UNIVERSITI PUTRA MALAYSIA

QUALITY OF LIFE OF STROKE SURVIVORS AND THEIR FAMILY CAREGIVERS AT SELECTED REFERRAL REHABILITATION CARE CENTERS

KHAW WAN-FEI

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By

KHAW WAN-FEI

Thesis Submitted to the School of Graduate Studies,
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QUALITY OF LIFE OF STROKE SURVIVORS AND THEIR FAMILY CAREGIVERS AT SELECTED REFERRAL REHABILITATION CARE CENTERS

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November 2017

Chair: Syed Tajuddin Syed Hassan, PhD
Faculty: Medicine and Health Sciences

Stroke disability results in hardship to both patients and families. Care for stroke patients can be stressful and lead to deterioration of quality of life (QOL). Despite the large number of stroke cases, limited local data are available on the impact of stroke on QOL of stroke survivors and caregivers, and little is known regarding the interdependence of QOL within the dyad. Thus, this study was developed to evaluate overall QOL of stroke survivors and caregivers, and determined factors predicting QOL. Dyadic analysis using Actor-Partner Interdependence Model (APIM) examined whether stroke survivor's and caregiver's QOL at baseline, predicts his or her own QOL at six months follow-up (actor effect) and partner's QOL at follow-up (partner effect).

This was a prospective study that involved 160 stroke survivors and 160 caregivers recruited from neurology clinics in Hospital Kuala Lumpur and Hospital Rehabilitasi Cheras in Klang Valley, Malaysia. The six months follow-up included 38 stroke survivors and 38 caregivers. Socio-demographic and medical conditions, caregiving appraisal, coping strategies and QOL were obtained from stroke survivors and caregivers. The data were entered and analysed using the IBM SPSS for Windows, Version 22.0 and IBM SPSS AMOS, Version 22.0. Univariate analysis was used to clean and check the quality of data. Bivariate analysis was performed to examine the bivariate relationships among predictor variables and stroke survivor's and caregiver's QOL. Confirmatory factor analysis (CFA) was used to test dimensionality of the QOL measure of five indicators: physical health, mental health, general health, peace, and faith. Path analysis was used to determine the direct and indirect effects of predictors on QOL in both stroke survivors and caregivers, and to assess the APIM model for survivor-caregiver dyads.

CFA results indicated acceptable goodness-of-fit of one-factor QOL model ($\chi^2(12) = 42.265$, $p < 0.001$; RMSEA = 0.063; SRMR = 0.038; CFI = 0.970), which included five indicators: physical health, mental health, general health, peace, and faith. Stroke survivors rated lower QOL scores compared to caregivers (*M* = 57.96, *SD* = 15.06 versus *M* = 45.50, *SD* = 16.65). Six determinants with both a direct and indirect effect on the QOL of stroke survivors were age, duration of stroke, stroke severity, cognitive function, physical function, and psychological distress. Seven determinants with both a direct and indirect effect on the QOL of stroke caregivers were caregiver's age, stroke severity, social support, adaptive coping, maladaptive coping, caregiving burden, and caregiving satisfaction. Actor effects between stroke survivor's QOL ($\beta = 0.79$, $p < 0.001$) and caregiver's QOL ($\beta = 0.76$, $p < 0.001$) at baseline and follow-up were significant. This indicates that stroke survivor's and caregiver's QOL at baseline were positively related to their own QOL at 6-months-follow-up.

These findings highlight the overall QOL score integrates all the measures of health status of stroke survivors and their caregivers. The APIM dyadic analysis provides insight into the relationships between stroke survivor's and caregiver's QOL. Thus, this study definitively indicates the necessity for arranging interventions targeting both stroke survivors and family caregivers, to enhance their QOL in the rehabilitation process.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KUALITI HIDUP PESAKIT STROK DAN PENJAGA MEREKA DI PUSAT RUJUKAN RAWATAN DAN PEMULIHAN YANG TERPILIH

Oleh

KHAW WAN-FEI

November 2017

Pengerusi: Syed Tajuddin Syed Hassan, PhD
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Ketidakupayaan pesakit akibat strok menyebabkan kesukaran kepada kedua-dua pesakit dan keluarga. Menjaga pesakit strok boleh menyebabkan stres dan kemerosotan kualiti hidup ("QOL"). Walaupun bilangan kes strok yang tinggi, namun hasil kajian tempatan mengenai kesan stroke terhadap kualiti hidup pesakit and penjaga keluarga adalah terhad. Tambahan pula, pengetahuan mengenai kualiti hidup bagi pasangan pesakit dan penjaga dalam konteks saling bergantungan masih kekurangan. Oleh itu, kajian ini bertujuan menilai "Overall QOL" bagi pesakit strok dan penjaga mereka. Kajian ini juga menentukan faktor-faktor yang mempengaruhi kualiti hidup. Analisis diad dijalankan dengan menggunakan "Actor-partner interdependence model" ("APIM") untuk mengenalpasti pengaruh kualiti hidup terhadap sendiri, kesan actor dan kualiti hidup terhadap pasangan mereka, kesan partner, di peringkat awal dan susulan.

Kajian dijalankan secara prospektif dengan melibatkan 160 pesakit strok dan 160 penjaganya, dari klinik neurologi Hospital Kuala Lumpur dan Hospital Rehabilitasi Cheras di Lembah Klang, Malaysia. Seramai 38 pesakit strok dan 38 penjaga mereka terlibat dalam kajian susulan enam bulan kemudian. Ciri sosio-demografi dan perubatan, penilaian penjagaan, strategi menghadapi stress, dan kualiti hidup diperolehi daripada pesakit strok dan penjaga mereka. Data yang diperolehi dianalisis dengan menggunakan perisian IBM SPSS for Windows, Version 22.0 dan IBM SPSS AMOS, Version 22.0. Analisis univariat digunakan untuk meneliti dan memeriksa kualiti data. Analisis bivariat dilakukan untuk meneliti hubungan bivariat antara pembolehubah ramalan dan QOL bagi pesakit dan penjaga strok. Analisis faktor konfirmatori ("CFA") digunakan untuk menguji dimensi skor QOL bagi lima indikator: kesihatan fizikal, kesihatan mental, kesihatan umum, keamanan, dan iman. Analisis jalur ("Path analysis") juga dijalankan untuk menentukan kesan langsung dan tidak langsung terhadap QOL, bagi kedua-dua pesakit dan penjaga strok, serta menilai model diad “APIM” bagi pesakit strok dan penjaga mereka.

Keputusan analisis “CFA” menunjukkan “One-factor QOL model” adalah bersesuaian dengan data ($\chi^2(12) = 42.265$, $p < 0.001$; RMSEA = 0.063; SRMR = 0.038; CFI = 0.970). Model ini merangkumi lima indikator: kesihatan fizikal, kesihatan mental, kesihatan umum, keamanan, dan iman. Nilai min skor “QOL” bagi pesakit adalah lebih rendah berbanding dengan penjaga ($M = 57.96$, $SD = 15.06$ berbanding $M = 45.50$, $SD = 16.65$). Enam penentu yang mempengaruhi “QOL” bagi pesakit strok secara langsung dan tidak langsung ialah umur pesakit, tempoh strok, tahap strok, fungsi kognitif, fungsi fizikal, dan tekanan psikologi. Tujuh penentu yang mempengaruhi “QOL” bagi penjaga stroke secara langsung dan tidak langsung ialah umur penjaga, tahap strok, sokongan sosial, “adaptive coping”, “maladaptive coping”, beban penjagaan, dan kepuasan penjagaan. Pada kedua-dua peringkat pengukuran, awalan dan enam bulan kemudian kesan aktor adalah signifikan, bagi kedua-dua pesakit “QOL” ($\beta = 0.79$, $p < 0.001$) dan penjaga “QOL” ($\beta = 0.76$, $p < 0.001$). Dengan menggunakan model “APIM” bagi pesakit dan penjaga, nilai “QOL” pada peringkat awal mempengaruhi nilai “QOL” pada peringkat susulan secara positif.

Hasil kajian ini jelas menunjukkan skor “QOL” adalah penting untuk menilai status kesihatan pesakit strok dan penjaga mereka. Model “APIM” pula dapat memberikan gambaran tentang hubungan antara “QOL” bagi pesakit dan penjaganya. Oleh itu, kajian ini menekankan kepentingan untuk merancang intervensi bagi kedua-dua pesakit dan penjaga strok supaya QOL mereka dapat ditingkatkan bersama dalam proses pemulihan.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

ADL	Activities of daily living
APIM	Actor-Partner Interdependence Model
BI	Barthel Index
CFA	Confirmatory factor analysis
CFI	Comparative Fit Index
CI	Confidence interval
CRA	Caregiver Reaction Assessment Scale
DALYs	Disability-adjusted life years
FACIT-Sp	Functional Assessment of Chronic Illness Therapy-Spiritual Wellbeing Scale
HADS	Hospital Anxiety and Depression Scale
HRQOL	Health-related quality of life
ICF	International Classification of Functioning, Disability, and Health
MCS	Mental component summary
MMSE	Mini-Mental State Examination
MOS-SSS	Medical outcomes study social support survey
OR	Odds ratio
PA	Path analysis
PAC	Positive Aspects of Caregiving Scale
PCS	Physical component summary
QOL	Quality of life
REGARDS	REason for Geographical and Racial Differences in Stroke study
RMSEA	Root mean square error of approximation
SEM	Structural equation modelling
SF-12	12-Item Short-Form Health Survey
SF-36	36-Item Short-Form Health Survey
SRMR	Standardized root mean square residual
WHOQOL	World Health Organization Quality of Life Group

CHAPTER 1

INTRODUCTION

1.1 Background

Stroke is the second leading cause of death globally and common cause of permanent disability. Worldwide, an estimated 16.9 million people are affected by stroke and 5.9 million deaths annually (Feigin et al., 2014). These numbers are expected to rise to 70 million stroke survivors and 12 million stroke deaths by 2030. For the year 2009, 52,000 cases of hospitalisation for stroke and 2,300 deaths were estimated to have occurred in government hospitals in Malaysia. The Malaysian National Burden of Disease Study showed stroke ranked second among top 10 leading cause of burden of disease. Stroke incidence in Malaysia has been estimated at 96/ 100,000 for ischemic stroke and 21/ 100,000 for hemorrhagic stroke in 2014 (Aziz et al., 2015).

Stroke is the main cause of disability in adult life and this has placed a tremendous burden on healthcare systems, families, and economics. About 15% to 30% of stroke patients with permanent impairments and 20% need institutional care after a stroke. Among those who survived, more than 60% stroke patients had incomplete recovery (Scherbakov, Von Haehling, Anker, Dirnagl, & Doehner, 2013). Stroke-related disability includes physical, social and cognitive functions. Approximately 70-80% of survivors manifest paralysis, speech disabilities or emotional problems. Apart from functional disability, the long-term effects of stroke include fatigue, cognitive and psychological problems (Mohd Zulkifly, Ghazali, Che Din, Singh, & Subramaniam, 2016). These impairments were linked to lower levels of quality of life (QOL) (Algurén, Fridlund, Cieza, Sunnerhagen, & Christensson, 2012; Azlin & Rizal, 2009).

Cross-sectional data suggest that QOL after stroke is significantly impaired (Bach et al., 2011; Cerniauskaite et al., 2012). However, data from longitudinal studies are limited and they showed similar trend to the cross-sectional studies (Algurén et al., 2012; Haley, Roth, Kissela, Perkins, & Howard, 2011; Hamza, Al-Sadat, Loh, & Jahan, 2014). A research that examined 85 stroke patients during rehabilitation and 6 months after discharge, noted that the patients' QOL scores improved significantly during inpatient rehabilitation, followed by a decline in the 6 months after discharge (Hopman & Verner, 2003). In addition, patients reported poorer QOL were associated with reduced functional recovery (Nichols-Larsen, Clark, Zeringue, Greenspan, & Blanton, 2005).

Stroke is a leading cause of persistent disability and handicap, affects all aspects of patient life including physical, behavioural, psychological, and social functioning. These resulting impairments after stroke can affect both stroke survivors and their caregivers (Algurén et al., 2012). Around 80% of stroke survivors return to community living after stroke, they rely on emotional and physical support from family members, such as spouses, adult children and siblings, close friends and sitters to aid in their recovery. In addition, stroke is a sudden and unpredictable event and caregivers often feel unprepared for their caregiving role, and these changes can be very stressful for both stroke patients and caregivers (Ostwald, Bernal, Cron, & Godwin, 2009).

Stroke caregivers have lower QOL than norms and caregivers' QOL are lower than those of the stroke patients (Akosile, Okoye, Nwankwo, Akosile, & Mbada, 2011; McPherson, Wilson, Chyurlia, & Leclerc, 2011; Parag et al., 2008). Caregivers of stroke survivors have been associated with higher levels of depression and reduced QOL (Godwin, Swank, Vaeth, & Ostwald, 2013b). The QOLs of stroke patients and their caregivers were influenced by various factors, such as ages and gender of patients and caregivers, patients' functional ability and social involvement (Jönsson, Lindgren, Hallström, Norrving, & Lindgren, 2005).

Although caregiving burden has been shown to decrease caregivers' physical and psychological QOL, caregivers have expressed increased in life satisfaction, enjoyments in caregiver role, and better problem solving and coping ability (Haley et al., 2009). Some caregiver studies draw conclusions that suggest caregivers' experiences are more positive than negative (Cameron, Stewart, Streiner, Coyte, & Cheung, 2014; Haley et al., 2009). For example, stroke family caregivers reported that caregiving enabled to appreciate life more, feeling needed and appreciated and developing a more positive attitude toward life. Positive caregiving experiences are associated to better physical and mental health, as well as better QOL. In a systematic review, it has been suggested that the need for more research examining both the positive and negative experiences of caregiving in stroke (Mackenzie & Greenwood, 2012). The significance of positive caregiving experiences is pronounced, and future work is needed to determine factors associated with positive impacts of caregiving and to establish strategies to improve positive caregiving experiences.

1.2 Statement of problem

Quality of life (QOL) is a useful indicator of overall health. It captures data on the physical, psychological, social and spiritual health of individuals. QOL of stroke survivors and caregivers are usually assessed by using multiple indicators of self-rated health status, physical and emotional functioning, social and spiritual well-being (Algurén et al., 2012; Hamza et al., 2014; Zhang, Sun, Wu, & Xia, 2013). However, these measures have been used separately and a cohesive picture of overall QOL has not been published. There is a need to identify a measure of QOL score, including general health, physical, mental, faith, and peace in stroke survivors and caregivers.

Much of the stroke research identifying possible socio-demographic, functional status, and behavioural factors contributing to QOL have used linear regression to identify predictor variables significantly associated with QOL (Saha, Harries, & Gilhooly, 2016). Despite a number of studies examining the factors that predict QOL, little is known about the complex inter-relationships between numerous predictors (Algurén et al., 2012; Ellis, Grubaugh, & Egede, 2013; Haley et al., 2011). Path analysis, an alternative statistical technique, is considered as an appropriate statistical method for such an explorative study to better understand the complex interrelation between the variables. Path analysis identifies direct and indirect pathways in which a set of predictor variables influences outcome variable. However, these factors have not been extensively studied using path analysis and available studies show inconsistent findings (Chen et al., 2015; Howitt et al., 2011; Morris, van Wijck, Joice, & Donaghy, 2013).

Care for stroke patients has been reported as a complex caregiving process. The relationship between caregiving stressors and caregiver outcome is influenced by caregiving appraisal and coping variables. Some studies have documented that caregivers adapt to challenges and problems of caregiving over time, whereas others have shown caregiving strain and burden are continuing to increase over time (Godwin et al., 2013b; McLennon, Bakas, Jessup, Habermann, & Weaver, 2014). However, the benefits of caregiving have been reported (Haley et al., 2009). Nevertheless, research on identifying of both positive and negative impacts of caregiving is underdeveloped. Information on factors that improve or deteriorate QOL is lacking. Also, the data on how survivors and family caregivers influence each other's QOL after a stroke are not available.

Despite the large number of stroke cases, there are limited local data on the impact of stroke on the family caregivers. There are many interpersonal and contextual variables influencing caregiver quality of life, many of which interact with one another, thus creating a distinctively unique experience for each caregiver. Caregiving stressors, appraisal, coping and social supports, and care-recipient conditions may influence caregiver QOL, but few studies considered the combined impact of all the variables (Ostwald et al., 2009; Yu, Hu, Efird, & McCoy, 2013). Existing studies examining predictors of caregiver burden and QOL are limited in terms of scope because they do not consider all important variables in a single comprehensive model.

Research on the impact of stroke on QOL tends to focus on the patients. However, there is evidence that the outcomes of caregivers and patients are interdependence (McCarthy, Lyons, & Powers, 2011). Significant positive correlations have been found between the outcomes of caregivers and care-recipients on QOL (Cramm, Strating, & Nieboer, 2012), distress, and depression (Ostwald et al., 2009). Since stroke survivors and their caregivers health outcomes are affected by patient's health situation, interactions in patient and caregiver dyads should be considerate in stroke studies. There is interdependence between stroke survivor and caregiver, because they share thoughts and feelings, extend mutual support, and encouragement from each other.

Ostwald et. al. (2009) have shown the mutual influence both stroke patients' and family members' stress and QOL. Thus, there is a need to study the impact of stroke on health outcomes that considers dyads as the unit of analysis.

Even though many QOL studies have reported experiences of stroke patients and caregivers by focusing on the individual level of analysis (Algurén et al., 2012; Haley et al., 2009; Saha et al., 2016), there has been very little research reported using the dyad level of analysis. The need of dyadic research in post-stroke QOL has been emphasized, and studies have identified relational factors in QOL following stroke for patients and caregivers, such as coping patterns, social supports, and burden (Opara & Jaracz, 2010; Visser et al., 2015). Moreover, dyadic studies have linked patients' QOL with their caregivers' QOL (Bergström, Eriksson, von Koch, & Tham, 2011; Cramm et al., 2012), but no studies have longitudinally studied the dyadic relations between patients' and their caregivers' QOL to understand the process of patient's recovery and caregiving experiences. It was necessary to study how a stroke impacts both persons individually as well as together over time.

Previous findings have shown in a dyad, mutual impacts on QOL occurred (Bergström et al., 2011; Cramm et al., 2012). Information on QOL of stroke survivors and caregivers are limited from developed countries. Since there are ethnic and cultural differences in QOL measures, there may also be differences in the patterns of QOL scores of stroke patients and caregivers in Malaysia. However, there are no local baseline data on the interrelationship of stroke survivors and caregivers QOL during the rehabilitation process. Thus, there is a need to investigate a dyadic relationship of stroke survivors and caregivers QOL across six months of stroke rehabilitation.

1.3 Research questions

The following research questions guided this study:

1. What are the overall QOL scores for stroke survivors and caregivers?
2. What are the factors associated with QOL scores of stroke survivors and caregivers?
3. Is there an interrelationship between QOL scores stroke survivors and caregivers over time?

1.4 Objectives of study

General objective:
To determine QOL scores in stroke survivors and caregivers and dyadic relations of stroke survivors' and their caregivers' QOL scores over two time points.

Specific objectives:

1. To identify a one-factor QOL model for stroke survivors and caregivers.
2. To determine the relationships between stroke survivor socio-demographic and medical conditions, functioning and disability, and QOL in stroke survivors.
3. To determine the relationships between caregiver variables, caregiving appraisal, coping strategies, and QOL in stroke caregivers
4. To determine the dyadic relationships between stroke survivors' and caregivers' QOL scores over two time points.

1.5 Research hypotheses

1. There is a one-factor QOL model that underlies scores on general health, physical health, mental health, peace, and faith for stroke survivors and caregivers.
2. There are direct and indirect effects of stroke survivor socio-demographic and medical conditions, functioning and disability, and QOL in stroke survivors.
3. There are direct and indirect effects of caregiver variables, caregiving appraisal, coping strategies, and QOL in stroke caregivers.
4. Stroke survivors' and caregivers' QOL scores would be positively related to their own and others' QOL over two time points.

1.6 Research conceptual framework

The research framework for this study is presented in Figure 1. This research framework displays the factors that influenced QOL scores of stroke survivors and caregivers. Next, the dyadic relationships among stroke survivors' and caregivers' QOL over time were examined.

In this study, QOL in stroke survivors and caregivers consisted of physical, mental, social, and spiritual domains. The first goal of this study was to identify overall QOL scores for stroke survivors and their caregivers. It hypothesized that there was one-factor QOL model that underlies the indicators on general health, physical health, mental health, peace, and faith. CFA was used to test dimensionality of the measure for five QOL indicators: physical health, mental health, general health, peace, and faith. The overall QOL score values were generated using weighted factor score values from one-factor QOL model.

QOL concepts and integrative biopsychosocial model of functioning, disability and health had been applied in the stroke rehabilitation and outcomes (Geyh, Cieza, Kollerits, Grimby, & Stucki, 2007). This model conceptualizes a person's functioning and disability as a dynamic interaction between health conditions and contextual factors, such as individual, social, and environmental factors. In this connection, and to address the second goal of this study related to identify the factors that influenced QOL scores of stroke survivors were analysed by using path analysis. This research included the following categories of variables: socio-demographic and medical conditions, and functioning and disability (e.g., physical function, cognitive function, and psychological distress). Socio-demographic and medical conditions of stroke survivors were presumed to affect stroke survivor's QOL directly as well as indirectly through levels of functioning and disability.

The review of literature had examined the impact of numerous variables on caregiver's QOL, all of which were examined using structural equation modelling. The caregiver model for studying determinants of QOL in stroke caregivers was developed by identifying relevant factors from literature and mapping with coping and stress models (Chronister & Chan, 2006). Using this framework as a guide and theoretical and empirical evidence that supports the role of coping strategies and social support in adjustment to stress in stroke caregiving (Nir, Greenberger, & Bachner, 2009; Ostwald et al., 2009; Visser-Meily et al., 2009; Yu et al., 2013). In this research framework for caregiver's QOL, factors that affected caregivers' QOL include: caregiver variables, caregiving appraisal (e.g., satisfaction, burden), and coping strategies (e.g., adaptive, maladaptive coping). The framework was designed to provide a comprehensive depiction of determinants of caregiver QOL.

The purpose of this study was to determine caregiver's QOL, caregiving satisfaction, and caregiving burden during caregiving period. It was hypothesized that caregiver variables influenced caregiver QOL directly as well as indirectly through measures of caregiving appraisal and coping strategies. Next, the role of caregiving satisfaction, burden, and coping on caregivers' overall QOL scores were examined. Coping strategies were hypothesized to have direct and indirect effects on caregivers' QOL. In addition, coping strategies and caregiving appraisal were mediated the relationships between the caregiver variables and caregiver QOL.

Existing studies examined the presence of interdependence relationship between QOL among stroke survivors and caregivers (Kim, Reed, Hayward, Kang, & Koenig, 2011). The illness of a family member causes physical, emotional, and financial stresses, which influences the quality of life of other family members. Family members have a strong influence on a patient's psychological adjustment and management of illness. Further, the Actor-Partner Interdependence Model (APIM) provided both a conceptual and methodological view of understanding interdependent influences within dyadic relationship (Kenny, Kashy, & Cook, 2006). The APIM dyadic analysis uses the dyad as the unit of analysis and not individuals and provides estimates of actor and partner effects. Based on the APIM, it is possible to explore the actor and partner effects of QOL among stroke survivors and their caregivers at two time points. The study examined whether stroke survivor's and caregiver's QOL at baseline predicts his or her own QOL at six months of rehabilitation (e.g., an actor effect) and his or her partner's QOL at six months of rehabilitation (e.g., a partner effect).

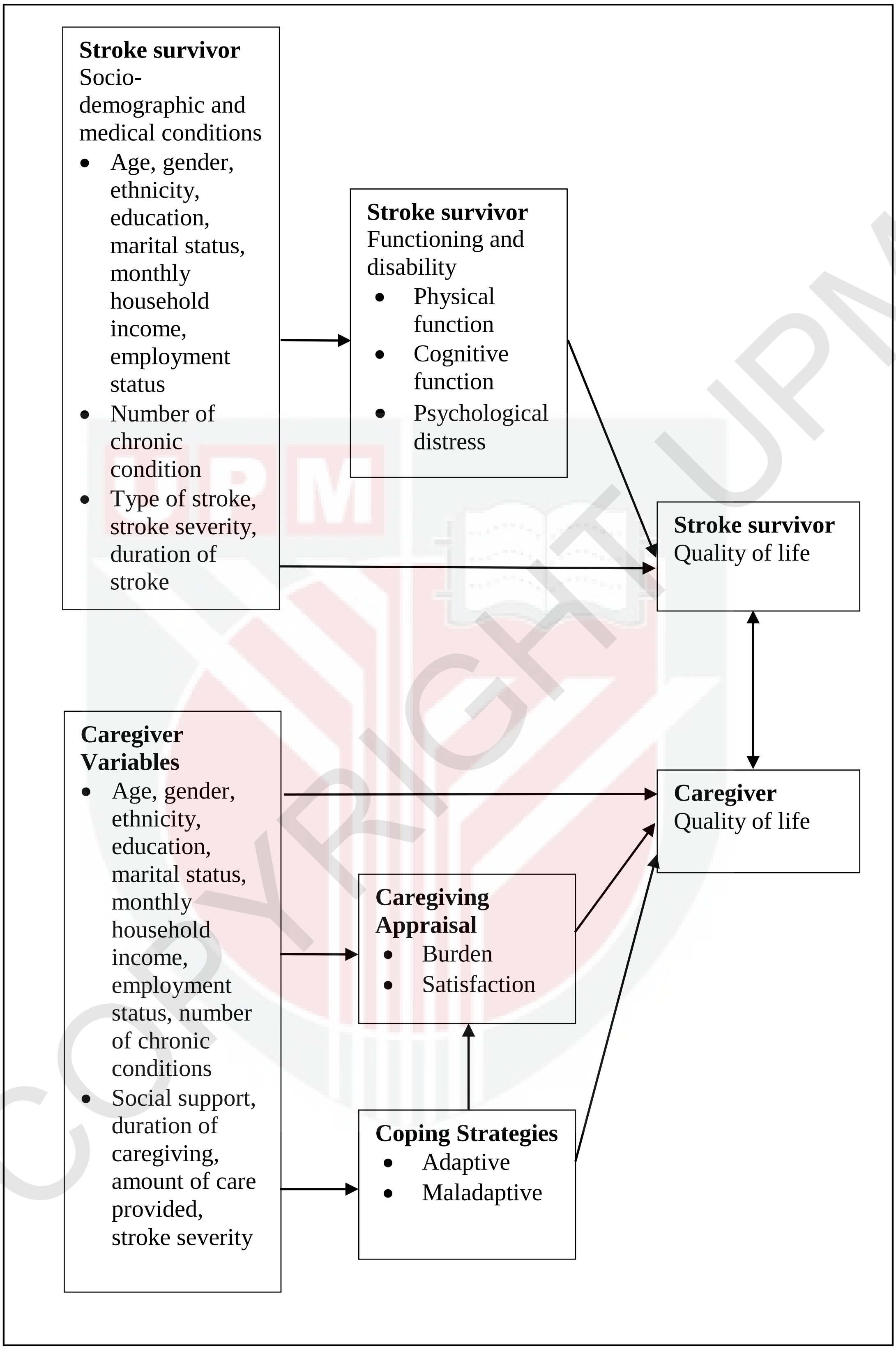

Figure 1: Conceptual framework of the QOL model of stroke survivors and caregivers

1.7 Significance of study

In order to view QOL comprehensively, researchers have sought a way to summarize these QOL measures. An overall QOL score, including general health, physical, mental, faith, and peace indicators, was assessed in this study among stroke survivors and caregivers. The resulting overall QOL score may be applied to determine stroke population health status, assess health disparities among stroke survivors and caregivers, and identify risk factors of overall QOL. Measuring overall QOL score of stroke survivors and caregivers could be used to assist health professionals in assessing the effects of illness and treatment or rehabilitation.

This study makes an important contribution to the literature by filling a void that addresses a public health issue and provides preliminary research of family caregiving following stroke. Since caregiving has been shown to have an important and increasing impact on stroke patients, this first study using local samples has been carried out. The study provided a comprehensive model in explaining caregiving appraisal and coping strategies and its relation to QOL. Every caregiver adapts to burden differently during caregiving process. Knowledge on coping strategies and social support will guide healthcare providers to intervene using effective strategies to improve supportive care and psychological adjustment for caregivers to enhance their overall QOL. Hence, interventions designed to meet family caregivers' needs need to be implemented.

In addition, family caregiving of stroke patients not only have negative experiences, but also positive feelings in their caregiver role. This information is important as to determine whether stroke caregivers find benefits in their role and activities or caregivers experience high levels of stress and burden. This information will enrich caregiving knowledge within the Malaysian culture and thus help healthcare providers view comprehensive picture of family caregiving in stroke rehabilitation. Different coping strategies can be introduced to caregivers with different situation. Rehabilitation programs highlighting coping resources, including problem-focused coping styles and positive relationship coping strategies for caregivers, and psychoeducation programs to inform caregivers about stroke-related information, and readjustment of caregiver's life (Cheng, Chair, & Chau, 2014) can be used to minimize negative caregiving experiences.

The effects of stroke on daily living and well-being are interdependence between two persons in the dyad. Better understanding of dyad situation may serve as a baseline data for identifying vulnerable dyads in order to provide targeted support. Furthermore, a better understanding of the dyadic relations between stroke survivors and caregivers QOL over time can provide additional evidence and implications to stroke rehabilitation. QOL scores of stroke survivors and caregivers have important clinical implications for exploration of risk factors for stroke survivors and caregivers at risk of poor health outcomes.

This study assesses important caregiver and survivor interdependent relationship that could add to the existing literature on QOL studies after a stroke. Stroke disability extracts a toll on the QOL of patients and caregivers, these caregivers have an impact on the patient’s adjustment to illness and recovery. Since there are interdependence relationship of QOL among dyads, there may also be changes in QOL among stroke patients and caregivers over time. Therefore, this study is the first kind in Malaysia to determine the dyadic relationships in QOL of stroke patients and caregivers over two time points. However, the APIM model in longitudinal dyadic study to examine the change in QOL are virtually unknown. The information can also contribute to the existing literature and prompt other researchers to investigate further on the mechanisms that contribute to dyadic relations of QOL of stroke survivors and caregivers. Consequently, the information can be used to promote the important of family interventions in successful stroke rehabilitation, not only direct rehabilitation for stroke survivors but also caregivers are an integral part of stroke rehabilitation process.

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LIST OF PUBLICATIONS

Khaw WF, Hassan STS, Lye MS & Siti Irma FI. 2017. Comparing Spirituality and Quality of Life between Stroke Survivors and Their Family Caregivers. International Journal of Public Health and Clinical Sciences, 4(6), 41-51.

Khaw WF, Hassan STS, Lye MS, Siti Irma FI, Rosna AR, Faisal I. 2017. Depression, anxiety and quality of life in stroke survivors and their family caregivers: A pilot study using an actor/partner interdependence model. Electronic Physician 9 (8), 4924-4933.

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