	.23

R = .56 R^2 = .31 Adjusted R^2 =.31 F = 43.05(4,380) p < .001
** p < .017 *** p < .001

Association of Threat Appraisal with 1-month Depressive Symptoms

The third required regression equation tested the association between threat appraisal and 1-month depressive symptoms. The results of this regression are displayed in Table 26. Gender, age, history of depression, and functional activity were entered as co-variates in the same step as threat appraisal. The regression model explained 39% of the variance in depressive symptoms (38% adjusted) and was highly significant (p < .001). Each of the co-variates except for gender was a significant independent predictor (p < .001). Controlling for the co-variates, threat appraisal was also a significant

independent predictor of 1-month depressive symptoms ($p < .001$). Therefore, the third requirement for mediation was met.

Table 26

Cross-sectional multiple regression with threat appraisal as independent variable and 1-month depressive symptoms as the dependent variable

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Gender	-.09	-.03	-.77	.44	-.11*	.00
Age	-.02	-.20	-4.82***	.00	-.23***	.04
History of depression	.76	.27	6.26***	.00	.42***	.06
modified Rankin scale	.24	.19	4.50***	.00	.29***	.03
Threat appraisal	.05	.37	8.72***	.00	.47***	.12

$R = .62$ $R^2 = .39$ Adjusted $R^2 = .38$ $F = 47.44(5,379)$ $p < .001$
* $p < .05$ ** $p < .01$ *** $p < .001$

Mediation

The fourth regression tested for mediation by examining whether the associations between significant key explanatory variables and depressive symptoms were attenuated when controlling for threat appraisal. Gender, age, history of depression, functional activity, and threat appraisal were entered as above with each key explanatory variable. The regression models are presented in Tables 27, 28, and 29. All models were highly significant ($p < .001$). As recommended by Baron and Kenny (1986), both the absolute size of the co-efficients and their significance were examined. As displayed in Table 30, associations between each explanatory variable and depressive symptoms were attenuated when threat appraisal was controlled. Furthermore, the strength of the associations was decreased as evidenced by the decrease in betas. Because the relationships were decreased, but not reduced to zero, threat appraisal was found to function as a partial mediator between social support, self-esteem, and

optimism and the outcome of depressive symptoms. Perceived social support and optimism were clearly mediated by threat appraisal. Although significance decreased only slightly for self-esteem, the change in beta suggested that self-esteem was also partially mediated by threat.

Table 27

Cross-sectional multiple regression with perceived social support as key indicator variable and 1-month depressive symptoms as the dependent variable, controlling for threat appraisal

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Gender	-.09	-.03	-.78	.44	-.11*	.00
Age	-.02	-.19	-4.73***	.00	-.23***	.04
History of depression	.75	.27	6.18***	.00	.42***	.06
modified Rankin scale	.24	.19	4.51***	.00	.29***	.03
Perceived social support†	.01	.02	.36	.72	.22***	.00
Threat appraisal	.05	.36	8.11***	.00	.47***	.11

† transformed variable

R = .62 R^2 = .39 Adjusted R^2 =.38 F = 39.46(6,378) p < .001

* p < .05 ** p < .017 *** p < .001

Table 28

Cross-sectional multiple regression with self-esteem as key indicator variable and 1-month depressive symptoms as the dependent variable, controlling for threat appraisal

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Gender	-.09	-.03	-.84	.40	-.11*	.00
Age	-.02	-.19	-4.74***	.00	-.23***	.04
History of depression	.72	.25	5.98***	.00	.42***	.06
modified Rankin scale	.22	.17	4.04***	.00	.29***	.03
Self-esteem	-.04	-.18	-3.28***	.00	-.46***	.02
Threat appraisal	.04	.25	4.52***	.00	.47***	.03

R = .63 R^2 = .40 Adjusted R^2 =.39 F = 42.34(6,378) p < .001

* p < .05 ** p < .017 *** p < .001

Table 29

Cross-sectional multiple regression with optimism as key indicator variable and 1-month depressive symptoms as the dependent variable, controlling for threat appraisal

Independent Variables	β	*Beta*	*t*	*p*	Bivariate *r*	Unique r^2
Gender	-.09	-.03	-.78	.44	-.11*	.00
Age	-.02	-.20	-4.80***	.00	-.24***	.04
History of depression	.76	.27	6.25***	.00	.42***	.06
modified Rankin scale	.24	.19	4.49***	.00	.29***	.03
Optimism	-.00	-.01	-.27	.79	-.25***	.00
Threat appraisal	.05	.36	7.44***	.00	.47***	.09

R = .62 R^2 = .39 Adjusted R^2 =.38 F = 39.45(6,378) p < .001
* p < .05 ** p < .017 *** p < .001

Table 30

Attenuation of association between key explanatory variables and 1-month depressive symptoms controlling for threat appraisal

Independent Variable	Mediator	Dependent Variable	Beta	*p*
Perceived social support		Depressive symptoms	.13	.00
Perceived social support	Threat appraisal	Depressive symptoms	.02	.72
Self-esteem		Depressive symptoms	-.35	.000
Self-esteem	Threat appraisal	Depressive symptoms	-.18	.001
Optimism		Depressive symptoms	-.19	.00
Optimism	Threat appraisal	Depressive symptoms	-.01	.79

Summary

The details of the data analyses used to test the conceptual model presented in Chapter 1 were presented in this chapter. A description of the data cleaning procedures, the sample, the instruments used in the study, and screening procedures was provided. The results specific to each aim and hypothesis were presented. Specific Aims 1 and 2 were not supported by the data. Hypotheses 3a and 3b were supported. However, because associations between key explanatory variables and 4-month depressive symptoms were not found to be significant, mediation of the association between perceived social support, self-esteem, and optimism and 4-month depressive symptoms by threat appraisal could not be tested. Specific Aim 3, therefore, was also not supported. As reported in the literature, significant correlations between the key explanatory variables, threat appraisal, and 1-month depressive symptoms were noted. Therefore, a post-hoc analysis examining mediation at one month was conducted. Threat appraisal was found to partially mediate the association between perceived social support, self-esteem, and optimism and 1-month depressive symptoms. The following chapter will present a discussion of these findings.

5. DISCUSSION

This chapter begins with a discussion of the specific aims and hypotheses and is followed by the theoretical, research, and practice implications of the findings. Tables 31 and 32 summarize these findings. The chapter concludes with a review of the limitations and strengths specific to this study.

Table 31

Summary table of key findings by specific aims

Aims	Dependent Variable	Significant Predictors from Regressions
Specific Aim 1	10-month Stroke-Specific Quality of Life	Functional Activity 4-month Stroke-Specific Quality of Life
Specific Aim 2	4-month Depressive Symptoms	History of Depression 1-month Depressive Symptoms
Specific Aim 3		
Hypothesis 3a	1-month Threat Appraisal	Race Perceived Social Support Self-esteem Survivor Group
Hypothesis 3b	4-month Depressive Symptoms	History of Depression Functional Activity 1-month Depressive Symptoms Intervention Group 1-month Threat Appraisal

Table 32

Summary table of key findings for post-hoc cross-sectional analyses

Associations Tested	Dependent Variable	Significant Predictors from Regressions
Perceived Social Support, Self-esteem, Optimism, and 1-month Depressive Symptoms	1-month Depressive Symptoms	Age History of Depression Functional Activity Perceived Social Support Self-esteem Optimism
Perceived Social Support, Self-esteem, Optimism, and 1-month Threat Appraisal	1-month Threat Appraisal	Race History of Depression Functional Activity Perceived Social Support Self-esteem Optimism
1-month Threat Appraisal and 1-month Depressive Symptoms	1-month Depressive Symptoms	Age History of Depression Functional Activity 1-month Threat Appraisal

Specific Aims and Hypotheses

Specific Aim 1

To determine whether depressive symptoms at 4 months after stroke are predictive of stroke-specific QOL at 10 months, after controlling for relevant demographic and illness variables.

Even among stroke survivors with good functional recovery, the literature suggests that QOL for stroke survivors is not only lower when compared with the population in general, but possibly decreases over time (Suenkeler et al. 2002; Kwok et al. 2006). Furthermore, stroke survivors have been reported to perceive their post-stroke QOL as worse than their pre-stroke situation. Depressive symptoms and QOL have been inversely associated with each other and

depressive symptoms have been reported to be a significant independent predictor of health-related QOL (Bays, 2001). This study addressed the question of whether depressive symptoms at 4 months following stroke are predictive of stroke-specific quality of life at 10 after stroke.

Hypothesis 1a. Depressive symptoms at 4 months after stroke will predict stroke-specific QOL at 10 months.

Consistent with findings reported in the literature review, depressive symptoms at 4 months post-stroke were moderately correlated in the expected direction with 10-month stroke-specific QOL (r = -.55, p < .01). However, when controlling for relevant demographic and illness variables and the prior outcome of stroke-specific QOL, depressive symptoms at 4 months did not contribute significantly to stroke-specific QOL at 10 months. Instead, the only significant predictors of 10-month stroke-specific QOL were functional activity as measured with Rankin scores and 4-month SS-QOL scores. The finding that increased functional activity was a significant predictor of better stroke-specific quality of life was similar to other longitudinal studies (Kwok, 2000; Robinson-Smith et al., 2000). This finding may reflect conceptual overlap with the functional domains of the SS-QOL. Contrary to what was expected, however, QOL was not predicted by depressive symptoms and did not change significantly between 4 months and 10 months. One research synthesis of 39 studies found that 22% to 73% of the variance in post-stroke QOL could be explained by the presence of depression, functional ability, and socialization (Bays, 2001). Both Suenkeler et al. (2002) and Kwok et al. (2006) found a decrease in QOL during the first year post-stroke

among survivors who had “minor” residual deficits. However, in one study, stable QOL over time was documented for survivors who, like those in this study, were not severely impaired (Samsa & Matchar, 2004).

The lack of a significant association between 4-month depressive symptoms and 10-month QOL has several possible explanations. From a statistical perspective, the lack of change in scores between the 4 month and 10 month time points did not allow for variance in 10-month SS-QOL scores. In addition, a regression equation works best in predicting a dependent variable when the independent variables are strongly correlated with the dependent variable but uncorrelated with other independent variables (Tabachnick & Fidell, 2007). The opposite situation was present in this regression equation. Because the independent variable of stroke-specific QOL at 4 months was more strongly correlated with 4-month depressive symptoms (r = -.74) than with the dependent variable of 10-month QOL scores (r = .71), the ability to predict 10-month SS-QOL was limited. The strength of the contribution of 4-month SS-QOL can be seen by comparing the unique r^2 values with the functional activity scores, the only other significant independent predictor of 10-month SS-QOL. The unique r^2 for functional activity scores as measured by the mRS was .01; unique r^2 for 4-month SS-QOL was .14.

Another consideration for the lack of significant findings between 4-month depressive symptoms and 10-month QOL is whether the SS-QOL is responsive to change over time. Initial psychometric testing asked respondents to compare their QOL today with their pre-stroke situation. Standardized effect sizes in the

range of .36 to .83 indicated that all SS-QOL domains, except personality, demonstrated moderate sensitivity to change over three months (Warner, 2008; Williams, Weinberger, Harris, Clark, & Biller, 1999). However, it is unknown how responsive the SS-QOL is over a longer period of time. It may also be that the stability of the SS-QOL scores simply reflects the natural progression of QOL as the effects from the stroke stabilize or improve over time.

Standards used to evaluate QOL are personal and can change over time. Qualitative research has suggested that, during the process of reconstructing their lives, stroke survivors use an internal standard to evaluate their QOL (Wyller & Kirkevold, 1999). Individuals faced with adaptation to life-threatening or chronic disease may change their internal standards, values, and conceptualization of QOL over time to maintain a personally acceptable level of QOL (Sprangers & Schwartz, 1999). This change has been labeled as response shift. The process leading to response shift does not have to be conscious and may vary across individuals. A model proposed by Sprangers and Schwartz (1999) suggests that a catalyst such as a life-threatening or significant change in health status causes personality dispositions, expectations, and sociodemographics to influence behavioral, cognitive, and/or affective processes. Alterations in these processes lead to a response shift and, finally, an individual's perceived QOL. The perception of sub-optimal QOL results in a feedback loop that reduces cognitive dissonance and allows the individual to maintain an acceptable level of QOL. Although not measured in the present study, response shift could partially

account for the lack of measurable change in QOL as previously illustrated in Figure 2.

In summary, depressive symptoms at 4 months post-stroke did not predict stroke-specific QOL at 10 months in this sample of mildly impaired stroke survivors, despite the moderate correlation reported in the findings. The significant independent predictors from the regression model included functional activity and 4-month stroke-specific QOL with 4-month QOL being the strongest predictor. Possible reasons for this unexpected finding included the effect of a stable variable on statistical analysis, responsiveness of the SS-QOL over an extended period of time, natural progression of QOL, and/or response shift.

Specific Aim 2

To determine whether perceived social support, self-esteem, and optimism at 1 month after stroke predict depressive symptoms among stroke survivors at 4 months, after controlling for relevant demographic and illness variables.

Significant correlations have been demonstrated between the key explanatory variables of perceived social support (Andersen et al., 1995), self-esteem (Fung et al., 2006), optimism (Moore et al., 2006) and the outcome variable of depressive symptoms in cross-sectional studies. Although the strength of the correlations between perceived social support and depressive symptoms has been reported to be very low (Boynton de Sepulveda & Chang, 1994), correlations between self-esteem and depressive symptoms (Fung et al., 2006; Howes et al., 2006; Johnson, Bakas, Lyon, & Williams, 2008) as well as between optimism and depressive symptoms (Ferreira & Sherman, 2007; Moore,

et al., 2006; Spencer et al., 1995) have been low to moderate. However, the use of longitudinal designs to explore relationships among these variables is rare in any population. Only self-esteem in adults older than 65 years of age has been reported to have a significant inverse relationship with depressive symptoms over time (Yang, 2006). Given the lack of information about perceived social support, self-esteem, optimism, and depressive symptoms over time, this study sought to explore the longitudinal association among between these variables.

Hypothesis 2a. Higher levels of perceived social support, self-esteem, and optimism at 1 month after stroke will predict lower levels of depressive symptoms in stroke survivors at 4 months after stroke.

Although models containing the key explanatory variables of perceived social support, self-esteem, and optimism were significant, these individual variables did not emerge as significant independent predictors of 4-month depressive symptoms. Instead, only a previous history of depression and 1-month depressive symptoms were found to be significant indicators. The relationship between perceived social support, self-esteem, optimism, and depressive symptoms across time has not been clearly defined in the stroke population. For this sample of 392 relatively unimpaired survivors, perceived social support at 1 month post-stroke had no significant direct effect (p = .14) on depressive symptoms 4 months into the recovery period. The correlation between baseline perceived social support and depressive symptoms at 4 months was very low (r = .20), but was similar to that reported by King and colleagues (2002). Unlike Yang (2006) who found a direct effect of self-esteem

on later depressive symptoms in older adults, this study found no direct effect between self-esteem and depressive symptoms in stroke survivors over time. Optimism, considered as a third possible predictor of depressive symptoms, was not found to be a significant predictor of depressive symptoms in longitudinal analysis. The finding is consistent with early work by Spencer et al. (1995) in which baseline optimism was not a significant contributor to 6 month depressive symptoms when baseline depressive symptoms were controlled.

In summary, the variables of perceived social support, self-esteem and optimism did not contribute significantly to the longitudinal model as predictors of post-stroke depressive symptoms at 4 months. Instead, history of depression, and 1-month depressive symptoms emerged as significant predictors of 4-month depressive symptoms in these models. The lack of significant findings related to perceived social support, self-esteem, and optimism may be partially accounted for by the strength of prior depressive symptoms in the regression analyses.

Specific Aim 3

To determine whether threat appraisal at one month after stroke is a mediating variable between perceived social support, self-esteem, and optimism at 1 month after stroke and depressive symptoms at 4 months, after controlling for relevant demographic and illness variables.

Although both quantitative and qualitative literature supports the relationships in the conceptual model underlying this study, the majority of the quantitative studies have used a cross-sectional design and none were found that formally tested for the effects of mediation over time using the design

prescribed by Baron and Kenny (1986). This study proposed to test the mediation effect of threat appraisal between key explanatory variables and depressive symptoms over time. Because the key explanatory variables were not significantly associated with 4-month depressive symptoms using the hypothesized longitudinal design, mediation, as proposed in hypothesis 3c, could not be tested. However, the associations between perceived social support, self-esteem, optimism, and threat appraisal were tested as proposed in hypothesis 3a. The association between threat appraisal and 4-month depressive symptoms was also tested as proposed in hypothesis 3b. These findings are presented in the following sections.

Hypothesis 3a: Perceived social support, self-esteem, and optimism will be negatively associated with threat appraisal.

Perceived social support, self-esteem, optimism, and threat appraisal were found to be associated as originally hypothesized. Of the three key variables, self-esteem and optimism were moderately correlated with threat appraisal and contributed substantially to the total variance. Perceived social support was significant but not as strong. Race was found to contribute 2% of the variance in those models containing perceived social support and optimism. The data suggest that blacks with higher perceived social support and optimism may experience less threat than do non-blacks at 1 month post-stroke.

Hypothesis 3b: Threat appraisal will be positively associated with depressive symptoms.

Of the variables hypothesized in the conceptual model to be associated with depressive symptoms over time from 1 to 4 months, only threat appraisal was significant. History of depression, functional activity limitations, depressive symptoms at 1 month, and receiving usual post-stroke care also contributed significantly to increased 4-month depressive symptoms. Age was not significant. Controlling for these variables, threat appraisal remained as a significant individual contributor to 4-month depressive symptoms.

These findings add to the limited amount of literature about threat appraisal and depressive symptoms. Based on a conceptual model, the present study supported the positive association of threat and depressive symptoms reported in the literature (Boynton de Sepulveda and Chang, 1994; Nicholl et al., 2002; Spencer et al., 1995). Threat appraisal was the one significant independent predictor in the hypothesized model to be associated with change in depressive symptoms from one to four months. This association was present even after controlling for intervention effects and variables such as history of depression. Previous cross-sectional studies (Nicholl et al., 2002; Boynton de Sepulveda & Chang, 1994) reported significant associations between the appraisal of a situation as threatening and increased depressive symptoms. The risk of depression was also reported to be higher in the first 6 months after stroke for those survivors experiencing increased threat related to the possibility of another stroke (Spencer et al., 1995). In addition, the present study improved on the measurement of threat appraisal in stroke survivors by using a measure of threat appraisal that has been found to be valid and reliable in this population

(Johnson, Bakas, Lyon, & Williams, 2008). Earlier studies have used single questions to measure threat appraisal (King et al., 2002; Spencer et al., 1995). Further research is warranted in this area

Hypothesis 3c: The associations of perceived social support, self-esteem, and optimism with depressive symptoms will be attenuated when controlling for threat appraisal.

For the reasons described above, the planned longitudinal analysis for mediation of depressive symptoms by threat appraisal was not conducted. Because existing studies commonly use cross-sectional analyses, the relationships necessary to establish mediation were retested from a cross-sectional approach in order to compare these findings with the existing literature. A discussion of the post-hoc analyses for mediation is presented in the following section.

Post-hoc Analysis

The mediation effect of threat appraisal using a cross-sectional design was explored through a series of post hoc analyses. The methodology described by Baron and Kenny (1986) was used to test for mediation using 1 month data. In cross-sectional analysis, significant variables in each of the regression models were younger age, a positive history of depression, and lower functional activity. In contrast with the longitudinal analyses, perceived social support, self-esteem, and optimism each demonstrated significant individual associations with 1 month depressive symptoms.

Associations among perceived social support, self-esteem, optimism, and 1-month depressive symptoms

In this analysis, higher scores for the key explanatory variables were associated with lower levels of depressive symptoms at 1 month post stroke. As compared with other cross-sectional studies of stroke survivors (Andersen et al., 1995; Boynton de Sepulveda & Chang, 1994; Robinson et al., 1983) and adults with other chronic illnesses (Ferreira & Sherman, 2007; Leskelä et al., 2006; Yu et al., 2004), perceived social support was significantly associated with depressive symptoms. Although perceived social support accounted for a significant amount of the variance in 1-month post-stroke depressive symptoms, this was a very small contribution to the total variance. Given the low correlation, it would appear that variables other than perceived social support may be more important in relation to depressive symptoms in this sample of stroke survivors.

Findings related to self-esteem and optimism were also similar to the literature. As in studies with stroke survivors (Fung et al., 2006) and adults with other chronic health conditions (Covic et al., 2006; Howes et al., 2006; Michielson et al., 2006), self-esteem was found to be significantly associated with 1-month depressive symptoms (r = -.47, p < .001) and to be the strongest independent indicator of depressive symptoms at 1 month (*Beta* = -.35) which suggests that stroke survivors with low self-esteem may be at higher risk for early depressive symptoms. Optimism was also a significant contributor to 1-month depressive symptoms in post-hoc cross-sectional analysis. However, the bivariate correlation between optimism and depressive symptoms (r = -.26) was

lower than that reported by Ferreira and Sherman (2007) for adults with osteoarthritis (r = -.53) or for adults with venous thrombosis (r = -.35) (Moore et al., 2006).

Survivors with more social support and/or higher optimism may have fewer depressive symptoms although the correlation between these variables is low. However, the stronger, significant inverse correlation between self-esteem and depressive symptoms suggests that survivors with higher self-esteem may have fewer depressive symptoms during the early post-stroke recovery period. Interventions that support self-esteem by emphasizing the survivor's self-worth and potential for growth may be helpful in reducing depressive symptoms during this time. Findings also suggest that stroke survivors with a positive history of depression and who are more limited in their functional activities appear to be at higher risk for early post-stroke depressive symptoms.

Associations among perceived social support, self-esteem, optimism, and threat appraisal

In the post-hoc analyses, the associations between perceived social support, self-esteem, optimism, and threat appraisal were tested without survivor group because the overall cross-sectional model tested the associations prior to randomization for the AIM intervention. As expected, the findings were similar to the longitudinal results, except that history of depression and functional activity were also significant contributors in the post-hoc models with perceived social support and optimism. These results provide empirical support for the hypothesized conceptual model.

Association of threat appraisal with depressive symptoms

As expected, threat appraisal was significantly associated with 1-month depressive symptoms. The strength of the association between threat appraisal and 1-month depressive symptoms was stronger than at 4 months. Age was also significant in this model with younger stroke survivors experiencing more depressive symptoms than older survivors.

Testing for mediation effect

Using the procedures recommended by Baron and Kenny (1986), threat appraisal was found to partially mediate the effect of perceived social support, self-esteem, and optimism on 1-month depressive symptoms in a cross-sectional design. The mediating effect of threat appraisal in stroke survivors has not been previously demonstrated in either cross-sectional or longitudinal approaches. As demonstrated by the AIM study, early depressive symptoms can be reduced using a case management approach (Williams et al., 2007). It may be possible to supplement such approaches throughout the recovery period with interventions that target threat appraisals. This is particularly important because threat appraisal emerged as a significant individual predictor in both the longitudinal analysis predicting change in depressive symptoms from 1 to 4 months, as well as in the cross-sectional analysis at 1 month post stroke.

In summary, longitudinal analysis of the associations among perceived social support, self-esteem, optimism and 4-month depressive symptoms were not significant partly because of shared variance with the prior outcome. Post-hoc cross-sectional multiple regression analyses of these associations were then

tested. Cross-sectional analyses provided support for the mediation effect of threat appraisal and for the conceptual model at 1 month post-stroke. Results of the cross-sectional analyses provide some support for areas for potential interventions that may be effective during the first month after stroke.

Theoretical Implications

Support for portions of the conceptual model presented in Chapter 1 was found. First, associations between key explanatory variables and threat appraisal were significant. Furthermore, reduced threat appraisal was associated with a reduction of depressive symptoms from 1 to 4 months post-stroke. From a cross-sectional perspective, threat appraisal was even more strongly associated with depressive symptoms at the same time point. These findings support the importance of threat appraisal in recovery from stroke and may be one factor that could be amenable to interventions designed to reduce depressive symptoms. Cross-sectionally, the mediational effect of threat appraisal was also demonstrated, adding to the literature in this area.

The impact of depressive symptoms at 1 month post stroke on 4-month depressive symptoms cannot be ignored. Lazarus considered depression to be a complex emotional state in which anger, guilt, worthlessness, and anxiety combine in varying degrees with sadness and grief to produce a sense of hopelessness. In depression, the sense of loss that is present in grief has become generalized to the whole of life (Lazarus, 1991). The consistent contribution of 1-month depressive symptoms to the prediction of 4-month depressive symptoms to the exclusion of perceived social support, self-esteem,

and optimism demonstrated the power of this complex emotion. This finding emphasizes the importance of early detection and treatment of post-stroke depressive symptoms.

When exploring the effect of an emotional response such as depressive symptoms on the distal outcome of QOL, the concept of response shift must also be considered. In the present study, the lack of support for an association between depressive symptoms and later quality of life can partly be attributed to the stability of the QOL variable over time. Whether this finding could be the result of response shift among individuals' perception of QOL, or whether the stability of QOL between 4 and 10 months is a reflection of the natural progression of QOL over time cannot be determined from these data.

Research Implications

Given the many challenges inherent in longitudinal research and the urgency of answering problems in behavioral science, Pedhazur and Schmelkin (1991) suggest that longitudinal research designs be avoided if possible. However, they also note that only longitudinal designs permit the tracking of changes in a variable over time. These authors suggest that cross-sectional research, while weaker in design, still has a place in understanding some research questions. The choice between cross-sectional or longitudinal design takes into account the question to be answered and the unique characteristics of each approach. The research design of this study was intended to take advantage of the availability of a longitudinal data set. However, the findings from this study reinforce the lesson that study design has implications for the analysis

and interpretation of resulting data. A longitudinal design such as that used in this study requires that prior scores be accounted for in order to measure the actual change that occurs between two time points. This requirement may yield findings that are very different from cross-sectional studies.

Cross-sectional designs produce a snapshot of the phenomenon under study at a single time point (Pedhazur & Schmelkin, 1991). This approach is particularly useful for describing either the status of a phenomenon or relationships among phenomena at a given point in time (Polit & Beck, 2006). However, this design does not allow the researcher to infer changes or trends in the phenomenon over time (Pedhazur & Schmelkin, 1991; Polit & Beck, 2006). In stroke research, cross-sectional designs are commonly used to explore the effect of psychosocial variables on post-stroke depressive symptoms or quality of life. Consequently, the effect of psychosocial variables over time is not well understood.

Longitudinal design is a blanket term describing methods that involve the repeated measurement of a variable as it occurs or changes over time (Pedhazur & Schmelkin, 1991; Polit & Beck, 2006). In the absence of experimentation, longitudinal data provide the strongest test of causal relationships between variables (Pedhazur & Schmelkin, 1991). However, longitudinal research has difficulties that are inherent in following a sample over time. Although the challenge of cost was not a significant issue in this secondary analysis, other difficulties common to repeated measurement existed. Attrition, a common problem in longitudinal research, was noted between the baseline and 10 month

observations in this study. The sample size decreased 12.2% from baseline to 10 months. The meaning of measures in longitudinal studies may change over time for the study participants (Pedhazur & Schmelkin, 1991). In this study, response shift may have affected the meaning of QOL between 4 and 10 months. In addition, the potential for detecting measurable change in variables under consideration depends on previous values of those variables (Bowling, 2002). If, as in this study, the previous QOL scores have some ceiling effects, there is little potential for improvement at later time points. With little potential for change, a measure such as the SS-QOL will appear stable over time. The challenge in longitudinal design, then, is to determine the optimal points in time to measure the phenomenon under study and then to determine plausible endpoints (Mandrekar & Kamath, 2005).

The implications of cross-sectional and longitudinal research designs are important to understanding the associations among key explanatory variables (perceived social support, self-esteem, optimism), threat appraisal, depressive symptoms and QOL in stroke survivors. An accurate understanding of these associations is necessary for the development of effective, well-timed interventions. Associations between explanatory variables, threat appraisal and depressive symptoms were demonstrated cross-sectionally and were consistent with existing literature. Mediation was demonstrated at a single time point. How these variables influence each other across time is still unclear.

The findings from this study can be used by researchers to continue longitudinal descriptive research related to an accurate model for understanding

the associations among explanatory variables, depressive symptoms, and stroke-specific QOL over time. This study demonstrated that, at 1-month post-stroke, threat appraisal mediates the effect of key explanatory variables (social support, self-esteem, optimism) on 1-month depressive symptoms in a sample of mildly impaired stroke survivors. Further descriptive work is needed to determine whether threat appraisal functions in the same manner in more impaired survivors. In addition, qualitative work could be useful in understanding what variables are associated with stroke survivors' appraisal of their post-stroke situation and how survivors view their quality of life over time. Findings from these studies would be useful in the identification of variables to include in future studies, identification of effective time points for intervention, and determination of appropriate time frames for evaluation of outcome measures.

Practice Implications

Because 1 month depressive symptoms was a strong predictor of 4 month depressive symptoms, the importance of treating post-stroke depressive symptoms that occur in the early stages of recovery is important. These findings are underscored by reports in the literature that early depressive symptoms are significantly associated with increased mortality (House et al., 2001; Morris et al., 1993; Williams et al., 2004). Although not found in the present study, post-stroke depressive symptoms have been reported to be the strongest predictor of stroke survivors' QOL (Astrom & Asplund, 2002; Carod-Artal et al., 2000; Gokkaya et al., 2005; King, 1996; Ones et al., 2005; Sturm et al., 2004). The lack of significant findings in the present study may reflect measurement issues rather

than the absence of a relationship between depressive symptoms and quality of life. Given the strong support in the literature, the effect of depressive symptoms on post-stroke QOL should not be disregarded.

Two findings from the present study suggest that if threat can be reduced in the early rehabilitation period, then depressive symptoms could be reduced. Threat appraisal was significantly associated with the change in depressive symptoms from 1 to 4 months post-stroke. Additionally, threat appraisal partially mediated the association between key explanatory variables (perceived social support, self-esteem, optimism) and 1-month depressive symptoms in the post hoc cross-sectional analysis. For stroke survivors, the experience of actual harm combined with decreased functional abilities and an uncertain future can create a threatening appraisal and the possibility of depressive symptoms (Lyon, 2002). The reduction of threat appraisals may, therefore, contribute to an improvement in the level of depressive symptoms.

Cognitive behavioral therapy (CBT) techniques have the potential for reducing depressive symptoms (Kraus, Kunik, & Stanley, 2007). CBT assumes that depressed individuals have a negative bias in the way they interpret their responses to stressful situations and that this consistently negative interpretation of events maintains depressive symptoms (Beck, Rush, Shaw, & Emery, 1979). Using specific CBT techniques such as cognitive restructuring, behavioral activation, and problem-solving skills, an individual is helped to understand how he or she constructs reality (Beck et al., 1979; Steinman et al., 2007). Cognitive restructuring involves replacing irrational or dysfunctional thoughts and beliefs

about potential harm with rational thoughts (Burns, 1999; Kraus et al., 2007). Irrational questions are reframed so that different responses can be formulated. Behavioral activation is intended to break patterns of inactivity by increasing pleasurable activities on a scheduled basis. These new behaviors provide a sense of accomplishment and self-worth. Problem-solving skills related to a stressful situation may also be taught (Dobkin et al., 2007; Kraus et al. 2007; Mitchell et al. 2008).

Although an earlier study using CBT with stroke survivors did not find a significant improvement in depressive symptoms (Lincoln & Flannaghan, 2003), more recent studies using psychosocial/behavioral interventions as an adjunct or alternative to pharmacotherapy have successfully reduced negative cognitions and depressive symptoms (Kraus et al. 2007). These studies have included community-dwelling older adults (Steinman et al. 2007) as well as individuals with Alzheimer's disease (Logsdon et al., 2007), HIV infection (Himelhoch et al., 2007), Parkinson's disease (Dobkin et al. 2007), and diabetes (Fisher et al., 2007). In a Cochrane review of psychological interventions for coronary heart disease, interventions including stress management components resulted in small but significant reductions in depression (Rees, Bennett, West, Davey-Smith, & Ebrahim, 2007). In stroke, Mitchell and colleagues (2008) recently demonstrated significant statistical and clinical reductions in depressive symptom scores using CBT techniques in conjunction with antidepressant therapy. This was accomplished by addressing a stroke survivor's thoughts and beliefs, reactions, and behaviors in stressful situations. Because threat appraisal involves

one's thoughts and beliefs about harms or losses related to stroke recovery, it may be amenable to CBT.

Components of CBT such as cognitive reframing and problem-solving may help a stroke survivor reduce threat appraisals (Lyon, 2002). Threat appraisal, the anticipation of future harm or loss, may be reduced by reframing thoughts about situations with little likelihood of happening. For example, a stroke survivor in rehabilitation may think that he or she will never be able to participate in social situations again. This thought could be reframed by first examining underlying distorted thinking such as all-or-nothing thoughts or jumping to conclusions and then substituting that thinking with responses that are more accurate (Burns, 1999). In threatening situations that are more likely, such as loss of income or important roles, problem-solving skills may reduce threat by providing a plan to address possible future harms. Although case management that monitors response to antidepressant therapy has been found to be effective in reducing depressive symptoms (Williams et al. 2007), it is possible that interventions incorporating CBT can be designed to reduce threat and subsequent depressive symptoms even further. Further research is needed to explore the possibilities of combining CBT with successful strategies such as AIM to reduce threat appraisal and subsequently improve post-stroke depressive symptoms.

Limitations

1. The variables chosen for this study were limited to those used in the original study.

Important variables reported in the literature as being associated with post-stroke depressive symptoms and/or quality of life were available in the AIM database. However, it is possible that other variables not measured could have influenced the findings. For example, data regarding socioeconomic status and fatigue were not collected. Lower socioeconomic status has been associated with decreased QOL in elderly adults (Netuveli et al., 2006) and in stroke survivors (Paul et al., 2005; Sturm et al., 2004). Fatigue has been described as being a distinct phenomenon that influences post-stroke depressive symptoms and QOL (Bendz, 2003; Carlsson et al., 2004; Naess et al., 2006).

2. The proportion of stroke survivors with depressive symptoms in the AIM data set may not accurately reflect the occurrence of post-stroke depressive symptoms in the broader population of stroke survivors.

One of the primary purposes of the AIM study was to test an intervention for stroke survivors who were depressed. Half of the sample was depressed and received either the AIM intervention or usual care. A matched cohort of non-depressed survivors made up the other half of the sample. The proportion of depressed survivors in the data set is higher than the approximately one-third of stroke survivors who have been reported to experience post-stroke depression (Williams et al., 2007). To minimize this limitation, the effect of survivor group

membership (depressed intervention, depressed control, matched control) was accounted for in the analysis.

3. Generalizability of the findings from this study is limited to mildly impaired, well-educated stroke survivors.

Because participants need to understand and verbally respond to the instruments, survivors with aphasia or cognitive impairment are typically excluded from studies (Johnson, Minarik, Nyström, Bautista, & Gorman, 2006). Survivors with severe aphasia or moderate to severe cognitive impairment were excluded from the original AIM study. Participants were mildly impaired as measured with the NIHSS and mRS scales. The mean education level of 12.22 years of education indicated that this sample had more than high school education. In addition, the mean age of 62 years limits findings to those survivors who are younger than retirement age. Findings of this study can be generalized only to well-educated stroke survivors who are considered mildly impaired and perhaps still working.

4. There are potential threats to internal validity inherent in the study design.

Potential threats to internal validity were controlled in the data analysis. Although approximately 12% of the sample population did not complete the study, the only significant difference between those survivors who remained in the study and those who did not was in level of education. Because education was not a significant contributor to any of the regression analyses, this potential threat from attrition was not considered important. The possible threat from history or maturation was accounted for by the inclusion of baseline values in the

analyses. Intervention effects from the study were controlled as well by inclusion of interaction effects in the regression analyses. None of the interaction effects was significant thereby suggesting that potential threat from the AIM intervention was minimal.

Study Strengths

An important strength of this study is that a well-defined, conceptual model derived from Lazarus' theory guided the analysis. The strength of the findings related to threat appraisal in relation to depressive symptoms can guide future practice and research. In the absence of an experimental design, a descriptive, longitudinal design provides a strong test of causal relationships among model variables (Pedhazur & Schmelkin, 2003). The use of an existing longitudinal data set to test the associations in the hypothesized conceptual model gave strength to the study as well. The availability of data at all time points in the original study also permitted comparison of cross-sectional relationships with the literature. Other strengths included the sample size and the use of instruments with documented evidence of reliability and validity in stroke survivors to measure the outcome variables.

Conclusions

In conclusion, the key finding of this study was that threat appraisal was associated with a change in depressive symptoms from 1 to 4 months post stroke after controlling for a number of other theoretically derived variables. In others words, increased threat appraisal contributed to worsening depressive symptoms between 1 and 4 months post stroke. In addition, from a cross-

sectional standpoint, threat appraisal partially mediated the effect of perceived social support, self-esteem, and optimism on 1-month depressive symptoms in stroke survivors. These findings suggest that reduction of threat appraisal is an important factor to consider in the treatment of post-stroke depressive symptoms. Stroke-specific quality of life was found to be stable over time in this study, but, because of the strong association with depressive symptoms in the literature, warrants further attention.

These findings have implications for theory, research, and practice. From a theoretical perspective, support was found for the importance of threat appraisal as part of a conceptual model derived from Lazarus' and Folkman's transactional theory of stress. Although the association between 4-month depressive symptoms and 10-month stroke-specific QOL was not supported in this analysis, the lack of change in the QOL variable may be partially attributed to the concept of response shift and/or the natural progression of recovery. Results of this study also have implications for the design of future research. Statistical approaches like multi-level linear modeling may prove helpful with stable variables such as stroke-specific QOL. Although the longitudinal relationships among study variables are still unclear, this study increased the understanding of how these variables are related from a cross-sectional perspective. Future research to clarify these relationships over time would provide direction to the development of interventions designed to reduce threat appraisal and depressive symptoms and to improve QOL for stroke survivors. In practice, the findings suggest that post-stroke depressive symptoms may be improved as threat

appraisal is reduced. Cognitive behavioral strategies may be useful in the reduction of threat in stroke survivors and could be explored in future research as a complement to current treatment for depressive symptoms.

Stroke is a leading cause of adult disability. Post-stroke depressive symptoms occur in approximately one-third of stroke survivors and have been reported as leading to increased mortality in the first two years after stroke. The findings that perceived social support, self-esteem, optimism and threat appraisal significantly contribute to 1-month depressive symptoms and that 1-month depressive symptoms and threat appraisal contribute significantly to depressive symptoms at 4 months post-stroke stress the importance of early detection and treatment of post-stroke depressive symptoms.

APPENDICES

APPENDIX A

LITERATURE REVIEW TABLES

LITERATURE REVIEW TABLES

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Aben, Verhey, Strik, Lousberg, Lodder, & Honig (2003) General diathesis-stress model	N = 190 Dutch 1st ever stroke survivors N = 200 Dutch 1st ever myocardial infarction survivors Longitudinal design	*Depressive symptoms* Structured Clinical Interview, Depression (SCID) Hamilton Depression Rating scale (HAM-D) Beck Depression Inventory (BDI) Hospital Anxiety & Depression Scale (HADS) *Functional activity* Barthel Index Rankin scale	Cumulative 1 year incidence of major & minor depression: Stroke – 37.8% MI – 25% Differences between stroke & MI no longer present when controlling for age, sex, & level of functional activity limitation. Conclusion: post-stroke depression may not reflect a specific pathogenic mechanism
Ahmad, Musil, Zausznewski, Resnick (2005) Lazarus & Folkman	N = 131 men with prostate cancer Cross-sectional design	*Appraisal* Cognitive Appraisal of Health Scale (3 domains: threat, challenge & harm/loss)	Hierarchical regression predicting Mental Health (mental component summary score from SF-36) Threat appraisal β = -.03, NS Harm/loss appraisal β = -.44, $p < .001$

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Andersen, Vestergaard, Ingemann-Nielsen, & Lauritzen (1995)	N = 285 Danish stroke survivors Longitudinal design	*Depressive symptoms* Hamilton Depression Rating Scale Beck Depression Inventory *History of depression* measurement method not reported *Functional activity* Barthel Index *Perceived social support* Social Activities Index	1 year incidence of post-stroke depressive symptoms - 41% or 85 survivors. Significant risk factors for PSD at 1 year: History of depression ($p < .01$) Female ($p < .001$) Living alone ($p < .05$) Social distress before stroke ($p < .01$) Decrease in social activities index ($p < .001$) PSD not related to: Age Social class Education Functional activity Lesion size or location Conclusion – PSD etiology is a complex combination of pre-stroke personal & social factors plus social, emotional, & intellectual handicap from stroke.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Anderson, Laubscher, & Burns (1996)	N = 90 Australian stroke survivors Psychometric evaluation of SF-36 in older stroke survivors.	*Quality of life* Medical Outcomes Study 36-Item Short Form Health Survey (SF-36), Australian version Adelaide Activities Profile *Depressive symptoms* General Health Questionnaire-28 (GHQ-28) *Functional activity* Barthel Index (BI)	Internal consistency reliability demonstrated: all SF-36 subscales [except vitality (α = .6)] had acceptable Cronbach's alpha (≥ .70). Construct validity demonstrated for functional activity & mental health with significant differences ($p < .001$) in survivors with lower BI & GHQ-28 scores. Construct validity not demonstrated for social functioning ($r < .30$ for most scales). High ceiling effects noted for role limits-physical (53%), bodily pain (43%), social functioning (67%), & role limits-emotional (72%), Conclusion: SF-36 needs to be supplemented as a measure of QOL with respect for ability to return to normal living & social functioning. Did not evaluate composite scores.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Astrom, Adolfsson, & Asplund (1993)	N = 80 Swedish stroke survivors Descriptive longitudinal design	*Depressive symptoms* DSM III criteria *Functional activity* Katz *Perceived social support* Social network questionnaire	Prevalence: - 25% acute stage - 31% at 3 months - 16% at 12 months - 19% at 18 months - 29% at 3 years Acute phase, more likely to have depressive symptoms if: - lived alone (p = .028) - had dysphasia (p = .001) - left hemispheric anterior lesion (p < .001) At 3 months post-stroke: - survivors with depressive symptoms were more dependent in ADL functional activity (p = .02) & had fewer social contacts (p = .012) -no associations between depressive symptoms & age, gender, history of psychiatric disorder, or lesion location. Long-term effect of lack of social contact: At 1 year & 3 years post-stroke, only fewer social contacts were associated with depressive symptoms (p = .016 at 1 year; p < .001 at 3 years)

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Bakas & Burgener (2002) Lazarus & Folkman Transactional Model of Stress	N = 104 family caregivers of stroke survivors Descriptive correlational study	*Appraisal* Appraisal of Caregiving Scale *Depressive symptoms* Profile of Mood States Short Form *Self-esteem* Rosenberg Self-esteem Scale	Predictors of emotional distress: self-esteem β = -.36, $p < .001$ $r = -.52$, $p < .001$ threat appraisal β = .32, $p < .01$ $r = .60$, $p < .001$
Bakas & Champion (1999) Lazarus & Folkman Transactional Model of Stress	Sample 1 N = 92 family caregivers of stroke survivors Sample 2 N = 104 family caregivers of stroke survivors Psychometric Testing of Bakas Caregiving Outcomes Scale	*Self-esteem* Rosenberg Self-esteem Scale *Threat appraisal* Appraisal of Caregiving Scale	Reliability in these samples: Threat appraisal sample 1 Cronbach's alpha = .92 Threat appraisal sample 2 Cronbach's alpha = .86 Self-esteem for sample 2 Cronbach's alpha = .86

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Bendz (2003)	N = 15 Swedish stroke survivors Phenomeno-logical qualitative design with observations at 3, 6, and 1 year after admission to rehabilitation unit	Focused on implications of a stroke from perspective of both survivors & their health care providers.	3 survivors treated for depression during first year post-stroke. Three main categories emerged: (1) stroke hits without warning (2) people with stroke lose normal functions (3) physical training is means to recover Stroke survivors' goals contained biomedical, social, & psychological elements. Health care providers' goal for survivors was recovery of function. Survivors saw daily life as hindered by psychological effects of reduced functions, low energy levels, & fear of another stroke. Physical training perceived by survivors as the means to regain previous social roles or adapt to new situation, not just to regain physical function.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Berg, Palomaki, Lehtihalmes, Lonnqvist, & Kaste (2003)	N = 100 Finnish stroke survivors with ischemic stroke Longitudinal, descriptive study	*Depressive symptoms* Beck Depressive Inventory (BDI) Hamilton Depression Rating Scale DSM-III-R criteria *Stroke severity* Scandinavian Stroke Scale *Functional activity* Barthel Index	Prevalence & duration: 54% at least mildly depressive at some point during study. 46% who were depressive at 2 months were also depressive at 12 &/or 18 months suggesting chronicity. 12% were depressive for 1st time at 12 or 18 months (N = 5). Depressive symptoms (BDI) related to older age only at 2 months (r = .24, p < .05) Acute predictors of later depressive symptoms: 6 months: model NS 12 months: [F= 3.06(5,82), r = .11, p < .05] Stroke severity significant. 18 months: [F= 3.19(5,79), r = .12, p < .05] Male gender significant. No association between lesion location & depressive symptoms.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Blazer, Landerman, Hays, Simonstock, & Saunders (1998)	N = 3,401 US community dwelling adults Cross-sectional data	*Depressive symptoms* Center for Epidemiologic Studies Depression Scale (CES-D)	Prevalence rate: 9% overall; 9.5% African-American, 8.85 Whites 4-factor structure demonstrated for CES-D similar for African-Americans & Whites. Difference in depressive symptoms slightly higher in African-Americans, but insignificant Racial differences in depressive symptoms disappeared when education, income, cognitive impairment, chronic health problems, & disability were controlled. Conclusion: minimal differences in overall depression symptom frequency between older community-dwelling African-American & White adults

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Boynton de Sepulveda & Chang (1994) Lazarus' theory of psychological stress & coping	N = 75 US stroke survivors Cross-sectional design	*Depressive symptoms* Centers for Epidemiological Studies Depression Scale (CES-D) *Functional activity* Barthel Index (BI) Beth-Israel Functional Status Questionnaire (BIF) *Social Support* Lubben Social Support Network Scale (LSSN) *Appraisal* Adaptation of Ways of Coping Questionnaire	Threat appraisal related to: Education (r = -.29, p < .01) BI (r = .29, p < .01) BIF (r = -.38, p <. 001) LSSN (r = -.32, p < .01) Depression related to: BI (r = .23, p < .05) BIF (r = -.38, p < .001) LSSN (r = .24, p < .05) Threat appraisal (r = .33, p < .01) Perception of threats to well-being not related to time since stroke
Burvill, Johnson, Jamrozik, Andersen, & Stewart-Wynne (1997)	N = 191 Australian stroke survivors cross-sectional design with measurments at 4 month intervals	*Depressive Symptoms* Psychiatric Assessment Schedule & DSM-III diagnosis of major depression. Minor depression diagnosed by DSM-III critieria for dysthymia without time limitation. *Functional activity* Barthel Index (BI) Frenchay Activities Index (FAI)	Prevalence: Overall – 28% Major depression – 17% Minor depression – 11% Non-significant trend for men, younger than 60 to have depression. At 4 months, survivors with post-stroke depression were significantly more functionally impaired (p < .01) than non-depressed survivors. No statistically significant differences in age or sex between depressed & non-depressed survivors.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Carey, Oberst, McCubbin, & Hughes (1991) Lazarus' & Folkman's transactional theory of stress	N = 49 family caregivers of chemotherapy patients Cross-sectional, correlation study.	*Depressive symptoms* Profile of Mood States (POMS-S) *Appraisal* Appraisal of Caregiving Scale	Harm/loss subscales were highly intercorrelated (r = .90, p < .001). Combined into one scale labeled negative appraisal. Negative appraisal & age predictive of 49% of mood disturbance
Carlsson, Möller, & Blomstrand (2004) Lazarus' & Folkman's transactional theory of stress	N = 15 Swedish stroke survivors with mild stroke Grounded theory qualitative design with semi-structured interviews	*Quality of life* Effect of hidden dysfunctions (mental fatigue, concentration & memory difficulty, impaired stress tolerance, sensitivity to light & sound) on everyday life at one year post-stroke	Core category was both harmed & threatened self. 4 sub-categories: - hidden vs. apparent dysfunction - predictability vs. unpredictability - independence vs. dependence - active life vs. passive life Post-stroke difficulties are both organic & psychological in nature.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Carod-Artal, Egido, Gonzalez, & de Seijas (2000)	N = 90 Spanish stroke survivors Cross-sectional at 1 year post-stroke	*Quality of life* SF-36 Sickness Impact Profile (SIP) *Depressive symptoms* Hamilton Depression Rating Scale (HAM-D) *Stroke severity* Scandinavian Stroke Scale (SSS) *Functional activity* Barthel Index (BI) Modified Rankin Scale (mRS) *Social Support* Frenchay Activities Index (FAI)	Prevalence: 67% had depressive symptoms; 38% major depression (78% women vs. 57% men, $p = .014$). All SF-36 subscales significantly associated with depressive symptoms ($p < .0001$ to $.0093$); functional activity (except for bodily pain, $p < .0001$ to $.046$); & being female ($p < .0001$). SIP physical & psychosocial dimensions & total score all significantly associated with depressive symptoms ($p < .0001$ to $.0003$); functional activity ($p < .0001$) & being female ($p < .0001$).
Cassidy, O'Connor, O'Keane (2004)	N = 50 Irish stroke survivors 2 month longitudinal descriptive study	*Depressive symptoms* Center for Epidemiological Studies-Depression (CES-D) Hamilton Depression Rating Scale (HAM-D) DSM-IV checklist for Major Depressive Disorder (MDD) *Functional activity* Rankin scale Barthel Index (BI)	Baseline at admission to rehabilitation (3 – 12 months post-stroke). Second assessment 2 months after admission. Female was only independent predictor of BL depressive symptoms ($t = 2.72$, $p < .009$). No relationships between previous psychiatric history & depression, or between functional activity & depression.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Chemerinski, Robinson, & Kosier (2001)	N = 74 US stroke survivors 6 month longitudinal descriptive study	*Depressive symptoms* Present State Examination (PSE) Hamilton Depression Rating Scale (HAM-D) *Functional Activity* Johns Hopkins Functioning Inventory (JHFI)	Remission of depression improves recovery. Survivors with remission of depression had greater improvement in functioning than those whose depression did not remit [$F = 6.37$ (1, 53), $p = .015$]. No significant differences between major depression remitted group & minor depression remitted group. Group sizes at time 2 too small to draw conclusions.
Chiu, Chen, Huang, Mau (2005)	N = 678 urban & 327 rural Chinese elders with chronic illnesses including stroke Cross-sectional analysis of large community survey	*Depressive symptoms* Geriatric Depression Scale-SF, Chinese Version (GDS) *Functional activity* Self-report of physical activities of daily living (PADL) & instrumental activities of daily living (IADL)	Prevalence: 20.1% of urban elders 12.8% rural elders Significant univariate associations between age, female gender, widowed, lower education, living alone, stroke, and fractures including hip ($p < .001$) & depressive symptoms; cardiovascular disease ($p < .005$) & hypertension ($p < .003$) & depressive symptoms Across 3 models (total, urban, rural), only functional ability consistently predictive of depressive symptoms ($p < .05$). PADL: OR = 2.99 (CI 1.87 – 4.81) IADL: OR = 2.97 (CI 2.10 – 4.39)

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Choenarom, Williams, & Hagerty (2005) Stress & coping framework	N = 90 adults, 51 with history of major depressive disorder, 39 without history of depression. 9 month longitudinal study	*Depressive symptoms* Beck Depression Inventory II (BDI-II) *Perceived social support* Social Support Scale (SOCIAL-S) Sense of Belonging Instrument (SOBI) SPOUSE-S (frequency of support by spouse) *Appraisal* Perceived Stress Scale (PSS)	SOBI & SOCIAL-S mediated relationship between perceived stress & depressive symptoms in depressed group even though BDI scores were not high in this group. Increased perceived stress & lower sense of belonging had significant direct effects on depressive symptoms that were consistent across time. Practice implications: Interventions aimed at stress reappraisal & sense of belonging may decrease depressive symptoms
Clarke, Black, Badley, Lawrence, & Williams (1999)	N = 145 Canadian stroke survivors Longitudinal data analyzed cross-sectionally at 3 month & 12 month points.	*Quality of life* Reintegration to Normal Living Scale (RNL) *Depressive Symptoms* Zung Depression Scale *Functional activity* Functional Independence Measure (FIM) Divided into physical & cognitive components *Stroke severity* Adams' Hemispheric Stroke Scale	Depressive symptoms & physical component of functional activity associated with QOL scores at both 3 & 12 month data collection points ($p < .05$). Also accounted for 41% of variance in RNL scores at 3 months.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Clarke, Marshall, Black, & Colantonio (2002)	N = 5,395 community-dwelling Canadian older adults (age ≥ 65) Included 339 stroke survivors (6.3%) Cross-sectional design	*Quality of life* Rhyff Measure of Psychological Well-Being, short form with 18 items *Depressive symptoms* Mental health questions from SF-36 used to measure mood. *Functional activity* Multidimensional functional assessment of older adults from Duke Older Americans resources & services procedures *Perceived social support* Single question to assess satisfaction with amount of social support	When compared with non-stroke population, stroke survivors: - have lower mental health scores - feel the need for more support than nonstroke seniors even though each group has similar # of supports - have lower Rhyff scores except for "purpose in life" Rhyff Measure – strong construct validity in older populations; but reliability of 6 dimensions not high with alphas of .26 for purpose in life to .52 for self-acceptance. Rhyff not tested in stroke populations.
Covic, Tyson, Spencer, & Howe (2006) Biopsychosocial model of illness, including depression	N = 134 Australian individuals with rheumatoid arthritis	*Depressive symptoms* Center for Epidemiological Studies Depression Scale (CES-D), α =.92 *Self-esteem* Rosenberg Self-esteem Scale (RSE), α = .88	Discriminant analysis of demographic, clinical, & psychological factors associated with depressive symptoms: Self-esteem (loading .73, $p < .01$) and tension (loading .73, $p < .01$) were strongest predictors of CES-D scores.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Diehr, Derleth, McKenna, Martin, Bushnell, Simon et al. (2006)	N = 982 clinically depressed persons from 6 international sites Non-experimental longitudinal design	*Quality of life* Quality of Life in Depression Scale (QLDS) (high score = worse QOL) WHO Quality of Life Brief Questionnaire (WHOQOL-BREF) Single item: How would you rate your quality of life? *Depressive symptoms* Center for Epidemiological Studies-Depression (CES-D): cut point was 16 Comprehensive International Diagnostic Interview (CIDI)	% depressed at 9 months = 35.64%, similar to stroke population Synchronous change found in depressive symptoms & QOL at 6 weeks & at 9 months. All of the change over time in QOL could be explained by change in depressive symptoms.
Dowswell, G., Lawler, Dowswell, T., Young, Forster, & Hearn (2000)	N = 30 British stroke survivors N = 15 British family caregivers Qualitative design	Qualitative study to explore the relationship between physical, psychological, & social variables after stroke	Qualitative concepts: - idea of loss - disruption - major discontinuity resulting from losses Physical, emotional, & social aspects seen as interconnected, not separate. Major change for survivors was in painful role switch from doer to receiver. Acceptance of continuing & permanent disabilities difficult

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Ferreira & Sherman (2007) Literature based model proposing relationships between perceived social support, personality & physical factors and outcomes of depression and well-being	N = 73 American adults with osteoarthritis Cross-sectional design	*Quality of life* Life Satisfaction Index *Depressive symptoms* Center for Epidemiological Studies Depression Scale *Perceived social support* Medical Outcomes Study Social Support Scale *Optimism* Life Orientation Test – Revised	Optimism (r = -.53), perceived social support (r = -.44) & life satisfaction (r = -.64) significantly associated with depressive symptoms (p < .01)
Fung, Lui, & Chau, 2006	N = 73 Chinese stroke survivors Descriptive correlational study	*Depressive symptoms* Center for Epidemiological Studies – Depression, Chinese version (CES-D) *Functional activity* Barthel Index (BI) *Self-esteem* Rosenberg Self-esteem Scale (RSE)	37% of sample reported depressive symptoms (CES-D > 4) Sample moderately dependent (BI = 12.05, SD 2.85). 32% of sample reported low self-esteem (< 25 on RSE) BI inversely correlated with CES-D (r_s = -.61, p < .01) RSE inversely correlated with CES-D (r_s = -.59, p < .01) No significant correlations between depressive symptoms & age, gender, marital status, educational level, or type/number of strokes.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Gokkaya, Aras, & Cakci (2005)	N = 118 Turkish stroke survivors (60 survivors & 58 age & gender matched control group) Descriptive longitudinal design	*Quality of life* Nottingham Health Profile (NHP) Turkish Version *Depressive symptoms* Dichotomous variable, reported as a "clinical feature" & "tendency to depression" *Functional activity* Functional Independence Measure (FIM)	31 of stroke group reported as having a "tendency to depression" At 6 months, SS group had significantly poorer NHP scores in 5/6 domains "Tendency to depression" significantly associated (p < .001) with NHP domains of: emotional reactions sleep social isolation physical mobility but not pain or energy. Highly significant (p < .001) correlations between FIM & energy (r = -.56), sleep (r = -.48), & physical mobility (r = -.78) of NHP domains Significant (p < .05) correlations between FIM & NHP domains of social isolation (r = -.37) & emotional reactions (r = -.28).

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Hackett & Anderson for Auckland Regional Community Stroke Study Group (2006)	N = 739 stroke survivors from New Zealand 6 month longitudinal descriptive design	*Depressive symptoms* General Health Questionnaire-28 (GHQ-28) cut-off ≥ 5 *History of depression* Self-report for some form of treatment prior to stroke *Functional activity* Barthel Index (BI)	Prevalence: At cut-off ≥ 5, 26.7% (N = 198) had abnormal mood post-stroke 12.5% had history of depression Approximately ½ of those with abnormal mood at 6 months had received treatment for depression since stroke. Important baseline predictors of 6 month abnormal mood: - greater need for help with ADLs (OR = 2.35, 95% CI 1.33 to 4.14) - history of depression (OR = 2.14, 95% CI 1.34 to 3.43) This model correctly identified only 54% of stroke survivors' mood. No association with age or gender.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Hackett, Duncan, Anderson, Broad, & Bonita (2000)	N = 639 six-year stroke survivors from New Zealand Control group N = 310 Data from population-based case control study. Control group randomly selected.	*Quality of life* Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) *Functional activity* Researcher developed tool assessing 10 basic activities of daily living considered key to stroke recovery	Stroke survivors were more likely dependent in activities of daily living than control group (OR = 2.4 to 5.8) & had significantly lower standardized physical functioning & general health subscale scores (95% CI) when compared with controls & general population norms. There were no differences between survivors, controls, & general population in mental health subscale scores. 61% of stroke survivors reported not having completely recovered at 6 years.
Hobart, Williams, Moran, Thompson (2002)	N=177 US stroke survivors	*Quality of life* Medical Outcomes Study 36-Item Short Form Health Survey (SF-36)	Scale Scores – Scaling assumptions fully met for 6 of 8 scales, but floor & ceiling effects were present in 4 scales Summary Scores – Assumptions not met. 2 components explained < 60% variance in all scales (standard ≥ 80%) and < 75% of variance in 5 of 8 scales (standard ≥ 75%). Significance – significant amt info lost when reporting only summary scores in stroke.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
House, Knapp, Bamford, & Vail (2001)	N = 448 stroke survivors 2 year longitudinal design. Sample from a randomized controlled clinical trial.	*Depressive symptoms* Present State Examination (PSE) short form General Health Questionnaire-28 (GHQ-28) cut-off ≥ 12 Severe depression subscale (GHQ-D) *Functional activity* Barthel Index (BI) *Perceived social support* Frenchay Activities Index (FAI)	Prevalence: Major depression as measured with PSE (ICD-10 research criteria) – 22.3% As measured with GHQ-28 (self-report) – 19.1% Depression significantly associated with lower pre-stroke (X^2 = 8.24, p < .004) & 1 month post-stroke BI scores (X^2 = 8.83; p < .005). GHQ mood symptoms associated with both 12 & 24 month mortality after adjusting for other risk factors including: age, cognitive impairment, urinary incontinence & level of physical disability (OR = 2.0, 95% CI 1.0 – 4.1, p < .05). **Psychiatric diagnosis i.e. major depression, not statistically significantly associated with increased 12 or 24 month mortality

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Howes, Edwards, & Benton (2006)	N = 50 adult men, N = 25 men with acquired brain injury (ABI) including stroke & N = 25 non-head injured matched controls Cross-sectional design	*Depressive symptoms* Hospital Anxiety & Depression Scale, depression subscale (HADS) *Self-esteem* Rosenberg Self-esteem Scale (RSE)	ABI group had significantly lower self-esteem than did controls (F = 8.35, p <.01). RSE negatively correlated with HADS in both ABI group (r = -.54, p < .01) & controls (r = -.49, p < .05).
Johnson, Bakas & Lyon (2008) Lazarus & Folkman Transactional theory of stress	N = 4 US stroke survivors; 6 content experts Cross-sectional design	*Appraisal* Appraisal of Health Scale (AHS)	Evidence for face validity obtained from telephone interviews with stroke survivors. Threat & benefit subscales of AHS had evidence of content validity: content validity index for threat .92, benefit 1.0, benign .0

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Johnson, Bakas, Lyon, & Williams (2008) Lazarus & Folkman Transactional theory of stress	N = 394 US stroke survivors Cross-sectional design	*Depressive Symptoms* Patient Health Questionnaire – 9 (PHQ-9) *History of depression* Self-report *Stroke severity* National Institute of Health Stroke Scale (NIHSS) *Functional activity* Modified Rankin Scale (mRS) *Perceived social support* Medical Outcomes Study Social Support Scale *Self-esteem* Rosenberg Self-esteem Scale (RSE) *Optimism* Life Orientation Test, Revised (LOT-R) *Appraisal* Appraisal of Health Scale, threat Subscale	Psychometric testing of Appraisal of Health Scale Internal consistency reliability: threat =.92, benign = .85, benefit = .44 Construct validity: Principal axis factoring resulted in 2 factors: threat & benefit accounting for 44.35% of variance. Goodness of fit indices: (relative χ^2 = 3.93; CFI = .96; standardized RMR = .06; RMSEA = .09). Multiple regression Threat appraisal significantly associated with depressive symptoms after controlling for history of depression, self-esteem, age, & functional activity (p < .001). Overall, 43% of the variance was accounted for by model constructs [F = 31.60(9, 380), p < .001]. Internal consistency reliability of instruments in this study: MOS social support scale = .96; LOT-R = .69; RSE = .87

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Jönsson, Lindgren, Hallström, Norrving, & Lindgren (2005)	N = 304 Swedish stroke survivors Longitudinal descriptive study with data collection at 4 & 16 months post-stroke.	*Quality of life* Medical Outcomes Study 36-Item Short Form Health Survey (SF-36), Swedish version *Depressive symptoms* Geriatric Depression Scale – 20 (GDS-20), Swedish version *Functional activity* Barthel Index (BI)	Lower GDS-20 score at 16 months post-stroke significantly associated (p < .001) with higher scores in all SF-36 domains. Although perceived physical function declined between 4 & 16 months, significant improvement in social, emotional, & mental health domains may indicate positive adaptation to post-stroke situation.
Keyes, Michalec, Kobau, Zahran, Zack, Simoes (2005)	N = 3,112 Missouri adults > 60 years of age Panel study	*Depressive symptoms* 5 questions addressing mentally unhealthy days & sad, blue, or depressed days over previous 30 days. *Perceived social support* 4 questions	Reported only as mean days. More mentally unhealthy days & sad, blue, or depressed days reported for: women, less than high school education, functional activity limitations, almost never visited others, no close friends for emotional support Perception that any help was available – fewer mentally unhealthy days & sad, blue, or depressed days than if no help was perceived as available

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
King (1996) Theoretical base not described, but suggests stress, coping, & adaptation to illness theories are appropriate to consider.	N = 86 US stroke survivors Cross-sectional design	*Quality of life* Ferrans & Powers QOL Index – Stroke Version (QLI) *Depressive symptoms* Centers for Epidemiological Studies Depression Scale (CES-D) *Functional activity* Functional Independence Measure (FIM) *Perceived social support* Social Support in Elderly (unpublished)	Prevalence 30% in depressed range of CES-D Predictors of overall QOL Model: R^2= .40, p < .001 CES-D (r = -.53, p < .001) Social support (r = .48, p < .001) FIM (r = -.20, p < .05) Time since stroke 1 to 3 years

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
King, Shade-Zeldow, Carlson, Feldman, & Philip (2002) Model of the Crisis of Physical Illness (Moos & Tsu)	N = 53 US stroke survivors 2 year longitudinal descriptive design	*Depressive symptoms* Centers for Epidemiological Studies Depression Scale (CES-D) *Functional activity* Functional Independence Measure (FIM) *Perceived social support* Interpersonal Support Evaluation List (ISEL) *Optimism* Life Orientation Test (LOT) *Appraisal* Single questions from Stroke Survey (concern about caring for self in future & concern about future stroke)	Prevalence of depressive symptoms did not change significantly over 2 years. 31% of survivors treated with medication for “nerves” or depression. Correlations with greater levels of depressive sx: At T1: Age (r = .24, p < .05) but fell out of regression model; ISEL (r = -.24, p < .05) T1 variables at T4: CES-D (r = .30, p < .01) but fell out of regression model; ISEL (belonging) (r = -.28, p < .05) At T4: lower levels of family functioning (r = .39, p < .01); ISEL (belonging) (r = -.41, p < .01) Age only demographic variable that predicted CES-D & then only at T1. Appraisal of impact items did not change significantly over time. Concern about future stroke decreased significantly between T2 (6 to 10 weeks after rehabilitation) & T3 (one year) (p < .01) & remained stable between T3 & T4. Optimism did not change & did not meet criteria for entry into regression analysis.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Kwok, Lo, Wong, Wai-Kwong, Mok, Kai-Sing (2006)	N = 303 Chinese stroke survivors in Hong Kong Longitudinal descriptive study with data collection at 3, 6, & 12 months post-stroke.	*Quality of life* World Health Organization Quality of Life measure, Hong Kong Chinese version 4 domains: physical, psychological, social interaction, and environment *Depressive symptoms* Geriatric Depression Scale, Short Form, Hong Kong Chinese version (GDS-SF)	Prevalence of baseline depressive symptoms: 36% (GDS score ≥ 8). Significant increase in GDS scores from 3 months to 6 months & 12 months post-stroke ($p < .025$) with Bonferroni adjustment. Significant decrease in psychological, social interaction, & environment domains of QOL at both 6 & 12 months ($p < .025$ with Bonferroni adjustment) GDS significantly ($p < .05$) associated with all 4 domains of QOL [coefficient (95% CI)] Physical: [-1.8 (-1.4 to -2.2)] Psychological: [-2.6 (-2.4 to -2.8)] Social interaction: [-1.2 (-.08 to -1.6)] Environment: [-2.0 (-1.6 to -2.4)] Depressive symptoms had more generalized effect on QOL than did functional disability. Decline in QOL attributed to psychosocial factors given significant increase in median GDS scores from 3 to 12 months (score of 5 vs. 6, $p < .025$), but unchanged functional activity scores

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Lai, Woo, Hui, & Chan, (2004).	N = 21 stroke survivors living at home in Hong Kong. Pilot experimental design	*Quality of life* Medical Outcomes Study 36-Item Short Form Health Survey, Chinese version (SF-36) *Depressive symptoms* Geriatric Depression Scale (15-item) *Functional activity* Elderly Mobility Scale Lawton IADL Scale *Self-esteem* State Self-Esteem Scale (SSES) (examined for validity in Chinese)	19 completed study Mean time since stroke = 3 yrs. (SD = 2, range 1 – 7 yrs) 52% depressed at baseline (GDS >7) At baseline, all subscales of SF-36 were lower than age-equivalent norms. After intervention, participants had similar or higher subscales than population norms. Significant improvement in all subscales of SF-36 including emotional role & mental health, & SSES (p < .001) compared with baseline. Videoconferencing was accepted.
Leentjens, Aben, Lodder, & Verhey (2006).	N = 190 Dutch stroke survivors 1 year longitudinal descriptive study with data collection within 1 month of stroke, followed by 3, 6, 9, & 12 months.	*Depressive symptoms* Structured Clinical Interview, Depression Hamilton Depression Rating Scale Beck Depression Inventory Hospital Anxiety & Depression Scale Symptom Checklist-90 *Functional activity* modified Rankin Scale	Model with four general risk factors for depression in the community was predictive (p < .01) of major depressive disorder in post-stroke. Factors included in model were female sex, personal history of depression, family history of depression, & somatic co-morbidity. Although models including lesion characteristics were each significant, only functional activity at 1 month post-stroke (disability) improved model significance (X^2 = 6.66, df = 1, p = .01).

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Leskelä, Rytsälä, Komulainen, Melartin, Sokero, Lestelä-Mielonen (2006)	N = 193 Finnish adults diagnosed with major depressive disorder 18 month longitudinal cohort study with observations at baseline, 6 months, 18 months.	*Depressive symptoms* World Health Organization Schedules for Clinical Assessment (SCAN) Structured Clinical Interview for DSM-III-R personality disorders Hamilton Rating Scale for Depression (HAMD) Beck Anxiety Inventory Beck Hopelessness Scale *Perceived social support* Interview Measure of Social Relationships (objective social support) Perceived Social Support Scale, Revised (PSSS-R)	Sample divided into 3 groups based on 6 month level of depressive symptoms & followed up at 18 months: full remission, partial remission, & major depressive episode (MDE) Groupwise analyses: Subjective, but not objective, social support was a significant predictor of 18 month HAMD particularly for those in full remission & MDE. -full remission group (r = -.321, p < .05) -MDE group (r = -.352, p < .05)
Maeda, Onuoha, & Munakata (2006)	N = 82 Japanese post-gastrectomy patients Cross-sectional design.	*Depressive symptoms* Zung Self-rating Depression Scale *Perceived social support* Munkata's perceived emotional support scale *Self-esteem* Rosenberg's Self-esteem Scale	Significant correlations between depression & age (p < .05, r = -.29), self-esteem (p < .01, r = -.61), & emotional support (p < .05, r = -.23). Self-esteem was significant independent predictor of depressive symptoms (β = -.60, p = .02) & together with postoperative symptom experience (β = .22, p = .02) accounted for 40% of variance (p = .00) in depressive symptoms

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Michielsen, Van Houden-hove, Leirs, Vanden-broeck, & Onghena (2006) *Locus of control*	N = 85 Belgian adults diagnosed with chronic fatigue syndrome and/or fibromyalgia Cross-sectional design	*Depressive symptoms* Depression subscale of Hospital Anxiety & Depression Scale *Self-esteem* Rosenberg Self-esteem Scale (RSE)	In hierarchical regression analyses, RSE predicted depressive symptoms after controlling for attribution style (β = -.51, adj. R^2 = .25, p < .00).
Miller & Spilker (2003) Prochaska's readiness for change	N = 60 US adults at risk for stroke Educational intervention study with random assignment to groups	*Quality of life* EuroQol *Depressive symptoms* Center for Epidemiological Studies Depression Scale (CES-D) *Functional activity* Lawton's Activities of Daily Living Scale Lawton's Independent Activities of Daily Living	QOL positively associated (p < .05) with achievement of new behaviors (r = .31) & knowledge of signs & symptoms of stroke (r = .40). Depressive symptoms negatively associated (p < .05) with achievement of new behaviors.
Mishel & Sorenson (1991) Uncertainty Model	N = 131 American women with gynecological cancer Cross-sectional design	*Depressive symptoms* "emotional distress" measured by Profile of Mood States (POMS) *Appraisal* Appraisal scale from Ways of Coping Checklist, modified after factor analysis from 4 factors to 2 factors	Threat & harm subscales loaded on same danger factor. Benefit & challenge subscales loaded on same opportunity factor. Both danger & opportunity had significant effect on POMS, but danger stronger. Danger (β = .66, R^2 = .49) Opportunity (β = -.18, R^2 = .03)

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Moore, Norman, Harris & Makris (2006) Theory of cognitive adaptation (Taylor)	N = 123 British adults with diagnosis of venous thrombosis Cross-sectional design	*Quality of life* SF-12 mental (MCS) & physical (PCS) functioning subscales *Depressive symptoms* Hospital Anxiety & Depression Scale (HADS), depression subscale *Self-esteem* Rosenberg Self-esteem Scale (RSE) *Optimism* Life Orientation Test – Revised (LOT-R)	Intercorrelations between outcomes of depression & QOL: Depressive symptoms & MCS (r = -.65, p < .001) Depressive symptoms & PCS (r = -.37, p < .001) Intercorrelations between IVs: Self-esteem & optimism (r = .52, p < .001) Correlations between IVs & DVs: Low self-esteem & optimism correlated with increased depressive symptoms. Self-esteem & depressive symptoms (r = -.35, p < .001) Optimism & depressive symptoms (r = -.47, p < .001) In hierarchical multiple regression, optimism was significant independent predictor of depressive symptoms (r = -.37, p < .001), model explained additional 24% of variance.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Morris, Robinson, Andrzejewski, Samuels, & Price (1993)	N = 91 US stroke survivors Longitudinal design	*Depressive symptoms* Present State Examination Hamilton Rating Scale for Depression (HAM-D) *Functional activity* Johns Hopkins Functioning Inventory (JHFI) *Perceived Social Support* Social Ties Checklist Social Functioning Examination (SFE)	Depressive status during acute phase was significantly associated with mortality for both major & minor depression (OR = 3.4, 95% CI 1.4 to 8.4, *p* = .007). Divergence between depressed & non-depressed groups began at 1 yr. & continued to 5 yrs., survival curve parallel after 5 yrs. Severity of depressive symptoms not associated with mortality. Depression & few social ties had additive effect on mortality. Pts having both had 92% mortality rate. Pts with one or the other had 58% mortality rate. If not depressed & many social ties, 38% mortality rate. After controlling for possible confounding variables, depression still associated with mortality (adj. OR = 3.7, 95% CI 1.1 to 12.2, *p* = .03).

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Morrison, Johnston, MacWalter, & Pollard (1998)	N = 25 Scottish stroke survivors Comparison group N=53 Scottish stroke survivors Non-random pilot study with comparison group drawn from separate study.	*Depressive symptoms* Hospital Anxiety & Depression Scale (HADS)	Intervention group had significantly less anxiety & depression than comparison group (p =.04 for anxiety, p =.01 for depression), and were more satisfied with advice & information received although did not reach .05 level (p = .06). 9 of 25 (36%) did not complete program at 1 month.
Naess, Waje-Andreassen, Thomassen, Nyland & Myhr (2006)	N = 190 young Norwegian adult ischemic stroke survivors Compared with 215 age & sex matched controls Cross-sectional descriptive study.	*Quality of life* Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) *Depressive symptoms* Montgomery Åsberg Depression Rating Scale (MADRS) *Functional Activity* modified Rankin Scale (mRS)	No significant differences between stroke survivors as a group & non-stroke control group on role-emotional or mental health sub-scales. Depressed participants (MADRS > 6) had significantly lower scores on all subscales of SF-36 than non-depressed (p < .001). Linear regression: Partial correlation between SF-36 subscales & MADRS. Depressive symptoms independently associated with low QOL (-.30 to -.62, p < .001) except for physical function & pain subscales.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Netuveli, Wiggins, Hildon, Montgomery, & Blane (2006)	N = 11,234 British older adults Secondary analysis of first wave of longitudinal study of aging.	*Quality of life* CASP-19 (a needs satisfaction model) *Depressive symptoms* *Center for* Epidemiological Studies, Depression (CES-D)	Although no single factor that determines QOL, depressive symptoms were the most significant negative influence on QOL in comparison with other physical health, functioning, & mental health variables (r = -5.464, 95% CI, -5.875 to -5.054, standardized β = -.265). Not stroke specific, but addresses the relationship between depressive symptoms & QOL in general population of older adults.
Nicholl, Lincoln, Muncaster, & Thomas (2002) Cognitive theory of depression: depression results from negative thoughts &/or negative distortions in how situations are interpreted	N = 50 British stroke survivors Psychometric study to test the Stroke Cognitions Questionnaire	*Depressive symptoms* Beck Depression Inventory (BDI) Wakefield Depression Inventory (WDI) *Appraisal* Stroke Cognitions Questionnaire (SCQ)	Items on SCQ similar to threat items from Appraisal of Health Scale. Stroke survivors categorized as depressed on BDI & WDI reported significantly more negative cognitions (p < .01) & fewer positive cognitions (BDI, p < .05; WDI, p < .01) than did survivors who were categorized as not depressed.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Nir, Zolotogorsky, & Sugarman (2004) Orem's Self-Care Deficit Theory of Nursing	N = 155 Israeli survivors of 1st ever stroke Stratified random sample, 12 week intervention	*Depressive symptoms* Geriatric Depression Scale – short form (GDS) *Functional activity* Functional Independence Measure (FIM) Study specific 10-item scale measured independent activities of daily living (IADL) on 5-point Likert scale. *Self-esteem* Rosenberg Self esteem Scale	Significant improvement in treatment group: (1) functional status (group x time interaction effect [F = 6.43(2,274), p < .001] at 3 months (2) depressive symptoms at 3 months (p = .044) & at 6 months (p = .021); (3) self-esteem improved between 3 & 6 months [F= 16.01(1,136), p = .001]. Both survivor & caregiver included in education program.
Nys, van Zandvoort, van der Worp, de Haan, de Kort, & Kappelle (2005)	N = 126 Dutch stroke survivors Cross-sectional, descriptive study at 3 weeks post-stroke, excluded survivors with history of depression, global aphasia, or severe disturbances of consciousness.	*Depressive symptoms* Montgomery Asberg Depression Rating Scale (MADRS) *Functional Activity* Barthel Index (BI) Modified Rankin Scale (mRS)	Survivors with moderate to severe symptoms had significantly higher BI (p = .003) & mRS (p = .004) scores No significant differences between groups (based on absent, mild, or moderate/severe symptoms) related to age, education, gender, or lesion location. Conclusion: depressive symptoms in early post-stroke period more probably result from reaction to "sudden & severe cognitive & functional impairment rather than a direct result of damage to specific brain regions."

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Oberst, Thomas, Gass, & Ward (1989) Cognitive models of stress & coping	N = 47 family caregivers of cancer patients Cross-sectional instrument develop-ment study	*Appraisal* Appraisal of Caregiving Scale	Threat appraisal correlated with caregiver education $r = -.31$, $p < .05$ High intercorrelation between harm/loss subscale & threat subscale ($r = .85$, $p < .001$). Also between benign & challenge subscales ($r = .64$, $p < .05$)
Ones, Yilmaz, Cetinkaya, & Caglar (2005)	N = 88 Turkish stroke pts at least 6 months post stroke N = 40 healthy controls Cross-sectional correlational study.	*Quality of life* Nottingham Health Profile (NHP) *Functional activity* Functional Independence Measure (FIM)	QOL in stroke survivor group was significantly lower than in control group for each subscale. No differences in gender or age & QOL for stroke group.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Paolucci, Gandolfo, Provinciali, Torta, Sommacal, for the DESTRO group (2005)	N = 1,064 Italian stroke survivors Multicenter, 2 year longitudinal study	*Quality of life* Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) *Depressive symptoms* Beck Depression Inventory (BDI) Visual Analog Mood Scale (VAMS) Montgomery Asberg Depression Rating Scale (MADRS) *Functional activity* Barthel Index (BI) modified Rankin Scale (mRS)	Risk factors associated with PSD: - female gender OR 1.49, $p < .0085$ - previous stroke OR 1.55, $p < .022$ - previous depression OR 3.97, $p < .0001$ - mRS score > 3 OR 2.70, $p < .001$ Combinations of above risk factors exponentially raised the risk of PSD. Minimum risk – 25% probability of PSD in males with first stroke, no history of depressive symptoms, & mild disability. Maximum risk – 90% probability of PSD in women with previous stroke history, history of depressive symptoms, & severe disability. Depression more frequent in women (43.6%) than in men (30.9%) with a greater probability (OR 1.49). History of previous depression increased risk of PSD by about 30% in both men & women.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Paolucci, Gandolfo, Provinciali, Torta, & Toso, for the DESTRO study group (2006)	Italian stroke survivors N = 1,064 Multicenter, 2 year longitudinal study	*Quality of life* Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) *Depressive symptoms* Beck Depression Inventory Visual Analog Mood Scale World Health Organization criteria for depression in course of a neurological disorder Montgomery Asberg Depression Rating Scale *Functional activity* Barthel Index modified Rankin Scale (mRS)	PSD has more impact on QOL than effects of stroke alone. Pts with PSD had lower SF-36 scores in all domains than pts without PSD at baseline & at final visit. PSD pts had significantly more severe initial functional impairment with ES = -.72 T1 (1 month) medium ES *d* = -.72 T2 (3 month) medium ES *d* = -.59 T3 (6 month) large ES *d* = -.82 T4 (9 month) medium ES *d* = -.53

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Parikh, Robinson, Lipsey, Starkstein, Federoff, & Price (1990).	N = 63 US stroke survivors 2 year longitudinal descriptive study	*Depressive symptoms* Hamilton Depression Rating Scale Zung Self-Rating Depression Scale Present State Exam modified to include only items r/t depression or anxiety *Functional Activity* Johns Hopkins Functioning Inventory (JHFI) *Perceived Social Support* Social Functioning Examination Social Ties Checklist	Key finding: Adverse effect of depression on physical recovery seen on both levels of depression; delayed functional recovery found even after remission of depression at 2 year follow up. No correlation between 2 year depression scores & social function or lesion location.
Paul, Sturm, Dewey, Donnan, Macdonell, & Thrift (2005)	N = 356 Australian stroke survivors 5-year follow-up of large (N = 978), prospective, community-based stroke incidence study	*Quality of life* Assessment of Quality of Life Scale (AQoL) *Stroke severity* National Institutes of Health Stroke Scale (NIHSS)	AQoL, a health utility measure of HRQOL, is scored -1 to +1 with 0 equated to death. 20% of sample had AQoL score ≤ .1. General population < 3% with same score. Score of .1 indicative of inability to live independently or fulfill family roles, and decreased psychological well-being. Independent predictors of low HRQOL: Increasing age Lower socioeconomic status Stroke severity

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Pohjsvaara, Leppavuori, Siira, Vataja, Kaste, & Erkinjuntti (1998)	N = 277 Finnish stroke survivors Cross-sectional descriptive study at 3 months post-stroke.	*Depressive symptoms* DSM III R criteria Montgomery Asberg Depression Rating Scale (MADRS) Beck Depression Inventory (BDI) Zung Self-Rating Depression Scale *Stroke severity* Scandinavian Stroke Survey (SSS) *Functional activity* Barthel Index (BI)	No significant differences in age, sex, education, stroke localization, or living situation between depressed & non-depressed groups. Any depression related to: Dependence defined as need for daily assistance (β = .58, OR 1.8, 95% CI 1.1 to 3.1) History of pre-stroke depression (β = .85, OR 2.3, 95% CI 1.3 to 4.4)
Rimmer, Braunsch-weig, Silverman, Riley, Creviston, & Nicola (2000) wellness model using Prochaska's stages of change	N = 35 stroke survivors participating in multidisci-plinary intervention in Chicago Pre-test/post-test lag control group design	*Quality of life* Life Satisfaction Questionnaire (LSQ) *Depressive symptoms* Symptom Check List-90 Revised (SCL-90R)	Treatment group made significant gains over controls in areas including increased life satisfaction, ability to manage self-care needs, & decreased social isolation Significant improvements for treatment group on some individual items of SCL-90R, but not for control group

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Robinson, Bolduc, & Price, (1987)	N = 65 of original 103 stroke survivors interviewed either at 12 or 24 months N = 37 at 12 months N = 48 at 24 months N = 20 at both times	*Depressive symptoms* Zung Depression Scale Hamilton Depression Rating Scale (HAM-D) Present State Examination (PSE) *Stroke severity* Neurological exam *Functional activity* Johns Hopkins Functioning Inventory (JHFI) *Perceived social support* Social Functioning Exam (quality & personal satisfaction from social roles) (SFE)	All with acute phase diagnosis of major depression improved significantly in severity of symptoms ($p < .001$) & functional activity ($p < .05$) by 2 years. 30% of those with acute phase diagnosis of dysthymia improved by 2 years. 34% of non-depressed developed either major or minor depression by 2 years. Only non-depressed group (in-hospital diagnosis) improved significantly in functional activity ($p < .05$). SFE significantly worse at 12 months for survivors with in-hospital major depressive disorder diagnosis ($p < .01$). Other groups did not change.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Robinson & Price (1982)	N = 103 US stroke survivors at baseline (time since stroke varied from < 6 months to 15 years) Longitudinal study with convenience sample	*Depressive symptoms* General Health Questionnaire (GHQ) *Functional activity* Johns Hopkins Functioning Inventory	No significant correlation between ability to perform ADLs & GHQ score. When survivors divided into groups by time since stroke, severity & prevalence significantly increased among survivors who were between 6 months to 1.5 years post-stroke. Significant increase in GHQ scores among survivors with left side lesions during 6 month to 1.5 year period (N = 9/14; $p < .05$)
Robinson, Starr, Kubos, & Price (1983)	N = 103 stroke survivors with hemorrhagic & thromboembolic infarcts Cross-sectional study at 2 weeks post-stroke	*Depressive symptoms* Zung Depression Scale Hamilton Depression Rating Scale (HAM-D) Present State Examination (PSE) *Stroke severity* Neurological exam *Functional activity* Johns Hopkins Functioning Inventory (JHFI) *Perceived social support* Social Functioning Exam (SFE) Social Ties Checklist	Prevalence of depressive symptoms: 27% with major depression 20% with minor depression Survivors with left frontal lobe lesions had significantly higher Zung & HAM-D scores than lesions in parietal & occipital lobes. Localization by hemisphere of damage did not differentiate groups by depressive symptom severity. Other factors correlated with HAM-D: JHFI $r = .37$, $p < .001$ SFE $r = .23$, $p < .02$ Age $r = -.24$, $p < .02$

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Robinson, Starr, Lipsey, Rao, & Price (1984)	N = 61 US stroke survivors interviewed at least once. N = 29 interviewed at both 3 & 6 months	*Depressive symptoms* Zung Depression Scale Hamilton Depression Rating Scale (HAM-D) Present State Examination (PSE) *Stroke severity* Neurological exam *Functional activity* Johns Hopkins Functioning Inventory (JHFI) *Perceived social support* Social Functioning Exam (SFE)	For N = 29 group: Relationship between SFE & depressive symptoms increased between 3 & 6 months. Correlation not significant at 3 months, but highly significant at 6 months (r = .45, p < .001). Functional activity significantly increasingly related to severity of depressive symptoms. At 3 months r = .39, p < .01 At 6 months r = .63, p < .001 Age not significantly correlated with HAM-D at 3 months or 6 months.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Rowe, Conwell, Schulberg, & Bruce (2006)	N = 522 American older adults receiving home health care Cross-sectional study	*Depressive symptoms* Structured Clinical Interview (SCID) Hamilton Rating Scale for depression (HRSD) *Perceived social support* Duke Social Support Index, abbreviated Single question about social network size	Logistic regression: Only perceptions of social support remained in model (B = -.143, *p* = .02) predicting suicidal ideation while controlling for other variables including age, sex, educational status, depression, & functional activity limitation.
Samsa & Matchar (2004)	N = 329 US stroke survivors Longitudinal, descriptive study with measurements at 1, 6, and 12 month intervals.	*Quality of life* time trade-off (TTO) direct scale (DS) *Functional activity* Barthel Index	Key finding: QOL is heterogeneous & depends on more than level of physical function. Weak positive relationship between functional activity limitation & QOL (r < .25) Participants with similar functional activity limitations reported different QOL.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Sato, Bryan, & Fried (1999)	N = 3,371 US adults over age 65 participating in Cardiovas-cular Health Study Cross-sectional data from Cardiovas-cular Health Study panel	*Depressive symptoms* Center for Epidemiological Studies Depression Scale (CES-D) *Functional activity* National Health Interview Survey supplement on aging questionnaire, modified	Cognitive & functional disability was most significant factor associated with depressive symptoms, not MRI-identified lesions. Findings consistent with interpretation that functional deficits associated with infarcts may be causal pathway for development of depressive symptoms.
Secrest & Thomas (1999) Existential phenomeno-logical methodology precludes supporting theory.	N = 14 US stroke survivors Descriptive qualitative study using purposive sampling design & existential phenomenol ogy.	Post-stroke QOL following rehabilitation	Loss and effort form the background of post-stroke QOL. Dimensions of QOL: continuity & discontinuity of self Focal themes for post-stroke QOL: (1) independence-ability/dependence-disability; (2) in control/out of control; (3) connection/disconnection with others Connections with other people meant “reciprocity, being with & understood by someone, & experiencing help from others” (p.243). Although relationships were important throughout, nurses were never mentioned.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Secrest & Zeller (2007) Continuity discontinuity model	N = 51 US stroke survivors Descriptive correlational study with data collection at 1, 3 & 6 months post-stroke	*Quality of life* Cantril ladder with 10 rungs Continuity/ Discontinuity of Self Scale (CDSS) *Depressive symptoms* Center for Epidemiological Studies, Depression (CES-D) *Functional activity* Barthel Index (BI)	QOL (Cantril ladder) at 1 month not significantly correlated with 6 month depressive symptoms. QOL (Cantril ladder) at 6 months & discontinuity at 1 month correlated (r = .45, p < .05) indicating that poor perceived QOL is related to increased sense of discontinuity. Continuity with others at 1 month correlated with depressive symptoms at 6 months (r = -.27, p < .05). Discontinuity & depression probably reflect 2 different constructs. Depressive symptoms changed over time; discontinuity did not. BI at 1 month (r = .38, p < .05) & at 6 months (r = .52, p < .01) correlated with 6 month QOL (Cantril ladder), but not with 1 month QOL. Relationship between depressive symptoms & QOL may have been affected by participants taking anti-depressants; data no more specific than “many” took anti-depressants.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Singh, Black, Herrmann, Leibovitch, Ebert, Lawrence, et al. (2000)	N = 81 Canadian stroke survivors 1 year longitudinal descriptive study	*Depressive symptoms* Montgomery Asberg Depression Rating Scale (MADRS) Zung Self-Rated Depression Scale *History of depression* Present or absent *Functional activity* Functional Independence Measure (FIM)	Functional activity limitations most significant risk factor for post-stroke depressive symptoms. Functional activity at 1 month was strongest predictor of 3 month depressive symptoms. 3 month depressive symptoms predicted by highly significant model ($p <$ .0005) FIM score at 1 month (R^2 = 12%, $p <$ .002) living at home at 1 month (R^2 = 8%, $p <$ .008) inferior frontal region damage (R^2 = 8%, $p <$ .007) 3 month & 1 year FIM scores also strongly correlated with depressive symptoms at 3 months (r = .38, $p <$ .0005) & 1 year (r = .002, $p <$ .002)

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Sinyor, Amato, Kaloupek, Becker, Goldenberg, & Coopersmith, (1986).	N = 64 Canadian stroke survivors At 6 wk follow-up: N=25 6 week descriptive correlational study	*Depressive symptoms* Zung Self-rating Depression scale (SDS) Hopkins Symptom Checklist (depression subscale) HSCL-D Composite Depression Index Nurses' Rating Scale *Functional activity* PT & OT rating on 20 items selected from the Patient Evaluation Conference System	Prevalence: Moderate to severe depression in 22% of all pts. SDS ≥ 60 Mild depressive symptoms in 25% pts. SDS 50 – 59 Depression scores not related to *changes* in functional status scores. However, at 6 week follow-up, depressed pts had significant reductions in PT measures of functional outcome $r = -.61$, $p < .01$ while non-depressed patients remained stable or improved slightly. Depressed pts had lower functional scores, but no significant group X time interaction. Correlation between depression & decreased functional ability inconsistent with other findings of no relationship.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Skarupski, de Leon, Bienias, Barnes, Everson-Rose, Wilson, et al. (2005)	N = 4,275 US community-dwelling older adults Epidemio-logic data collected at 3 time points over 3 year intervals	*Depressive symptoms* Center for Epidemiologic Studies Depression Scale (CES-D)	Crude prevalence rates of depressive symptoms: Cycle 1: 17.3% blacks 9.9% whites Cycle 2: 23.6% blacks 12.2% whites Cycle 3: 19.3% blacks 8.8% whites Significant association between baseline race & depressive symptoms (β = .467, $p < .001$) decreased by half after controlling for socioeconomic variables, but still remained significant (β = .225, $p < .001$). Racial differences in depressive symptoms increased slightly over time, although curvilinear tendency noted.
Spalletta, Ripa, & Caltagirone (2005)	N = 200 Italian stroke survivors Cross-sectional	*Depressive symptoms* Structured Clinical Interview for Depression Hamilton Rating Scale for Depression Beck Depression Inventory *Functional activity* Barthel Index	Prevalence: MDD: 25% Minor depression: 31% BI significantly ($p < .0001$) different in MDD group Stroke survivors with major depression, minor depression, & no depression can be distinguished using the DSM-IV criteria

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Spencer, Tompkins, Schulz, & Rau (1995)	N = 87 US stroke survivors Longitudinal study with initial interview at 3 to 10 weeks post-stroke & 2nd interview at 6 months	*Depressive symptoms* Centers for Epidemiological Studies Depression (CES-D) *Stroke severity* objective (support person's judgment) subjective (Barthel Index) *Functional activity* Barthel Index (BI) *Perceived social support* Satisfaction with social contacts Perceived reciprocity *Optimism* Life Orientation Test (LOT) *Threat appraisal* question on concern about future care	Risk for depression: Greater functional activity impairment, less optimistic, greater perceived stroke severity, more concern about future stroke, less satisfaction with social contact Baseline (3-10 weeks): 32% of variance in CES-D score accounted for by threat appraisal, perceived severity, & LOT, controlling for age, income, & number of prescriptions. LOT score only independent predictor (β = -.32, p < .01) 6 months: 34% of variance in CES-D score accounted for by 6 month satisfaction with amount of social contact, BI scores, & threat appraisal, controlling for age, income, & number of prescriptions. 6 month BI score independently predictive of 6 month CES-D (β = -.44, p < .01). Satisfaction with amount of social contact approached significance (β = -.24, p = .03). Baseline CES-D added 25% of variance to 6 month CES-D (β = .45, p < .001). Baseline perceived stroke severity & LOT scores added 2% more to 6 month CES-D.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Sturm, Donnan, Dewey, Macdonell, Gilligan, Srikanth, et al. (2004)	N = 225 Australian stroke survivors at 2 years post-stroke Descriptive correlational study comparing baseline data with 2 year data.	*Quality of life* Assessment of Quality of Life (a generic HRQOL utility instrument) with 5 dimensions: (1)independent living, 2) social relationships, 3) physical senses, 4) psychological well-being, & 5) illness	Independent baseline predictors of 2 year QOL: age, female, initial NIHSS score, neglect, & low SES Independent determinants of QOL at 2 years: handicap, physical impairment, anxiety & depression, disability, institutionalization, dementia, & age. Mean AQoL utility score for all stroke survivors was.47 (95% CI .42 to .52) compared with the median AQoL score of .86 for healthy elderly adults. Even among survivors with good functional recovery, QOL may be reduced. Almost 25% of survivors had score < .1 (0 – 1)

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Sturm, Osborne, Dewey, Donnan, Macdonell, Thrift (2002) Conceptual framework of World Health Organization International Classification of Impairments, Disabilities, & Handicaps	N = 93 stroke survivors from North East Melbourne Stroke Incidence Study	*Quality of life* Assessment of Quality of Life scale (AQoL) Medical Outcomes Short -Form Health Survey (SF-36) *Depressive symptoms* Irritability, Depression, Anxiety Scale (IDA) (depression & anxiety subscales used) *Stroke severity* National Institutes of Health Stroke Scale (NIHSS) *Functional activity* Barthel Index London Handicap Scale (LHS)	Mean AQoL utility score = .40 SD = .33 Median score = .37 No substantial floor or ceiling effects, good distribution across entire scoring range. Established convergent, criterion, construct, & predictive validity for AQoL AQoL 3 month score significant predictor of death and/or institutionalization adjusting for age, sex, & 3 month impairment score (p = .006)

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Suenkeler, Nowak, Misselwitz, Kugler, Schreiber, Oertel et al. (2002)	N = 144 German stroke survivors Descriptive correlational study with measure-ments at 3, 6, & 12 months	*Quality of life* Medical Outcomes Study 36-Item Short Form Health Survey (SF-36), German version *Depressive symptoms* Montgomery Asberg Depression Rating Scale (MADRS) *Stroke severity* European Stroke Severity (ESS), German version *Functional activity* Barthel Index (BI) Items from Swedish Stroke Registry	PCS lower at 3, 6, & 12 months, & MCS, PF, & SF decreased significantly (p < .05) between 6 & 12 months. Stroke survivors with higher depressive symptoms at 3, 6, & 12 months reported worse QOL even though they had only “minor” neurological deficits (ESS range 90-99/100) Tendency toward any depressive symptoms is predictive of lower QOL. BI & ESS stable over the year & not predictive of QOL after 1 yr. At one yr after stroke, 66% reported worsened life satisfaction compared with life before stroke.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Tsouna-Hadjis, Vemmos, Zakapoulos, & Stamatelopoulos (2000)	N = 43 Greek stroke survivors 6 month longitudinal descriptive study	*Depressive symptoms* Zung Scale *Stroke severity* Scandinavian Stroke Scale *Perceived social support* Family Social Support scale, emotional support subscale	Mean Zung score for total sample 2.0 out of 4.0 with 4.0 indicative of high depression. Significant univariate effect of total support on depressive symptoms (p = .002). Suggests that survivors with high levels of support regardless of severity of stroke have different level of depressive symptoms than those with low levels of support. No significant interaction effect between depressive symptoms, time, & support adjusted for severity levels. Subscale analyses: High emotional support significantly affected depressive symptoms at 1 month (p = .004) & at 3 months (p = .013), but not at 6 months

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Vataja, Leppävuori, Pohjasvaara, Mäntylä, Aronen, Salonen, Kaste, et al. (2004)	N = 70 Finnish stroke survivors Cross-sectional analysis of 3 month data from Helsinki Stroke Aging Memory Study.	*Depressive symptoms* Present State Examination (PSE) Schedules for Clinical Assessment in Neuropsychiatry *Stroke severity* Scandinavian Stroke Scale (SSS) *Functional ability* Barthel Index (BI)	Prevalence: 26/70 participants (37.1%) Depressed participants significantly (p = .002) more impaired in BI, had more severe stroke & took more anti-depressants (p = .001) than non-depressed Brain structures most affected in depressed participants: Basal ganglia, more specifically, the pallidum on the left side, (only independent correlate of PSD in multivariate model; OR = 7.2; 95% CI 1.9 to 35.7)
Vataja, Pohjasvaara, Leppavuori, Mantyla, Aronen, Salonen et al. (2001)	N = 275 Finnish stroke survivors Cross-sectional study	*Depressive symptoms* Structured Clinical Interview (diagnosis) Montgomery Asberg Depression Rating Scale (severity) *History of depression* Yes or no *Stroke severity* Scandinavian Stroke Scale *Functional activity* Barthel Index	Survivors with depression more likely to have positive history of depression (p = .01), more severe stroke (p < .001), and more functional activity limitations (p = .02). No significant differences for education, sex, or age. Based on standardized MRI protocol: left-sided, prefrontal, subcortical lesions ndependently correlated with post-stroke depression (OR = 3.1, 95% CI 1.0 to 10.1)

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Walke, Byers, Gallo, Endrass, & Fried (2007)	N = 226 chronically ill adults (COPD, heart failure, cancer) Cross-sectional study	*Quality of life* Single item rating overall QOL on 5-point scale *Depressive Symptoms* Edmonton Symptom Assessment Scale, 9 items including "feelings of depression" item	37% of sample reported feelings of depression Significant bivariate association between feelings of depression & QOL (OR = 1.9, 95% CI 1.35 to 2.72) Feelings of depression independently associated with QOL in logistic regression (OR = 1.7, 95% CI 1.13 to 2.57)
Williams, Bakas, Brizendine, Plue, Tu, Hendrie, et al. (2006)	N = 225 pairs of US stroke survivor-proxy pairs Descriptive, cross-sectional design	*Quality of life* Stroke-specific Quality of Life scale (SS-QOL) *Depressive symptoms* Patient Health Questionnaire – 9 (PHQ-9)	Mean survivor scores for each SS-QOL domain & for total score > than mean proxy scores ($p < .001$) Greater survivor-proxy agreement associated with greater survivor PHQ-9 & lower perceived proxy burden ($r^2 = .15$). Conclusion: only modest agreement between survivor-proxy assessment of QOL; varies by level of survivor depressive symptoms & proxy perception of burden

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Williams, Brizendine, Plue, Bakas, Tu, Hendrie, et al. (2005)	N = 145 depressed US stroke survivors N = 171 non depressed US stroke survivors Cross-sectional design	*Depressive Symptoms* Patient Health Questionnaire-9 (PHQ-9) Structured Clinical Interview for Depression	PHQ-9 discriminates between stroke survivors with & without any depression diagnosis (AUC =.96) regardless of age, gender, or ethnicity. PHQ-9 score ≥ 10 For Major Depressive Disorder: 91% sensitivity 89% specificity For any depression diagnosis: 78% sensitivity 96% specificity Depressed group significantly younger (p = .009) than non-depressed group.
Williams, Ghose, & Swindle (2004)	N = 51,119 national VA cohort of ischemic stroke survivors Retrospec-tive chart review	*Depressive symptoms:* ICD-9 codes *Stroke severity* National Institutes of Health Stroke Scale (NIHSS)	Prevalence: 5% diagnosed with depression PSD group was younger, had fewer chronic conditions, & higher 3-year mortality risk than other groups. PSD hazard ratio 1.13, the same as for “other mental disorder or substance abuse” diagnoses. PSD independently increased risk of mortality in first 3 years post-stroke when controlling for C-V risk factors & overall mortality risk.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Williams, Kroenke, Bakas, Plue, Brizendine, Tu, et al. (2007)	N = 188 US ischemic stroke survivors Prospective, randomized, outcome blinded trial.	*Depressive symptoms* Patient Health Questionnaire (PHQ-9): screening, depression response Structured clinical interview – depression (SCID): Hamilton Depression Inventory (HAM-D) depression response	Depression response (51% vs. 30%, *p* = .005) & remission (39% vs. 23%, *p* = .01) more likely in AIM group than usual care group. Difference in response noted by 6 week assessment & continued through 12 weeks.
Williams, Weinberger, Harris, & Biller (1999)	N = 71 US ischemic stroke survivors	*Quality of life* Stroke-Specific QOL scale (SS-QOL) Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) overall HRQOL as dichotomous response (same or worse than before stroke) *Depressive symptoms* Beck Depression Inventory *Stroke severity* Canadian Neurologic Scale (CNS) National Institutes of Health Stroke Scale (NIHSS) *Functional activity* Barthel Index (BI)	Findings suggest SS-QOL is more sensitive to post-stroke QOL changes than SF-36. SS-QOL was independent predictor of overall HRQOL (OR = 2.97; 95% CI 1.3 to 7.1, *p* =.01) SF-36 & demographics not associated with overall HRQOL Higher depressive symptoms scores significantly associated with worse overall HRQOL (*p* = .01) More than half (52%) of group of highly recovered stroke survivors still report overall HRQOL as being worse than before the stroke.

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Williams, Weinberger, Harris, Clark, & Biller (1999)	N = 32 ischemic stroke survivors for item generation N = 72 ischemic stroke survivors for instrument pilot testing	*Quality of life* Stroke-Specific Quality of Life scale (SS-QOL) overall health related quality of life (overall HRQOL) as response to one of three options For construct & criterion validity: Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) Beck Depression Inventory National Institutes of Health Stroke Scale Barthel Index	Internal reliability of 12 unidimensional domains adequate (Cronbach's alpha ≥ .73). Poor correlation between SS-QOL & SF-36 on social roles domain. Most domains moderately correlated with established outcome measures (r^2 range = .3 to .5). Moderately responsive to change in first 3 months after stroke (standardized effect sizes for most domains > .4)

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Wyller & Kirkevold (1999)	N = 6 Norwegian stroke survivors, 3 years post-stroke Qualitative study	Semi-structured qualitative interviews related to quality of life	Norwegian survivors did not recognize the term until explained as overall satisfaction with life. Link between objective measures of QOL & perceived QOL is the interpretation or evaluation process used to reconstruct the person's place in life. Evaluation of QOL is in comparison with some personal pre- or post- stroke reference point. All survivors reported significant body changes. QOL seriously affected even for survivors with little impairment.

Source and Theoretical Base	Sample and Design	*Variables and Instruments*	Findings and Comments
Xie, Wu, Zheng, Croft, Greenlund, Nensah, et al. (2006)	N = 1,040 US stroke survivors > 18 years of age N = 38,640 US non-stroke adult population > 18 years of age Combined data from Medical Expenditure Panel Survey for 2000 & 2002	*Quality of life* SF-12 physical & mental health summary scores EuroQOL Indices EQ-5D (health utility) and EQ-VAS (self-rating of health)	Stroke significantly impairs QOL in US ($p < .001$) adjusting for sociodemographics, risk factors, & comorbidities (% lower mean scores than general population for each QOL measure) mental health 4.1% physical health 7.9% health utility 6.9% self-perceived health 7.2% Black vs. white racial disparities in QOL significantly more pronounced ($p < .01$) in stroke population than non-stroke population as measured by health utility scores (-1.0 to 1.0) stroke survivors -.06 non-stroke population -.02

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Yang (2006) Pearlin's Stress Process Theory	N = 1,149 American adults ≥ 65 years at 2 time points: baseline & 6 years	*Depressive symptoms* Centers for Epidemiological Studies Depression Scale (CES-D) *Functional activity* Guttman scale of functional disability developed from the (1) Nagi Physical Performance Scale, (2) Rosow-Breslau Health Scale for the Aged, (3) Instrumental Activities of Daily Living Scale, & (4) Katz Activities of Daily Living Scale	Functional activity at T1 has small but significant direct effect on CES-D at T2 (β =.09, $p < .001$) Perceived social support most important social support dimension. Having at least 1 confidant at T1 had direct negative effect on CES-D at T2 (β = -.22) controlling for T1 CES-D & functional activity. Perceived social support & psychological resources including RSE account for 16.5% of variance in T2 CES-D (Adj R^2 change .261 to .425) Multiple regression: RSE & changes in RSE have greatest direct effect on changes in CES-D when compared with functional activity & perceived social support. RSE T1: β = -.34 Change in RSE: β = -.31 Functional activity T1: β = .09 Change in Functional activity: β = .04 Perceived social support: Confidant T1: β = -.14 Change in confidant: β = -.15 Path analysis: RSE at T1 has direct effect on CES-D at T2 (-.34, $p < .001$) as does change in RSE & CES-D at T2 (- .31, $p < .001$).

Source and Theoretical Base	Sample and Design	Variables and Instruments	Findings and Comments
Yu, Lee, Woo, & Thompson (2004)	N = 227 hospitalized Chinese adults with CHF, over age 60	*Depressive symptoms* Hospital Anxiety & Depression Scale (HADS) *Functional Activity* New York Heart Association Classification *Perceived social support* Medical Outcomes Study Social Support Survey, Chinese version	Bivariate analysis: All MOS-SSS subscales (r = -.34 to -.49), age (r = .22), & education (r = .20) were significantly associated with HADS score (p < .01). Regression model with fatigue (β = -2.60) & emotional-informational support (β = -.12) accounted for 44% of variance in HADS score. Comparatively small social network size still perceived as moderately adequate

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVALS

IUPUI/CLARIAN INSTITUTIONAL REVIEW BOARD (IRB)
APPLICATION FOR RESEARCH NOT SUBJECT TO FDA OR COMMON RULE DEFINITIONS OF HUMAN SUBJECTS RESEARCH

SECTION I: PERSONNEL INFORMATION

Principal Investigator: Bakas, Tamilyn **Department:** Nursing
(Last, First, Middle Initial – must have faculty/staff status or faculty sponsor must sign)

Building/Room No.: Nursing, NU 417 Phone: (317) 274-4695 E-Mail: tbakas@iupui.edu

Contact Information:

Name: Same as above Address: Phone:

Fax: E-Mail:

If this is a Student Protocol, List Name of the Student: Elizabeth A. Johnson Phone: 274-8033

Protocol Title: **Factors Associated with Post-Stroke Depressive Symptoms and Quality of Life**

Sponsor/Funding Agency: National Institute of Nursing Research PI on Grant: T. Bakas (faculty sponsor)

Sponsor Protocol #/Grant #: Individ. NRSA Predoc Fellowship submitted 4/06 Period: From: 9/1/06 to 5/30/08

Sponsor Type: ☒ Federal ☐ State ☐ Industry ☐ Not for Profit ☐ Unfunded; ☐ Internally Funded

Grant Title (if different from project title): Note: Student has also applied for in IUSON/NINR Institutional NRSA Predoc Fellowship submitted 5/1/06 that if funded will last from 6/1/06 through 5/30/08.

SECTION II: PROJECT TYPE

Refer to the **Checklist for Determining Whether an Activity Requires Review by the IUPUI/Clarian IRB** for additional information

☐ Research involving **only** one or more **deceased individuals**

Investigators must be able to provide proof that individuals are deceased if requested.

☐ Research using data derived from a **limited data set**

This project type may only be selected if the following is true: Your data set excludes 16 specified identifiers that are listed in the regulations, including: name, street address, telephone and fax numbers, e-mail address, social security number, certificate/license number, vehicle identifiers and serial numbers, URLs and IP addresses, and full face photos and other comparable images. The limited data set could include the following identifiable information: admission, discharge, and service dates, date of death, age (including age 90 and older), and five digit zip code.

Indicate from where the data is obtained:

☐ The data will be received from a covered entity (e.g. division, department, or practice plan) separate from that of the investigator. A **data use agreement** must be established between the entity(ies) supplying the data and the investigator. See the **SOP for Subject Confidentiality and Privacy** for additional information.

☐ The data will be obtained from within the investigator's own covered entity (e.g. his/her own data or that of the department). No data use agreement is required.

☐ Other, please explain:

☒ Research involving **de-identified data** created from PHI from a HIPAA covered entity

This project type may only be selected if the following is true: The health information excludes all of the following: (1) Name; (2) All geographic subdivisions smaller than a state, including street address, city, county, precinct, zip codes if the geographic unit of combining all the same three initial digits contains more than 20,000 people; (3) All elements of dates (except year) for dates directly related to an individual, including birth date, admission date, discharge date, date of death; and all ages over 89 and all elements of dates (including year) indicative of such age, except that such ages and elements may be aggregated in a single category of age 90 or older; (4) Telephone numbers; (5) Fax numbers; (6) Electronic mail addresses; (7) Social security numbers; (8) Medical record numbers; (9) Health plan beneficiary numbers; (10) Account numbers; (11) Certificate/license numbers; (12)

Vehicle identifiers and serial numbers, including license plate numbers; (13) Device identifiers and serial numbers; (14) Web universal resource locators (URLs); (15) Internet protocol (IP) address numbers; (16) Biometric identifiers, including finger and voice prints; (17) Full face photographic images and any comparable images; and (18) Any other unique identifying number, character, or code.

☐ Research involving **coded private information or biological specimens**[1]

To qualify for this type of review, the private information or specimens cannot be linked to specific individuals by the investigator(s) either directly or indirectly through coding systems. Address the following:

a. Was the private information or specimens collected specifically for this proposed research project through an interaction or intervention with living individuals?

☐ No.
☐ Yes. Your research involves human subjects and requires a human subjects research submission.

b. How will it be assured that the investigator(s) cannot readily ascertain the identity of the individuals to whom the private information or specimens pertain?

☐ the key to decipher the code will be destroyed before the research begins
☐ the investigator(s) and the holder of the key will enter into an agreement prohibiting the release of the key to the investigator(s) under any circumstances, until the individuals are deceased
☐ Other. Please explain:_____

[1] Refer to Guidance on Research Involving Coded Private Information or biological Specimens from OHRP at http://www.hhs.gov/ohrp/humansubjects/guidance/cdebiol.pdf.

SECTION III: PROJECT DESCRIPTION

1. Provide a brief description, in lay terms, of the purpose of the proposed project and the procedures to be used.

Stroke is the leading cause of disability in the US. Stroke survivors commonly experience depression and poor quality of life post-stroke. The purposes of this study are to (a) to determine the psychometric properties of the Appraisal of Health Scale in stroke survivors and (b) to conduct a secondary analysis of an existing longitudinal database of 392 stroke survivors to determine factors associated with depressive symptoms and quality of life.

De identified data will be obtained from Dr. Linda Williams, the principal investigator of the AIM study (1 R01 NS39571), a randomized clinical trial evaluating a case management approach to the treatment of post-stroke depression (see data transfer agreement from Dr. Williams). Data includes information regarding sample characteristics (including ages, but not birth dates), measurement scores, and responses to the intervention. De-identified data exclude the following identifying information: name, social security number, address, birth date, phone number, e-mail address, account numbers, or other characteristics that could distinguish an individual. The database will be provided on a computer system that is secure according to university policies and will be stored as a protected file. No access to identifiers will be available for this project. Any paper documents generated for this project will be kept in locked file cabinets in a locked office. Demographic information and responses to a schedule of patient assessments were recorded. Data were also collected for those subjects randomized to the intervention group regarding patient response to the previously described case management intervention. The longitudinal data base will include de-identified sample characteristics, medical co-morbidities, responses to questions about history of depression, and scores from instruments measuring stroke severity, functional ability, perceived social support, self-esteem, optimism, appraisal, severity of depressive symptoms, depression diagnosis, and both generic and stroke-specific quality of life among other variables. Screening scores for depressive symptoms and cognitive ability will also be available.

Data collection for the AIM study has been completed with no further stroke survivors being enrolled. Data for the AIM study were collected between April 2001 and February 2005. No new or additional data will be collected for the proposed study. The sponsor, Dr. Bakas, will closely monitor the safety of the de-identified data base and ensure that it will be securely kept on a password-protected computer system that is backed up nightly by the university.

Those involved in data analytic procedures and who plan to serve as either primary authors or co-authors on publications or presentations that may result from the findings include Elizabeth Johnson, Tamilyn Bakas, Susan Pressler, Joan Austin, Susan Perkins, and Linda Williams. All have received training on the protection of human subjects and all have completed the Indiana University Human Subjects Protection Test with passing scores. There is minimal risk of loss of confidentiality; however, this is highly unlikely because the database will be de-identified before the database is provided for this analysis.

Findings from this study will provide psychometric validation of the Appraisal of Health Scale that can then be used to determine factors associated with depressive symptoms and poor quality of life in stroke survivors. The findings from this study will provide information for future interventional research to help stroke survivors.

2. Provide a list of all data points that will be collected below or attach a data collection sheet.

Please see Research Description above for detailed information regarding database content.

Statement of Investigator. I have personally reviewed this application and agree with its contents.

Signature of Investigator: E-MAILED MAY 23 2006 Date: _____

☒ Accepted

☐ Denied
- ☐ Separate human subjects application must be submitted.
- ☐ Project doesn't meet ethical principles
- ☐ Other action required: _____

Authorized Signature: _____ Date: 25 May 2006

Department of Veterans Affairs

Memorandum

Date: July 21, 2006

From: Chairman, Research and Development Committee

Re: Review of Research Study

To: Tamilyn Bakas

1. Your research proposal entitled, "Factors Associated with Post Stroke Depressive Symptoms and Quality of Life" was reviewed by the VA Research and Development Committee on July 20, 2006. The action taken by the Committee is listed below:

   Approved / July 20, 2006

   Please be advised that before this study may begin at the VA all individuals involved in working on the study must complete the VA educational and credentialing requirements. For information on the needed documentation or to find out your credentialing status contact Judy Otter at 554-0000 ext. 2527.

2. If you have any further questions, please contact Robyn Bragg on ext. 2526.

APPENDIX C

AGREEMENT TO SHARE DATA

INDIANA UNIVERSITY

SCHOOL OF MEDICINE

DEPARTMENT OF NEUROLOGY
Emerson Hall 125
545 Barnhill Drive
Indiana University Medical Center
Indianapolis, Indiana 46202-5124
(317) 274-

February 28, 2006

It is my pleasure to write this letter of support for Elizabeth A. Johnson's proposal. I am willing to share the de-identified database compiled for the NIH funded project *AIM: A Randomized Trial of Treatment for Post-Stroke Depression* (R01 NS39571) of which I am the principal investigator. Her proposed project, testing the theoretical model used as the underpinning of our overall study design, is a further analysis planned in addition to our primary manuscripts. Ms. Johnson will continue attending the AIM Executive Committee meetings and will update this group on a regular basis regarding her progress.

As primary sponsor, Dr. Tamilyn Bakas will be directing Ms. Johnson's progress towards achieving the aims of this proposed study. Dr. Susan Pressler will serve as her co-sponsor. My role as Ms. Johnson's minor advisor will be to provide further support and consultation, and my expertise in evaluating patient-centered outcomes after stroke. In addition, I will be guiding Ms. Johnson in an independent study in which she will be learning about system-based and patient-based self-management interventions for post-stroke depression. This independent study will include an interdisciplinary focus including neurology, primary care, health psychology, and rehabilitation-based approaches to identifying and treating depression in stroke survivors.

Sincerely,

Linda S. Williams, MD
Chief of Neurology, Roudebush VAMC
Associate Professor of Neurology, IU School of Medicine
Research Scientist, Regenstrief Institute, Inc.
317.554.0000/2887

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Wyller, T. B. & Kirkevold, M. (1999). How does a cerebral stroke affect quality of life? Towards an adequate theoretical account. *Disability and Rehabilitation, 21*(4), 152-161.

Xie, J., Wu, E. Q., Zheng, S., Croft, J. B., Greenlund, K. J., Nensah, G. A., et al. (2006). Impact of stroke on health-related quality of life in the non-institutionalized population in the United States. *Stroke, 37*, 2567-2572.

Yang, Y. (2006). How does functional disability affect depressive symptoms in late life? The role of perceived social support and psychological resources. *Journal of Health and Social Behavior, 47*, 355-372.

Yu, D. S. F., Lee, D. T. F., Woo, J. & Thompson, D. R. (2004). Correlates of psychological distress in elderly patients with congestive heart failure. *Journal of Psychosomatic Research, 57*, 573-581.

CURRICULUM VITAE

Elizabeth A. Johnson

EDUCATION

Degree Granting Institution	Degree	Date Awarded
Indiana Central College	AD Nursing	May, 1975
Purdue University	BS Nursing	May, 1981
Indiana University	MSN	December, 1992
Indiana University	PhD	June, 2008

LICENSURE AND CERTIFICATION

Licensed, Registered Nurse, Indiana	1975 - present
Certified, Clinical Specialist in Gerontological Nursing	1994 - present

ACADEMIC APPOINTMENTS

Place	Title	Dates
Indiana Wesleyan University	Adjunct Faculty	2001 - 2004
Indiana University School of Nursing	Research Assistant	2004 - 2006
Indiana University School of Nursing	Associate Instructor	spring, 2008

CLINICAL APPOINTMENTS

Place	Title	Dates
Turtle Creek Nursing Home Ft. Wayne, IN	Nursing Assistant	1974
Lutheran Hospital Ft. Wayne, IN	Staff Nurse	1975 - 1977
Rochester Methodist Hospital Rochester, MN	Staff Nurse	1978 - 1979
West Central Neighborhood Services Ft. Wayne, IN	Community Health Nurse	1981 - 1986

St. Vincent Hospital Indianapolis, IN	Professional Staff Nurse	1990 - 1992
	Clinical Nurse Specialist	1992 - 1997
Marquette Manor Indianapolis, IN	Unit Manager	1997
Wishard Hospital/ IU Medical Group Indianapolis, IN	Clinical Nurse Specialist, Senior Care	1998 - 2000
Nation's CareLink Minneapolis, MN	Field Nurse	2000 - 2004
Geriatric Care Consultation Indianapolis, IN	Nurse Entrepreneur Consultant	2001 - 2007
Indiana University School of Nursing, Indianapolis, IN	Nurse Intervener TASK program	2005 - 2006

PROFESSIONAL SOCIETIES

Name	Dates
Academy of Medical-Surgical Nurses	1992 - 2005
American Stroke Association	2005 - present
Gerontological Society of America	2005 - present
Mid-West Nursing Research Society	2005 - present
National Gerontological Nurses Association	1994 - present
National Association of Clinical Nurse Specialists	1994 - present
Sigma Theta Tau	2008 - present

TEACHING ASSIGNMENTS

Indiana Wesleyan University (2001 - 2004)

Level	Course	Credits	Sections
BSN completion	Nursing's Role in the Health Care System	3	2
	Nursing Theory for the Clinician	3	1
	Gerontology	3	5
	Nursing Research	3	1
	Intercultural Nursing	3	1
	Management in Nursing	3	2
MSN	Care of the Aging and Chronically Ill Populations	2	3

Indiana University School of Nursing (2008)

BSN	B249 Fundamentals Clinical	2	1

SERVICE Dates

Committee Service

Indiana University School of Nursing
Dean's Council Student Representative 2004 - 2006

Community Service

Church at the Crossing, Indianapolis, IN
5th & 6th grade Sunday School Team Leader and Lead Teacher: Preparing for Adolescence program 1996 - 2006
Health Ministries Team 2007 - 2008

Regional Service

Academy of Medical-Surgical Nurses
Central Indiana Chapter program chair 1993 - 1995
Central Indiana Chapter president 1995 - 1997

Central Indiana Gerontological Nurses Association
Central Indiana Chapter president 2002 - 2005
Program chair for annual Celebration of Excellence in Geriatric Nursing Care dinner 2002 - 2005
Planning committee member and presenter Best Practices in Care of Older Adults workshop 2005

National Service

National Association of Clinical Nurse Specialists
Gerontology Task Force 2004 - 2006

AWARDS AND HONORS

Best Poster Award - Johnson, E. A., Bennett, S. J., Bakas, T., & Sheneyfelt, T. "What about Family Caregivers of Patients with Heart Failure?" 30th Annual Patient Care Research Conference, Indianapolis, IN, December, 2004.

Who's Who among Students in American Universities and Colleges, 2007.

Indiana University School of Nursing graduate student representative at the 2008 Midwest Nursing Research Society Student Poster Competition. "Psychometric Testing of an Appraisal Measure for Stroke Survivors."

PROFESSIONAL ACTIVITIES

Poster Presentations

Johnson, E. A., Bakas, T., Lyon, B. L., & Williams, L. S. (2008, March). *Psychometric testing of an appraisal measure for stroke survivors*. Midwest Nursing Research Society 2008 Graduate Student Poster Competition, Indianapolis, IN.

Johnson, E. A., Bakas, T., Lyon, B. L., & Williams, L. S. (2008, February). *Evaluation of the Appraisal of Health scale in stroke survivors*. International Stroke Conference, New Orleans, LA.

Johnson, E. A., Bennett, S. J., Bakas, T., & Sheneyfelt, T. (2004, December). *What about family caregivers of patients with heart failure?* 30th Annual Patient Care Research Conference, Indianapolis, IN.

Bennett, S. J., Bakas, T., Johnson, E. A., & Shaneyfelt, T. (2004, November). *What about family caregivers of patients with heart failure?* Heart Failure Society of America, 8th Annual Scientific Meeting, San Diego, CA.

Presentations

Bakas, T. & Johnson, E. A. (2008, March). *Meeting the needs and concerns of stroke family caregivers.* Community Hospitals of Indianapolis, Hook Rehabilitation Center, Stroke Support Group, Indianapolis, IN.

Bakas, T., Farran, C. J., Austin, J. K., Given, B. A., Perkins, S. M., Johnson, E. A., & Williams, L. S. (2008, February). *Stroke caregiver outcomes from the Telephone Assessment and Skill-building Kit (TASK) for Stroke Family Caregivers*. Paper presented at International Stroke Conference, New Orleans, LA.

Bakas, T., Farran, C. J., Austin, J. K., Given, B. A., Johnson, E. A., & Williams, L. S. (2007, November). *Program Evaluation Outcomes from the Telephone Assessment and Skill-Building Kit (TASK) for Stroke Family Caregivers.* American Academy of Nursing 34th Annual Meeting and Conference, Washington DC.

Bakas, T., Farran, C. J., Austin, J. K., Given, B. A., Johnson, E. A., & Williams, L. S. (2007, July). *Stroke caregiver intervention pilot study (TASK program).* Invited presentation for New Approaches in Caregiver Research and Interventions, Robert-Bosch-Hospital, Clinic for Geriatric Rehabilitation, Eberhard Karls Universitat Tubingen, Stuttgart, Germany.

Bakas, T., Farran, C. J., Austin, J. K., Given, B., Johnson, E. A., & Williams, L. S. (2007, April). *Content validity, feasibility, and acceptability of the telephone assessment and skill building kit (TASK) for family caregivers of stroke survivors*. Invited concurrent session presented at 10th Biennial VA Nursing Research Conference, Ft. Wayne, IN.

Johnson, E. A., Bakas, T., & Lyon, B. L. (2007, April). A*ppraisal in stroke survivors: A new use for an old concept.* (findings regarding face and content validity for Appraisal of Health Scale). Invited concurrent session at 10th Biennial VA Nursing Research Conference, Ft. Wayne, IN.

Johnson, E. A., Bakas, T., & Lyon, B. L. (2006, December). *Appraisal in stroke survivors: A new use for an old concept.* Concurrent session presented at the 32nd Annual Nursing Research Conference: Relationship-Centered Care, Indianapolis, IN.

Bakas, T. & Johnson, E. A. (2006, June). *Telephone-based support for family caregivers of stroke survivors: Overview of the TASK program*. Community Hospital East Stroke Support Group presentation, Indianapolis, IN.

Publications

Johnson, E. A., Bakas, T., & Williams, L. S. (2008). *Psychometric evaluation of the Appraisal of Health scale in stroke survivors.* (Manuscript in process). Indiana University.

Johnson, E. A., Bakas, T., Lyon, B. L., & Williams, L. S. (2008). Evaluation of the Appraisal of Health Scale in stroke survivors [Abstract]. *Stroke, 39*(2), 682.

Bakas, T., Farran, C. J., Austin, J. K., Given, B. A., Perkins, S. M., Johnson, E. A., & Williams, L. S. (2008). Stroke caregiver outcomes from the Telephone Assessment and Skill-building Kit (TASK) for Stroke Family Caregivers [Abstract]. *Stroke, 39*(2), 550.

Johnson, E. A., Bakas, T., & Lyon, B. L. (2008). Cognitive Appraisal of Health Scale: Early Instrument Development. *Clinical Nurse Specialist: The Journal of Advanced Nursing Practice, 22*(1), 12-18.

Johnson, E. A., Bakas, T. & Williams, L. S. (2007). Post-stroke depression: Focus on diagnosis and management during stroke rehabilitation. *Geriatrics and Aging, 10*(8), 492-496.

Bakas, T., Pressler, S. J., Johnson, E. A., Nauser, J., & Sheneyfelt, T. (2006). Family caregiving in heart failure. *Nursing Research, 55*(3), 180-188.

Bennett, S. J., Bakas, T., Johnson, E. A., & Sheneyfelt, T. (2004). What about family caregivers of patients with heart failure? [Abstract]. *Journal of Cardiac Failure, 10*(4) (Suppl.), S100.

FELLOWSHIPS AND GRANTS

Graduate Minor in Aging Fellowship	$18,805	September, 2004 - June, 2005
Indiana University-Purdue University, Indianapolis Graduate Student Fellowship	$ 4,400	September, 2004 - June, 2005
Research Incentive Fund Fellowship	$15,000	September, 2005 - June, 2006
NIH Institutional Predoctoral Research Training Grant (NRSA) PHS T32 NR07066	$ 3,462	July 2006 - August, 2006
NIH Individual Predoctoral Research Training Grant (NRSA) NIH F31 NR010156-01	$51,730	August, 2006 - May, 2008
Research Incentive Fellowship	$10,000	August, 2006 - May, 2007
Research Incentive Fellowship	$10,000	August, 2007 - May, 2008