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Quality of life of stroke's patient: Systematic literature review

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***Abstract*---**Stroke is a prevalent issue within the community as the diagnosis of stroke plays an essential role in the Quality of life (QoL) of the patient. This study is a Systematic Literature Review (SLR) of QoL of stroke patients according to the statement of Preferred Reporting Items for Systematic Review (PRISMA). A published article between 2008 to 2020 from four databases namely EBSCO Medline, Ovid, PubMed and Science Direct were included in the study. After the identification and screening process, 37 articles were reviewed thoroughly in the study. Analysis of these 37 articles revealed the QoL of stroke patients is poor compared to the general population. The diagnosis of stroke impacted both physical and mental dimension of QoL in which the most impacted domain was reported to be the physical domain. Among the influential factors towards QoL were age, patient's disability, gender, patient's comorbidity, income status and family support. To improve the QoL of the patients, it's highly imperative to consider the factors influencing QoL in the treatment plan of the patients.

***Keywords*---**quality of life, HRQoL, stroke, stroke patients, EQ5D.

Introduction

Globally, 15 million of the populations were diagnosed with stroke yearly that has caused stroke to be among the major contributor to the disability-adjusted life years (DALYs). It was estimated that by 2020, DALYs due to the incidence of

stroke would rise to 61 million (1). After the Ischemic Heart Disease, stroke is the third leading cause of death with the number of death amounting to 5 million (1,2). Recently, the long longevity is one of the contributing factors behind the diagnosis of stroke and, this has led to the greater demands of long-term care which may jeopardize the Quality of Life (QoL) of the ageing patient (3,4). In Malaysia for instance, after the hospital discharged, the patient is required to attend the outpatient stroke clinic in three month's duration and also outpatient rehabilitation (5). In another study conducted in Taiwan, it was revealed that patients with stroke are the major users of long-term care facilities (6).

As the long-term care of stroke requires continuous care post-hospital discharge it may jeopardize the QoL of the patient (7). QoL is patient's perception towards their position in life from the perspective of culture and value system that they are currently involved and how these values impact their goals, expectation, daily values and concerns (8). In the health care sector, the concept of QoL is expanded to Health-related quality of life (HRQoL) in which the QoL is measured by analysing the impact of disease towards the patient's physical, economic and social well-being (9,10). Among the instruments that are being used to measure the QoL and HRQoL are EuroQoL five-dimensional (EQ5D), EuroQoL visual analogue scale (EQ-VAS), Short Form 36 (SF-36), Short Form 12 (SF-12) have been developed and validated (9,11). In comparison to other instruments, the usage of EQ5D is wider in measuring the QoL of stroke patients (12–15).

The determinant of a good QoL is the outcome of the treatment. Post-stroke diagnosis, the QoL of the stroke patients will significantly decrease, but it could be increased through rendering the effective medical services to minimise the morbidity, mortality and stroke recurrence (16). Inefficient stroke management will increase the probability of stroke incidence to reoccur which may jeopardize HRQoL of the patient (17,18). The management of patient post-stroke plays an important role in supporting the patient to improve their QoL as this period is the most challenging period whereby the patient needs to adjust with their new morbidity. Past research has highlighted that due to the changes of pre-morbid lifestyles and poor activities of daily living, 66% of the stroke patients were diagnosed with depression post-stroke, with more than 50% of them were at the mild stage of depression (19). To compare the QoL of stroke patient with the general population using the SF-36, the mean score of stroke patients for all eight health domains was lower than the general population except for Domain 4 namely body pain (20)

Another important factor that would impact the QoL of stroke patients is the QoL of the caregiver of the patient. Post-hospital discharged, the caregiver plays a crucial role to continue the care for the stroke patients (21,22). This responsibility may impact the QoL of the caregiver as they need to compromise their physical health, social life, and emotional well-being to focus on the care of the patients. The caregivers commonly felt the burden in managing the stroke patients as the stroke care demands a long duration of care which they need to commit it daily (23). The majority of the caregivers commonly faced difficulties and limited time to adapt to the situation as commonly stroke is a sudden onset incidence (24–26). This situation could be the underlying cause of the mental and physical exhaustion among the caregiver such as burn out and sleep deprivation which

would prevent them to offer the best care to the patients (27). Once the QoL of caregiver is impacted, the QoL of the patients would also be impacted.

The aim of this study is to perform a systematic literature review (SLR) of QoL of stroke patients that received their post-stroke care at home and primary care institution. As far as concerned, there are no studies done assessing the impact of post-stroke care at-home care and primary care-based post-stroke services. SLR was chosen as the study method due to its capacity in providing a transparent review and ability to produce quality evidence from the literature search and literature review (28).

Materials And Method

This section comprises three components namely search strategy, article selection process and data analysis method.

Search Strategy

This study conducted a Systematic Literature Review (SLR) of the published article on Quality of Life (QoL) Stroke Patients between 2008 to 2020 according to the statement of Preferred Reporting Items for Systematic Review (PRISMA). The search methods of this study used four databases namely EBSCO Medline, Ovid, PubMed and Science Direct.

Article Selection Process

There were three stages of the article selection process namely identification, screening and eligibility.

Identification

During this process, the keywords and phrases to perform the article search was identified. The selected keywords and phrases are stroke, stroke patient, quality of life, health related quality of life, home care, primary care, economic burden and community health. Then the search was performed using boolean operator such as 'AND' and 'OR' (29). The search yielded a total of 355 papers.

Screening

The identified articles were reviewed, screened and finally, 74 articles were identified to achieve the inclusion and exclusion criteria of the study (Table 1). The selected articles were only a original research article that were published between 2008 to 2020. These timeline were agreed by all the researcher to examine by taking into the consideration that the QoL of the patients improved as the technology and health care treatment improved. The articles were limited to English and Malay language articles. The search strategy delineated studies that focused on post-stroke care and only focused on articles related to the QoL of Stroke Patients. Then, a more thorough screening involving the abstract of the articles were performed which led to the removal of 16 articles.

Table 1 Inclusion and Exclusion Criteria

Criterion	Eligibility	Exclusion
Article Type	Research Article	Systematic Review Journal, Book Series, Chapter in Book, Book, Proceeding
Language	English, Malay	Non-English and Non-Malay
Timeline	Between 2008 -2020	Before 2008
Scope of Research	QoL of Stroke Patient	QoL of Non-Stroke Patient

Eligibility

After the screening process a total of 58 articles were included at the final stage. At this stage, a thorough examination was performed including the examination of the title, abstract, and contents of all articles. Post examination, 37 articles were identified to meet all the inclusion and exclusion criteria and these articles were relevant to the study's objective (Figure 1). All articles that were included in this study are summarised in Table 2.

Data Abstraction and Analysis

An integrative review was applied during the data analysis. Integrative review is the most comprehensive technique to analyze and synthesizes both qualitative and quantitative research designs (30).

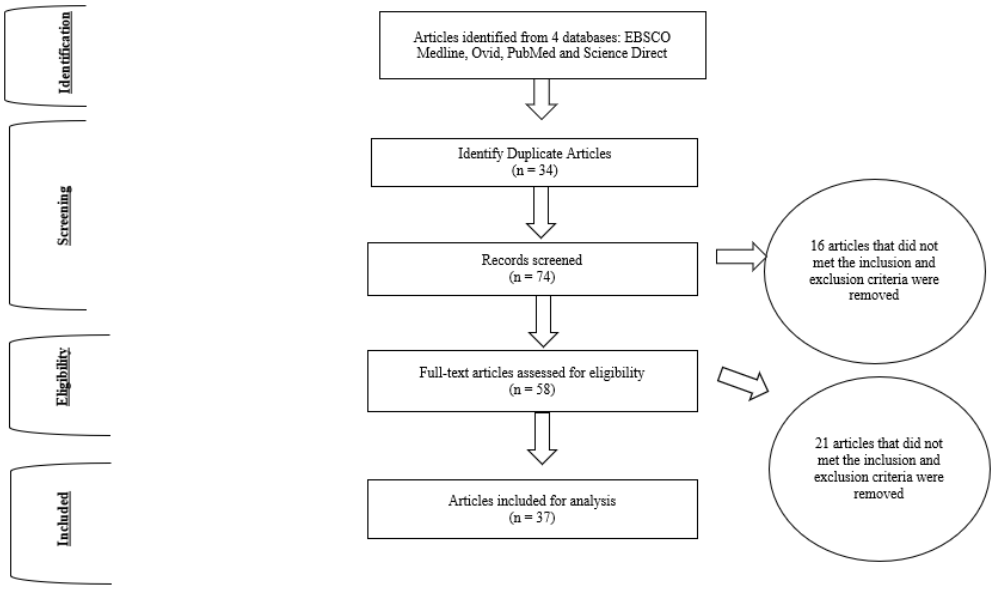

Figure 1 Study Flow

Table 2 List of Articles

No	Title	Author	Year	Instrument	Objective	Key Findings
1	HRQoL in stroke patients.	Din et al. (31)	2008	SF36	To assess the Malaysian stroke patient's HRQoL.	This Malaysian study highlighted ethnicity, educational level, type of occupation, stroke condition, other comorbidities, age of patient and duration of stroke as the factors determining HRQoL of the patient. Among all the reviewed studies, this is the only study that highlighted the impact of the ethnic group towards the HRQoL of the patient.
2	Quality of life in stroke patients.	Dayapoglu & Tan (32)	2010	SF36, Perceived Social Support from the Family Scale	To determine the QoL and the association between QoL and patient's socio-demographic and medical conditions.	This study highlighted the QoL of stroke patient is poor especially among elderly patient aged 61 – 71 years old. The poor QoL among the patient is due to the lower score of functional status, well-being, and general health perception. This study also argued the importance of the geographical area of the patient in which patient in the city showed a higher QoL compared to the patient in the rural area.
3	Satisfaction with care as a QoL predictor for stroke patients and their caregivers.	Cramm et al. (13)	2012	EQ-5D, Satisfaction with Stroke Care Questionnaire	To identify, indicators associated with QoL of stroke patients.	The QoL of stroke patient was reported to be lower than the general population. In this study, the importance of the caregiver's educational level and age towards the QoL of the patient was highlighted. This study also reported the caregiver's quality of care as one of the key factors to determine the QoL of the patient.
4	"It burdens me" : The impact of stroke in central Aceh, Indonesia.	Norris et al. (33)	2012	In-depth interviews	To illustrate the condition of stroke's patient in Aceh's rural community.	This Indonesian study highlights the contribution of spiritual strength in improving the QoL of the stroke patient.
5	What is next after transfer of care from hospital to home for stroke patients? Evaluation of a community stroke care	Aziz et al. (34)	2013	Patient Health Questionnaire, Barthel Index	To identify the output of a pilot long-term stroke clinic that combined secondary prevention and rehabilitation at community level.	In a developing country that is still lack rehabilitation facilities, this study highlights the importance to have structured management and synergy between the stroke multidisciplinary care team and primary care team to improve the QoL of the patient.

	service based in a primary care clinic.					
6	Quality of Life of Stroke Survivors. A 3-month follow-up study.	Rachpukdee et al. (35)	2013	SF36	To assess, compare and identify predictors of unsatisfactory QoL.	The study highlights that the QoL of stroke patient is the worst at 1-month post-stroke and gradually improve at 3-month post-stroke.
7	QoL of individuals with stroke and their caregivers in a city of Triangulo Mineiro.	Lima et al. (36)	2014	WHOQOL-BREF	To compare the QoL of individuals with stroke and their caregivers	This study reported a lower QoL among patient with caregiver compared to the patient without a caregiver. The underlying factor is may due to the lower educational level among the caregiver.
8	Correlation between the activities of Daily Living of Stroke Patients in a Community Setting and Their Quality of Life.	Kim et al. (37)	2014	Functional Independence Measure (FIM), Stroke-Specific QoL (SS-QoL)	To examine the relationship between QoL of chronic stroke patients and their daily living's activities.	This study highlighted that social cognition involving problem-solving, patient's social interaction and ability to remember as the most impacted QoL domain among stroke patients.
9	Determining QoL and associated factors in patients with stroke	MM et al. (38)	2015	Barthel Index, SF36, HADS, FAM, Mini Mental State Evaluation, Brunnstorm Motor Evaluation Scale, Ashworth Scale	To measure stroke patient's overall and domain specific QoL and to determine factor influencing QoL post stroke.	Using the SF36, the QoL of patient is lower among female than male and also lower among illiterate patient than literate patient.
10	The negative impact of spasticity on the health-related quality of life of stroke survivors: A longitudinal cohort study.	Gillard et al.(39)	2015	Physical Component Summary (PCS), Mental Component Summary (MCS) scores, SF 12, EQ-5D, SS-QoL	To determine the level of strain experienced by the caregivers of stroke survivors and the QoL of these caregivers.	This study reported a lower HRQoL among stroke patient with spasticity than the stroke patient without spasticity.
11	Predictors of HRQOL in stroke patients after neurological inpatient rehabilitation: A prospective study.	Katona et al.(40)	2015	SF36, EQ-5D	To determine the long-term effect of HRQOL among stroke survivors post 2.5 years after the rehabilitation of inpatient neurological and to explore factors influencing HRQOL.	This study concluded that physical mobility is an important factor in determining the emotional quality of stroke patients.

12	Comparing responsiveness of the EQ-5D-5L, EQ-5D-3L and EQ VAS in stroke patients.	Golicki et al. (41)	2015	EQ-5D-5L, EQ-5D-3L, EQ-VAS	To explore the sensitivity of EQ-5D-5L among stroke patients and to compare it with sensitivity of EQ-5D-3L and EQ-VAS.	This study highlighted the improvement of HRQoL of the patient improved between baseline and follow up (at 4 months).
13	Health-related quality of life is associated with stroke deficits in older adults.	Min & Min (42)	2015	EQ-5D	To investigate the relationship between HRQoL and stroke associated deficit, specifically on the count and category of deficits among older adults.	Using the EQ-5D score, the QoL of patients reduced significantly as the stroke deficits increased.
14	Validity of EQ-5D-5L in stroke.	Golicki et al.(43)	2015	EQ-5D-3L & EQ-5D-5L	To explore the validity of EQ-5D-5L among acute stroke and to compare it with EQ-5D-3L	This study concluded that the improvement of pain/discomfort and anxiety/depression's scores could increase the QoL of the patient.
15	The burden of stroke in the Netherlands: Estimating QoL and cost for 1-year poststroke.	Eeden et al. (44)	2015	EQ-5D-3L	To twofold. Firstly, to determine and investigate the changes in societal cost post 1 year of stroke diagnosis. Secondly to assess the QoL, and relation between cost and QoL.	Finding from this study highlighted gender as one of the significant factor influencing QoL of the patient in which the QoL of men is higher than women.
16	Variations in HRQoL and survival 1 year after stroke: Five European population-based registers	Ayis et al. (45)	2015	Physical Component Summary (PCS), MCS, EQ-5D	To analyse and compare the clinical outcomes and the data of Patient-Reported Outcome Measures (PROMs) gathered through standardised procedures in European Registers of Stroke (EROS) at 3 and 12 months post stroke. Secondly to determine the association between HRQoL of patients at 3 months post stroke and survival within 1 year across 5 selected populations.	This study highlighted the impact of the geographical area on the QoL of the patient. This study also reported anxiety/depression, physical disability and pain/discomfort as the important domains that could influence the QoL of the patient.
17	Determinants of QoL in Stroke	Espuela et al. (46)	2015	PCS, MCS	To identify the determinants of HRQoL in stroke	The HRQoL of patient especially the physical and mental scores were poorer at 6 months post-

	Survivors After 6 months from comprehensive stroke unit.				survivors.	stroke. The most impacted domains were emotional role function, general health, mental health and vitality.
18	Predictors of functional level and quality of life at 6 months after a first ever stroke : the KOSCO study.	Chang et al. (47)	2016	EQ-5D, FIM	To assess the predictor factors of the storke patient's functional status and QoL.	This study revealed that the physical limitation that increased stroke patient's dependency on others was the underlying cause of a poor HRQoL at 6 months post-stroke onset.
19	Validity, responsiveness, and minimal clinically important difference of EQ-5D-5L in stroke patients undergoing rehabilitation.	Chen et al. (48)	2016	EQ-5D-5L, EQ-VAS	To examine the characteristic and effectiveness of EQ-5D-5 and EQ-VAS among people getting rehabilitation post stroke.	This study highlighted the improvement of EQ-Index from 0.719 to 0.813 post the rehabilitation session among stroke patient.
20	Functional limitation and HRQoL and associated factors among long term stroke survivors in Malaysia community.	Nordin et al. (49)	2016	Rivermead mobility index (RMI), Barthel Index, SSQOL	To identify long term stroke patient survivor's functional and QoL and associated predictors among these patients in the Malaysian community.	This study stressed the limited number of community -based rehabilitations centres that impacted the management of long-term post-stroke which may affect the QoL of stroke patient in Malaysia.
21	Is community-based rehabilitation (CBR) beneficial in improving physical function and health status among chronic stroke survivors? A Malaysian Experience.	Nordin et al. (50)	2016	EQ-5D	To determine the impact of CBR on chronic stroke survivor's functionality and general health status who stayed at home post discharge.	This study highlighted the positive impact of CBR on the QoL of the patient.
22	The stroke impact scale: Performance as a quality of life measure in a community - based stroke rehabilitation setting.	Richardson et al. (51)	2016	EQ-5D-5L, SIS	To explore the psychometric of the SIS	This study concluded that physical functioning is the important factor influencing HRQoL across all time points within the first year post-stroke. On the other hand, the level of self-perceived participation deemed as important toward the patient's HRQoL at the later stages of recovery.

23	Factor influencing pre-stroke and post-stroke QoL among stroke survivors in a lower middle-income country.	Mahesh et al. (52)	2017	SF36	To explore stroke patient's QoL pre and post stroke diagnosis	The QoL score of the patient reduced by 50.0% from a median of 50.0 to a median of 25.0 post-stroke. The most impacted domain was reported to be the role-limitation-physical score.
24	Comparison of 3-month stroke disability and QoL across modified ranking scale categories.	Rangaraju et el.(53)	2017	EQ-5D-3L	To analyse the outcomes of using BI and HRQoL at 3 months post stroke across the mRS 0 - 5 categories.	The mRS was reported to be highly influenced by the functional disability and QoL of the patients.
25	Long term impact of stroke on patients' HRQoL.	Wit et al. (54)	2017	EQ VAS	To explore the scale and factors that influence the HRQoL among 5 years stroke survivors across four countries in Europe.	The HRQoL of the stroke patients will improve gradually and at the five years post-stroke, 8 out of 100 patients showed a higher HRQoL than age and gender-matched norm in the general population.
26	The factors associated with HRQoL in Stroke Survivors Age 40 and Older.	Jeon et al. (55)	2017	EQ VAS	To measure the relationship among the clinical information and socio-demographic information and HRQoL across Korean stroke survivors above 40 years old.	The EQ VAS showed a significantly lower score among stroke patient than non-stroke patient.
27	HRQoL and related factors in stroke survivors: Data from Korea National Health and Nutrition Examination Survey (KNHANES) 2008 to 2014.	Kwon et al. (56)	2018	EQ-5D	To evaluate the HRQoL among stroke survivors using (EQ-5D), and to determine the determinant factors of HRQoL.	The patient's comorbidities such as diabetes mellitus and hypertension could also impact the QoL of the patient as it affects the speed of recovery. In addition, the QoL of the patient is also lower among patient with a lack of regular exercise.
28	Documenting the impact of stroke in a middle-income country : A Malaysia case study.	Mairami et al. (57)	2018	Semi-structured interview	To measure the consequences of stroke towards stroke survivors.	Malaysia experienced a limited rehabilitation centre that may impact the recovery process of stroke survivors.
29	Can acute clinical	Yeoh et al. (58)	2018	Shah Modified Barthel Index	To determine the regularly applied	The clinical outcomes of the patient could influence the

	outcome predict HRQoL after stroke ; a one-year prospective study of stroke survivors.			(Shah-mBI), National Institute of Health Stroke Scale (NIHSS), Modified Ranking Scale (mRS), Mini-Mental State Examination (MMSE), Frontal Assessment Battery (FAB), EQ-5D	clinical indicator to predict the value for HRQoL at 3 months and 1-year post-stroke.	HRQoL of the patients at 3 months and 12 months post-stroke.
30	Construct validity and reliability of EQ-5D-3l for stroke survivors in a lower middle-income setting.	Mahesh et al. (59)	2019	EQ-5D-3L, SF-36	To assess the validity and reliability of EQ-5D-3L among stroke patients across Sri Lanka	This study revealed, among the Sri Lankans, the most influential domains towards patient QoL were pain and anxiety domain.
31	Contextual factors that shape recovery after stroke in Malaysia.	Mairami et al. (60)	2019	Semi-structured interview	To identify factors that contribute to the recovery post stroke in a community.	Similar to the findings with other developing countries, this study also highlighted the limited access of rehabilitation centres that delayed the patient's recovery which subsequently impacted their QoL. The limited number of rehabilitation influenced the adoption of traditional medicine among stroke patient.
32	HRQoL loss associated with first time stroke.	Yeoh et al. (61)	2019	EQ-5D-3L	To quantify the loss due to the first diagnosis of stroke by comparing the HRQoL of the patient before and after stroke onset.	Echoing other reviewed studies this study also highlighted a low HRQoL among stroke patient compared to the general population but, as time goes by, the HRQoL showed a gradual increment. At 3-month post-stroke, the HRQoL of stroke patient reduced by 35.1% compared to the general population. However, it rose back to 19.1% at one-year post-stroke.
33	Post-acute care regains QoL among middle-aged and older stroke patients in Taiwan.	Peng et al. (62)	2019	EQ-5D	To measure the HRQoL of middle aged and older stroke patients after stroke post care program and to determine factors influencing HRQoL	The study concluded that HRQoL older patient aged between 74 to 85 years old was lower than patient aged less than 50 years old.

34	Sequelae and QoL in Patients Living at Home 1 Year After a Stroke Managed in Stroke Units.	Broussy et al. (63)	2019	HADS, EQ-5D, Fatigue Severity Scale	To resolve the lack of information in managing stroke patients at home.	This French study also reported a lower HRQoL among stroke patient compared to the general population.
35	Does a Mobile app improve patients' knowledge of stroke risk factors and HRQoL in patients with stroke?	Kang et al. (64)	2019	EQ-5D	The examine the effectiveness of the stroke health-education mobile app (SHEMA) to improve knowledge of the factors influencing stroke and HRQoL among stroke's patients in Taiwan.	This study stressed the importance of stroke health education. Even could facilitate a better HRQoL, the traditional method of health education was reported to be more effective than SHEMA.
36	Prevalence of worsening problems using post-stroke checklist and associations with QoL in Patients with stroke.	Im et al. (65)	2020	EQ-5D-3L, PSC	To determine the worsening problems among stroke patient using Post stroke Checklist at 3, 6, and 12 months post stroke and their relationship with HRQoL.	Finding from this study showcased the most persistent problem among stroke patient was mood disturbances which were reported by 8.8% at 3 months post-stroke, 16.0% at 6 months post-stroke and 13.5% at 12 months post-stroke.
37	Sex differences in QoL after stroke were explained by patient factors not clinical care: evidence from Australia Stroke Clinical Registry.	Phan et al. (66)	2020	EQ-5D-3L	To explore the impact of of clinical care on gender differences and HRQoL post stroke.	This study highlighted a poorer HRQoL among women compared to men. The frequently impacted domains among women were self-care, usual activity, pain/discomfort and anxiety/depression.

Findings

In this section, firstly the general findings were presented. Following that, the specific output on the Quality of Life (QoL) of patients and the domain of QoL were given. At the end of the section, the output of factors influencing QoL were presented.

General Findings

This study reviewed a total of 37 articles. From these 37 articles, two articles were published in 2020 and six articles were published in 2019 (59–64). In 2018, three articles were published and nine articles were published in 2017 and 2016 (52–55, 47–51). Apart from that, nine articles were published in 2015 (38–46). Also, two articles were published in 2014, two articles were published in 2013, another

two were published in 2012, and one article was published in 2010 and 2008 (32,31).

The analysis produced a total of 3 themes related to Quality of Life (QoL) of the stroke patients. The majority of the articles discussed the factors influencing QoL (13,32,35,39,42–47,51–57,60–62,65–67). Level of QoL of stroke patients was discussed in 22 articles (13,32,35–37,39–42,46–48,52,54–56,58,59,61–63,67). Other theme that were identified during the analysis was QoL Domain of stroke patients (36,37,39,40,42,45,46,51,52,61,64–66,68,69). Lastly, the

Table 3 Themes

Theme	Number of Articles
Factor influencing QoL	27
Level of QoL	22
QoL Domain	15

Table 4 below summarized the study instruments that were used to measure the QoL of the patients. The EuroQoL-5Dimension or EQ-5D were widely used across studies that measure the QoL of stroke patients (13,40–42,44,45,47,48,50,51,53,56,59,61–66). Among these studies, 12 of the studies mentioned the usage of EQ-5D and, 7 studies have specifically mentioned the usage of EQ-5D-3L (13,39,40,42–45,47,53,56,58,59,61–66). In addition, 3 studies have used the EQ-5D-5L (41,48,51). Other instruments that were frequently used are Short Form 36 Health Survey Questionnaire (SF-36), Physical Component Summary (PCS) and Mental Component Summary (MCS) Scores (31,32,35,39,40,45,46,52,59,67).

Table 4 List of Instruments

Type of Instruments	Number of Used
EuroQoL-5Dimension (EQ-5D)	12
EQ-5D-3L	7
EQ-5D-5L	3
Short Form 36 Health Survey Questionnaire (SF - 36)	6
Physical Component Summary (PCS)	3
Mental Component Summary (MCS) scores	3
Stroke-Specific QoL (SS-QoL)	3
EQ-VAS	2
Functional Independence Measure (FIM)	2
Mini-Mental State Examination (MMSE)	2
Semi-structured interview	2
Ashworth Scale	1
Brunnstorm Motor Evaluation Scale	1
Fatigue Severity Scale	1
Functional Ambulatory Care	1
Frontal Assessment Battery	1
Hospital Anxiety Depression Score	1
National Institute of Health Stroke Scale	1
Modified Rankin Scale	1

Patient Health Questionnaire (PHQ)	1
Perceived Social Support from the Family Scale	1
Rivermead mobility index (RMI)	1
Satisfaction with Stroke Care Questionnaire	1
Short Form 12 Health Survey Questionnaire (SF - 12)	1
Stroke Impact Scale (SIS)	1
Stroke Impact Scale-16 (SIS-16)	1
WHOQOL-BREF	1

QoL of Stroke Patients and Impacted Domain

Findings from the SLR indicates that the QoL of stroke patients was poor and low compared to the general population (13,32,35,39,42,46,56,63). For instance, in a study conducted in Korea, 50% of the stroke patients expressed low satisfaction of their QoL and the EQ-5D index of these stroke patients we lower than those without stroke (56). Among the stroke patients, the QoL is particularly low among patient with severe cognitive impairment and with spasticity (35,39). The unsatisfactory QoL was commonly observed at 1 month after diagnosis and gradually increased at 3 months post-stroke (35,41,58). Despite several studies indicates an improvement of QoL at 3 months post-stroke, one of the recent article published in 2020 highlights that the QoL of stroke patients worsening at 6 months post-stroke (65). In addition, one Singaporean study reveals that the QoL of stroke patients decreased up to 35% compared to the general population at 3 months post-stroke (61).

The negative impact of stroke towards the QoL of the patient could be observed at both the physical and mental dimension of QoL (36,46). Among the reported domain of QoL were mobility, self-care, activity, pain, anxiety, functional capacity, social cognition, social interaction (13,32,37,59). Majority of the study indicates that the highly impacted domain was physical domain as physical disability due to stroke caused changes in their daily activities post the diagnosis (36,37,39,40,45,61). Besides, pain/discomfort and anxiety/depression were also listed as the frequently impacted QoL domain among the stroke patients (40,42,56,61).

Factor Influencing QoL of Stroke Patients

The output from the analysis identified 23 commons factor that may influence the QoL of stroke patients. The most influential factor was age which was highlighted in 13 articles (13,31,32,35,39,42,46,47,49,52,56,62,66). In addition, the patient's disability due to the diagnosis also was highlighted as one factor that could influence the QoL of the patients (13,16,34,44,45,46,47,48,52). Review of the articles also indicates gender and the comorbidity of patients as the contributing factor that may impact the QoL of stroke patients (13,32,39,44,46,49,52,55,56,61,62,66). Other factors that were highlighted were income status, family support, educational level of the patients and severity level of the stroke. Table 5 below summarized the factors influencing QoL of stroke patients.

Table 5 Factors Influencing QoL

No	Factor Influencing QoL	Number of Papers
1	Age	13
2	Patient's Disability	11
3	Income Status	9
4	Gender	8
5	Patient's Comorbidity	8
6	Family Support	7
7	Educational Level	7
8	Severity Level of Stroke	6
9	Healthcare access	5
10	Mental Health	4
11	Geographical Area	3
12	Disease Duration	3
13	Caregiver's Educational Level	2
14	Marital Status	2
15	Smoking Status	2
16	Caregiver Age	1
17	Health Insurance	1
18	Alcohol Consumption	1
19	Knowledge in stroke	1
20	Physical Exercise	1
21	Alternative Medicine	1
22	Spiritual Strength	1
23	Ethnic Group	1

Impact of qol to stroke patient

The diagnosis of a stroke may cause social and physical limitation that subsequently impacted the patient's QoL. The social and physical limitations due to stroke could jeopardize the patient's social and job status relating to the difficulties to sustain their daily living (32). The output from the SLR highlights a poor QoL among the stroke patients particularly during the early stage of the diagnosis (35,40,41,46,47,58,61). In a Singaporean study that measured the HRQoL of stroke patients using EQ-5D-3L, the EQ index of stroke patients was lower by 0.33 than the general population at three months post-stroke and by 0.18 at twelve months post-stroke (61). This indicates an improvement of QoL at twelve months post-stroke among the patients. However, the analysis of the present study indicates disagreement of timeline on the improvement of QoL whereby some studies reported a great improvement at three months post-stroke and some studies reported a poor QoL even at six months post-stroke (35,47). For instance, a Thailand study which used SF-36 reported a significant improvement at three months post-stroke among their patients (35). On the contrary, a Korean study that used FIM and EQ-5D highlighted that the majority of the patient still depends on the third party for their daily activities and a low QoL was still recorded at 6 months post-stroke (47). Despite the disagreement on the timeline, both of these studies agreed that a proper and effective treatment plan in assisting patients to increase their functional independence is crucial to improve the QoL of the patients. Post diagnosis, the patient is challenged with their new physical limitation and morbidity whereby 30.8% of the stroke patients require

assistance to walk (42). Therefore this group of patients requires an effective physical and emotional support through a rehabilitation programme to address their physical disability (17,18). In the situation where an ineffective treatment plan is rendered to the patient, it may deteriorate the QoL of the patient.

Factor Influencing QoL: Global Observations

From the analysis, the most contributing factor to the QoL of the patient is the age group. The elderly patient with the age of 60 years old and above tends to measure a lower QoL than the younger patient (13,32,35,42,46,55,56,66). The lower QoL among the elderly compared to the younger patient is due to the physical limitation and low rate of improvement before the rehabilitation session. In a Turkish study, it was highlighted that patients with the age of 61 to 71 years old had a low QoL whereby their QoL's domain was particularly low involving the functional status, well -being, general health perception and global quality of life (32). The functional status of a patient plays an imperative role in the QoL of the patient. A low functional status indicates a high dependency towards the third party that may cause mood disturbance among the patient and caregiver. A Korean study has proven that patient who faced challenges in mobility, self-care and usual activities perceived a poor QoL (42). In addition, the improvement of physical disability due to stroke requires a patient to involve in the physical exercise to enhance and improve their body muscle. However, the engagement of the elderly in physical exercise is low which may delay their recovery process (56). Interestingly when the age is compared by gender, men aged below 65 years old showcase a lower QoL than women aged 75 years old and above (66). As the breadwinner of a family, a low functional status among stroke patients may cause the men to experience emotional disturbance that will relate to a low QoL. Nevertheless, when the age factor is eliminated, a lower QoL was observed among the women (44,46,55). In a Dutch study, it was reported that the total cost of managing stroke is lower among man compared to female (44). The higher cost among women may relate to a poorer QoL among women compared to men due to the burden of healthcare cost. This is taking into consideration the limited financial resources among women. Apart from that, women's responsibility in managing house chores is higher than men. When they are diagnosed with stroke and experience physical limitation, it may cause mood disturbance relating to the poor QoL. Also, women might neglect the rehabilitation session due to their commitment to managing the house chores. As discussed earlier, the rehabilitation session is imperative to expedite the stroke's recovery. Hence, if the rehabilitation session is not being prioritized, it may delay the recovery process relating to the poor QoL among the women.

QoL of the patient is also depending on the other medical conditions of the patient. Patients with existing comorbidities such as hypertension, diabetes or arthritis have a higher tendency to perceive a lower QoL (32,46,55,62). The existing comorbidities such as diabetes could relate to other cardiovascular diseases (CVD). The recurrent stroke is commonly associated with CVD and managing CVD is predicted to lower the risk of recurrent stroke (55). In addition, as treating a patient with comorbidities is usually trickier than the normal patient, their length of stay usually longer relating to the poor QoL among this group of patient (47). Therefore, the medical history of the patients plays a crucial

role in determining the QoL of the patient. In planning the treatment plan of the stroke patients, it is highly imperative to investigate their medical history thoroughly in ensuring effective medical treatment is rendered to them.

Apart from these, the QoL of the patients is influenced by their income status. Patient with a stable income status commonly perceives a better QoL than a patient without a stable income status (35,56,62). A stable socio-economic status of a patient would help them to feel more comfortable and secured. As managing stroke requires additional cost such as travelling cost to attend rehabilitation session, a stable source of income is crucial in providing a peaceful mind to the patient. However, as mentioned earlier, stroke patients commonly faced the physical limitation that may relate to difficulties for them to involve in physical movement. In most of the cases, they will lose their job and encounter financial difficulties (35,56). With a low-income status, they might not afford to receive sufficient treatment and attend rehabilitation session post-stroke which would impede their full recovery. Concerning the income status, the socio-economic status of the patient is highly associated with their educational level. Patient with a higher educational level commonly had a more secured job status. Hence patient with a higher educational level would perceive a better QoL (47). A lower educated patient might be jobless and may face financial constraint. In this particular situation, the existence of health insurance scheme plays a crucial role in helping the patient to expedite their recovery rate and subsequently improve their QoL. It was proven that patient with a health insurance scheme perceived a better QoL than those without insurance as with the insurance they are still able to receive appropriate treatment at the rehabilitation centre even without a fixed income (35).

In achieving a good QoL, stroke patients rely heavily on the support given by their family and friends. Supports by the caregiver could ease the patient's burden in managing their daily activities. An understanding caregiver in giving the physical and moral support to the caregiver is imperative in improving the QoL of the patient (13,35,46). Without the support given by the caregiver, stroke patients may perceive a low QoL. However, the quality of the assistance given by caregiver differs according to the caregiver's age and educational level (13,32). A more educated and younger caregiver would bring merit to the QoL of the patient. In the situation in which the caregiver is equipped with limited knowledge of handling stroke patients, it will relate to a poorer QoL. In a previous study conducted in Brazil, it was reported that the QoL of a patient with a caregiver is lower than the QoL of a patient without caregiver (36). This may be due to the lower education level among the caregivers.

Factor Influencing QoL: Local Findings

Studies on QoL of stroke patient are still relatively scarce within Malaysia. There is no specific local study that compared the QoL of the stroke population with the non-stroke population. There was one study that compared the QoL of the stroke population by age group, ethnicity and also gender, but this study was limited to the stroke patients (31). The majority of the studies focused on the factor influencing the QoL of a stroke patient(31,49,57,60). The majority of the factors were aligned with findings from global observations such as educational level,

income status, age, stroke condition, existing comorbidity, duration of illness, family support and social support. However, unlike the global studies, the local studies also highlighted the limited number of rehabilitation centres due to the financial constraint of healthcare systems that may impact the QoL of stroke patients (49,60). This finding echoed finding from other lower-middle-income country's study such as Sri Lanka that stressed the lack of rehabilitation centre to support the healing process of stroke patient which subsequently impacted the QoL of the patient (52). The limited access to the healthcare systems has motivated stroke patients to seek alternative medicine and to seek strength spiritually (60). The same pattern was also observed in a study that was conducted in Aceh, Indonesia that reported the crucial role of spiritual support towards the QoL of the patient due to the financial constraint(33).

Conclusion

The QoL of stroke patients is poor compared to the general population. The poorer QoL is commonly associated with mobility in which most of the patients suffered from physical limitation post-stroke diagnosis. The QoL of the patient commonly influenced by the age, gender, socio-economic status, comorbidity and caregiver of the patient. Therefore, these factors need to be considered in instituting the rehabilitation programme of the patient. This study only focuses on the QoL of the stroke patients without looking into details on the cost of managing the stroke patients. The cost of managing stroke patients is believed could impact the QoL of the patient. Hence, it is recommended for the future study to explore this area.

Ethical approval

Ethical approval to conduct this study was granted from the Faculty of Medicine, Universiti Kebangsaan Malaysia (FF-2017-490).

List of abbreviations

QoL	: Quality of Life
HRQoL	: Health Related Quality of Life
EQ-5D	: EuroQol-5Dimension
EQ-5D-3L	: 3 Level Version EuroQol-5Dimension
EQ-5D-5L	: 5 Level Version EuroQol-5Dimension
EQ-VAS	: EuroQoL Visual Analogue Scale
WHOQOL-BREF	: World Health Organization Quality of Life- Brief
PCS	: Physical Component Summary (PCS)
SF-36	: Short Form 36 Health Survey Questionnaire
SF-12	: Short Form 12 Health Survey Questionnaire
MCS	: Mental Component Summary Score
FAM	: Functional Ambulatory Care
FIM	: Functional Independence Measure
SIS	: Stroke Impact Scale
SS-QoL	: Stroke-Specific Quality of Life
HADS	: Hospital Anxiety Depression Score

References

1. Annear PL, Kwon S, Lorenzoni L, Duckett S, Huntington D, Langenbrunner JC, et al. Pathways to DRG-based hospital payment systems in Japan, Korea, and Thailand. Health Policy (New York). 2018;122(7).
2. Ayis S, Wellwood I, Rudd AG, McKevitt C, Parkin D, Wolfe CDA. Variations in Health-Related Quality of Life (HRQoL) and survival 1 year after stroke: Five European population-based registers. BMJ Open. 2015;5(6):1–9.
3. Aziz AFA, Aziz NA, Mohd Nordin NA, Ali M, Sulong S, Aljunid S. What is next after transfer of care from hospital to home for stroke patients? Evaluation of a community stroke care service based in a primary care clinic. J Neurosci Rural Pract. 2013;4(4):413–20.
4. Aznida FAA, Azlin NMN, Amrizal MN, Saperi S, Aljunid SM. The cost of treating an acute ischaemic stroke event and follow-up at a teaching hospital in Malaysia : a Casemix costing analysis. BMC Health Serv Res [Internet]. 2012;12(Suppl 1):P6. Available from: http://www.biomedcentral.com/1472-6963/12/S1/P6
5. Bakas T, Austin JK, Okonkwo KF, Lewis RR, Chadwick L. Needs, concerns, strategies, and advice of stroke caregivers the first 6 months after discharge. [Internet]. Vol. 34, The Journal of neuroscience nursing : journal of the American Association of Neuroscience Nurses. 2002. p. 242–51. Available from: http://www.ncbi.nlm.nih.gov/pubmed/12391740
6. Broussy S, Saillour-Glenisson F, García-Lorenzo B, Rouanet F, Lesaine E, Maugeais M, et al. Sequelae and quality of life in patients living at home 1 year after a stroke managed in stroke units. Front Neurol. 2019;10(AUG):1–7.
7. Chang WH, Sohn MK, Lee J, Kim DY, Lee SG, Shin Y Il, et al. Predictors of functional level and quality of life at 6 months after a first-ever stroke: the KOSCO study. J Neurol. 2016;263(6):1166–77.
8. Chappell NL, Reid RC. Burden and well-being among caregivers: examining the distinction. Gerontologist. 2002;42(6):772–80.
9. Chen P, Lin KC, Liing RJ, Wu CY, Chen CL, Chang KC. Validity, responsiveness, and minimal clinically important difference of EQ-5D-5L in stroke patients undergoing rehabilitation. Qual Life Res. 2016;25(6):1585–96.
10. Chen Q, Cao C, Gong L, Zhang Y. Health related quality of life in stroke patients and risk factors associated with patients for return to work. Medicine (Baltimore). 2019;98(16):e15130.
11. Clery A, Bhalla A, Bisquera A, Skolarus LE, Marshall I, McKevitt C, et al. Long-Term Trends in Stroke Survivors Discharged to Care Homes: The South London Stroke Register. Stroke. 2020;51(1):179–85.
12. Craig E, Kerr N, McDonald G. Coding paediatric outpatient data to provide health planners with information on children with chronic conditions and disabilities. J Paediatr Child Health. 2017;53(3):283–90.
13. Cramm JM, Strating MMH, Nieboer AP. Satisfaction with care as a quality-of-life predictor for stroke patients and their caregivers. Qual Life Res. 2012;21(10):1719–25.
14. Dayapoglu N, Tan M. Quality of life in stroke patients. Neurol India. 2010;58(5):697–701.
15. de Lima ML, Santos JLF, Sawada NO, de Lima LAP. Quality of life on individuals with stroke and their caregivers in a city of Triangulo Mineiro. Rev Bras Epidemiol. 2014;17(2):453–64.

16. De Wit L, Theuns P, Dejaeger E, Devos S, Gantenbein AR, Kerckhofs E, et al. Long-term impact of stroke on patients' health-related quality of life. Disabil Rehabil. 2017;39(14):1435–40.
17. Dharma KK, Damhudi D, Yardes N, Haeriyanto S. Increase in the functional capacity and quality of life among stroke patients by family caregiver empowerment program based on adaptation model. Int J Nurs Sci [Internet]. 2018;5(4):357–64. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2352013217303770
18. Din NC, Ahamat MH, Mukahar R, Basri H. Health-Related Quality of Life in Stroke Patients. Pros Semin Sebumi 2008 Univ Indones Jakarta. 2008;(Hooi 2003):1–15.
19. Dorsey MK, Vaca KJ. The stroke patient and assessment of caregiver needs. J Vasc Nurs [Internet]. 1998;16(3):62–7. Available from: http://www.sciencedirect.com/science/article/pii/S1062030398900036
20. Em S, Bozkurt M, Karakoç M, Çağlayan M, Akdeniz D, Oktayoğlu P, et al. Strok hastalarında yaşam kalitesi ve İlişkili faktörlerin değerlendirilmesi. Turkiye Fiz Tip ve Rehabil Derg. 2015;61(2):148–54.
21. Feigin VL, Norrving B, Mensah GA. Global burden of stroke. Circ Res. 2017;120(3):439–48.
22. Garbusinski JM, Van Der Sande MAB, Bartholome EJ, Dramaix M, Gaye A, Coleman R, et al. Stroke presentation and outcome in developing countries: A prospective study in The Gambia. Stroke. 2005;36(7):1388–93.
23. Gillard PJ, Sucharew H, Kleindorfer D, Belagaje S, Varon S, Alwell K, et al. The negative impact of spasticity on the health-related quality of life of stroke survivors: A longitudinal cohort study. Health Qual Life Outcomes [Internet]. 2015;13(1):1–9. Available from: http://dx.doi.org/10.1186/s12955-015-0340-3
24. Gioldasis G, Talelli P, Chroni E, Daouli J, Papapetropoulos T, Ellul J. In-hospital direct cost of acute ischemic and hemorrhagic stroke in Greece. Acta Neurol Scand. 2008;118(4):268–74.
25. Glamcevski MT, Pierson J. Prevalence of and factors associated with poststroke depression: a Malaysian study. J Stroke Cerebrovasc Dis. 2005;14(4):157–61.
26. Golicki D, Niewada M, Buczek J, Karlińska A, Kobayashi A, Janssen MF, et al. Validity of EQ-5D-5L in stroke. Qual Life Res. 2015;24(4):845–50.
27. Golicki D, Niewada M, Karlińska A, Buczek J, Kobayashi A, Janssen MF, et al. Comparing responsiveness of the EQ-5D-5L, EQ-5D-3L and EQ VAS in stroke patients. Qual Life Res. 2015;24(6):1555–63.
28. Hunger M, Sabariego C, Stollenwerk B, Cieza A, Leidl R. Validity, reliability and responsiveness of the EQ-5D in German stroke patients undergoing rehabilitation. Qual Life Res. 2012;21(7):1205–16.
29. Im HW, Kim W-S, Kim S, Paik N-J. Prevalence of Worsening Problems Using Post-Stroke Checklist and Associations with Quality of Life in Patients with Stroke. J Stroke Cerebrovasc Dis. 2020;29(12):105406.
30. Jeon NE, Kwon KM, Kim YH, Lee JS. The factors associated with health-related quality of life in stroke survivors age 40 and older. Ann Rehabil Med. 2017;41(5):743–52.
31. Kang YN, Shen HN, Lin CY, Elwyn G, Huang SC, Wu TF, et al. Does a Mobile app improve patients' knowledge of stroke risk factors and health-related quality of life in patients with stroke? A randomized controlled trial. BMC

Med Inform Decis Mak. 2019;19(1):1–9.
32. Katona M, Schmidt R, Schupp W, Graessel E. Predictors of health-related quality of life in stroke patients after neurological inpatient rehabilitation: A prospective study. Health Qual Life Outcomes [Internet]. 2015;13(1):1–7. Available from: ???
33. Kim K, Kim YM, Kim EK. Correlation between the Activities of Daily Living of Stroke Patients in a Community Setting and Their Quality of Life. J Phys Ther Sci [Internet]. 2014;26(3):417–9. Available from: http://jlc.jst.go.jp/DN/JST.JSTAGE/jpts/26.417?lang=en&from=CrossRef&type=abstract
34. Kwon SY, Park JH, Kim WS, Han K, Lee Y, Paik NJ. Health-related quality of life and related factors in stroke survivors: Data from Korea National Health and Nutrition Examination Survey (KNHANES) 2008 to 2014. PLoS One. 2018;13(4):1–12.
35. Lindgren P, Glader E, Jönsson B. Pst6 Utility Loss and Indirect Costs After Stroke in Sweden. Value Heal. 2006;9(6):A330.
36. Lopez-Espuela F, Zamorano JDP, Ramírez-Moreno JM, Jiménez-Caballero PE, Portilla-Cuenca JC, Lavado-García JM, et al. Determinants of Quality of Life in Stroke Survivors After 6 Months, from a Comprehensive Stroke Unit: A Longitudinal Study. Biol Res Nurs. 2015;17(5):461–8.
37. Mahesh PKB, Gunathunga MW, Jayasinghe S, Arnold SM, Liyanage SN. Factors influencing pre-stroke and post-stroke quality of life among stroke survivors in a lower middle-income country. Neurol Sci. 2017;39(2):287–95.
38. Mahesh PKB, Gunathunga MW, Jayasinghe S, Arnold SM, Senanayake S, Senanayake C, et al. Construct validity and reliability of EQ-5D-3L for stroke survivors in a lower middle income setting. Ceylon Med J. 2019;64(2):52.
39. Mairami FF, Warren N, Allotey PA, Mak JS, Reidpath DD. Documenting the impact of stroke in a middle-income country: a Malaysian case study. Disabil Rehabil [Internet]. 2020;42(1):102–13. Available from: https://doi.org/10.1080/09638288.2018.1493544
40. Mairami FF, Warren N, Allotey PA, Reidpath DD. Contextual factors that shape recovery after stroke in Malaysia. Disabil Rehabil [Internet]. 2020;42(22):3189–98. Available from: https://doi.org/10.1080/09638288.2019.1588399
41. Milani AS, Navimipour NJ. Load balancing mechanisms and techniques in the cloud environments: Systematic literature review and future trends. J Netw Comput Appl. 2016;71:86–98.
42. Min KB, Min JY. Health-related quality of life is associated with stroke deficits in older adults. Age Ageing. 2015;44(4):700–4.
43. Mn NA, Am R, L WB. Health related quality of life (HRQoL) among stroke survivors attending rehabilitation centers in Selangor. J Kesihat Masy. 2009;15(2):83–90.
44. Mohamed Shaffril HA, Samah AA, Samsuddin SF, Ali Z. Mirror-mirror on the wall, what climate change adaptation strategies are practiced by the Asian's fishermen of all? J Clean Prod. 2019;232:104–17.
45. Nordin NAM, Aziz NAA, Sulong S, Aljunid SM. Functional limitation and health-related quality of life, and associated factors among long term stroke survivors in a Malaysian community. Med J Malaysia. 2016;71(6):313–21.
46. Nordin NAM, Yern NY, Aziz AFA, Huai RSS, Singh DKA. Is Community-Based Rehabilitation Beneficial in Improving Physical Function and Health Status

Among Chronic Stroke Survivors? A Malaysian Experience. Malaysian J Public Heal Med. 2016;16(3):204–10.
47. Norris M, Allotey P, Barrett G. “It burdens me”: The impact of stroke in central Aceh, Indonesia. Sociol Heal Illn. 2012;34(6):826–40.
48. Ortman JM, Velkoff VA, Hogan H. An aging nation: the older population in the United States. Washington, DC US Census Bur. 2014;25–1140.
49. Peng LN, Chen LJ, Lu WH, Tsai SL, Chen LK, Hsiao FY. Post-acute care regains quality of life among middle-aged and older stroke patients in Taiwan. Arch Gerontol Geriatr [Internet]. 2019;83(March):271–6. Available from: https://doi.org/10.1016/j.archger.2019.04.011
50. Pequeno NPF, Pequeno NPF, Cabral NL de A, Marchioni DM, Lima SCVC, Lyra C de O. Quality of life assessment instruments for adults: a systematic review of population-based studies. Health Qual Life Outcomes. 2020;18(1):1–13.
51. Permana, A. T., Suroto, N. S., Parenrengi, M. A., Bajamal, A. H., Lestari, P., & Fauzi, A. A. (2022). Current update on stroke ischemic management: Stem cell as emerging therapy. *International Journal of Health & Medical Sciences*, *5*(1), 122-128. https://doi.org/10.21744/ijhms.v5n1.1851
52. Phan HT, Gall SL, Blizzard CL, Lannin NA, Thrift AG, Anderson CS, et al. Sex differences in quality of life after stroke were explained by patient factors, not clinical care: evidence from the Australian Stroke Clinical Registry. Eur J Neurol. 2020;
53. Power M, Kuyken W. World Health Organization Quality of Life Assessment (WHOQOL): Development and general psychometric properties. Soc Sci Med. 1998;46(12):1569–85.
54. Rachpukdee S, Howteerakul N, Suwannapong N, Tang-Aroonsin S. Quality of life of stroke survivors: A 3-month follow-up study. J Stroke Cerebrovasc Dis [Internet]. 2013;22(7):e70–8. Available from: http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2012.05.005
55. Rahman MM, Putit ZB, Suut NB, Arif MT, Said AB, Suhaili RB et al. Coping Strategies by Stroke Caregivers: Evidence from a Qualitative Study in Sarawak, Malaysia. Malaysian J Public Heal Med. 2020;20(1):48–54.
56. Rangaraju S, Haussen D, Nogueira RG, Nahab F, Frankel M. Comparison of 3-Month Stroke Disability and Quality of Life across Modified Rankin Scale Categories. Interv Neurol. 2017;6(1–2):36–41.
57. Richardson M, Campbell N, Allen L, Meyer M, Teasell R. The stroke impact scale: Performance as a quality of life measure in a community-based stroke rehabilitation setting. Disabil Rehabil. 2016;38(14):1425–30.
58. Schulman KL, Berenson K, Shih YT, Foley KA, Ganguli A, Souza J De, et al. METHODOLOGICAL ARTICLES A Checklist for Ascertaining Study Cohorts in Oncology Health Services Research Using Secondary Data : Report of the ISPOR Oncology Good Outcomes Research Practices Working Group. 2013;6.
59. Shafie AA, Hassali MA, Mohamad Yahaya AH. Health-related quality of life among nonprescription medicine customers in Malaysia. Value Heal Reg Issues. 2013;2(1):107–17.
60. Simon C, Kumar S, Kendrick T. Cohort study of informal carers of first-time stroke survivors: profile of health and social changes in the first year of caregiving. Soc Sci Med. 2009;69(3):404–10.
61. Ski C, O’Connell B. Stroke: the increasing complexity of carer needs. J Neurosci Nurs [Internet]. 2007;39(3):172–9. Available from:

http://www.ncbi.nlm.nih.gov/pubmed/17591413
62. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). Health and treatment of diabetes mellitus. *International Journal of Health Sciences*, *5*(1), i-v. https://doi.org/10.53730/ijhs.v5n1.2864
63. Tooth L, McKenna K, Goh K, Varghese P. Length of stay, discharge destination, and functional improvement: Utility of the Australian National Subacute and Nonacute Patient Casemix Classification. Stroke. 2005;36(7):1519–25.
64. van der Gaag A, Brooks R. Economic aspects of a therapy and support service for people with long-term stroke and aphasia. Int J Lang Commun Disord. 2008;43(3):233–44.
65. Van Eeden M, Van Heugten C, Van Mastrigt GAPG, Van Mierlo M, Visser-Meily JMA, Evers SMAA. The burden of stroke in the Netherlands: Estimating quality of life and costs for 1 year poststroke. BMJ Open. 2015;5(11).
66. van Heugten CM, Visser-Meily A, Post M, Lindeman E. Care for carers of stroke patients: Evidence-based clinical practice guidelines. J Rehabil Med. 2006;38(3):153–8.
67. Wang YL, Pan YS, Zhao XQ, Wang D, Johnston SC, Liu LP, et al. Recurrent stroke was associated with poor quality of life in patients with transient ischemic attack or minor stroke: Finding from the CHANCE trial. CNS Neurosci Ther. 2014;20(12):1029–35.
68. World Health Organization W. World Health Organization : Disease Burden and Mortality Estimates 2018. 2018. p. 1–2.
69. Wu CY, Hu HY, Huang N, Fang YT, Chou YJ, Li CP. Determinants of long-term care services among the elderly: A population-based study in Taiwan. PLoS One. 2014;9(2).
70. Yeoh YS, Koh GCH, Tan CS, Lee KE, Tu TM, Singh R, et al. Can acute clinical outcomes predict health-related quality of life after stroke: A one-year prospective study of stroke survivors. Health Qual Life Outcomes. 2018;16(1):1–9.
71. Yeoh YS, Koh GCH, Tan CS, Tu TM, Singh R, Chang HM, et al. Health-related quality of life loss associated with first-time stroke. PLoS One. 2019;14(1):1–13.