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Field of Study: **Neuro Surgical Nursing**

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ABSTRACT

Stroke due to intracerebral haemorrhage is defined as the rapidly developing clinical signs of neurologic dysfunction related to the focal collection of blood within the brain parenchyma which is not attributed to trauma. A person with stroke related to primary intracerebral haemorrhage (PICH) may exhibit physical disabilities, cognitive deficits, speech problems, emotional difficulties, daily living problems and post stroke complications. Adaptation to achieve greater independence to function in activities is crucial in relation to achieved positive stroke recovery outcomes.

This study aimed to determine the early functional adaptation, later (3 months) functional adaptation, improvement over time, and factors associated with achieving the functional recovery of PICH patients admitted at Hospital Universiti Sains Malaysia and Hospital Sultanah Nur Zahirah, Kuala Terengganu, Malaysia. The specific questionnaire includes the Functional Independence Measure (FIM score), National Institutes of Health Stroke Scale (NIHSS), Complication Inventory Checklist (CIC), Patient Health Questionnaire Nine-item Depression Scale (PHQ-9-DS), and Stroke Knowledge Checklist (SKC). A total of 113 subjects were included in the analysis.

The subjects consisted of 66 (58%) men and 47 (41.6%) women. Their mean (SD) age were 55.0 (SD=11.8) years. The majority of participants were hypertensive (95.6%). Basal ganglia were the most common area (49.5 %) of bleeding, followed by bleeding in the lobar areas (20.3%) and thalamic (14.1%) of the brain. Fifteen patients (13%) underwent surgery combined with conservative treatment, whereas 98 patients (86%) received conservative treatment. The mean (SD) length of hospitalisation was 12.0 (SD =14.1) days.

The total mean (SD) of early functional adaptation score (FIM) was 48.1(30.1), which indicated low functional adaptation in acute recovery phase. Later (3 months) functional

adaptation total mean (SD) score was expected at a significantly higher than the early adaptation score, the total mean difference, t (112) = -16.45, $p < .05$, 95% Cl [-50.6, -39.7]. This finding indicates that functional adaptation markedly improved at three month post PICH after received treatment and rehabilitation intervention.

Multiple linear regression analysis demonstrated that five associated variables statistically predicted as factors affecting of the early functional adaptation score, R^2 = .52, $F = 22.7$, $p < .05$). Females (β = 9.6, p = .023), intracerebral bleeding in the non-lobar area (β = -16.7, $p < .001$), higher neurological deficit score (β = - 1.91, $p < .001$), respiratory infection (β = -16.7, $p < .001$), and lower stroke knowledge score (β = 2.89, p = .09) were associated with lower early functional adaptation score.

The regression analysis of later (3 months) functional adaptation accounted for, R^2 = .65, F = 33, $p < .05$) of the factors affecting later (3 months) adaptation score. Six predictors including young age (β = - 0.82, $p < .001$), early functional adaptation score (β = .40, $p <$ .001), high stroke knowledge (β = 2.78, $p < .001$), lack of exposure to urinary infection at three months post PICH (β = -29.1, $p < .001$), absence of depression at three months post PICH (β = - 0.98, $p < .001$), and appropriate ICH treatment (β = 22.5, $p < .001$) were identified as factors associated with the increase in later (3 months) adaptation outcome score at three months post PICH.

A better understanding of the factors that affect the adaptation process is essential in the planning of specific stroke education and rehabilitation interventions with the aim of enhancing functional recovery process.

Keywords: intracerebral haemorrhage, stroke, stroke related disability, adaptation, post stroke complications.

ABSTRAK

Strok yang disebabkan oleh perdarahan intraserebral primer didefinisikan sebagai terbentuknya tanda-tanda klinikal ketidakfungsian sistem neurologik yang disebabkan terdapat pengumpulan darah di dalam parenkima otak yang bukan terjadi akibat kecederaan. Individu yang mengalami strok akibat perdarahan intraserebral primer mungkin mengalami kecacatan fizikal, deficit fungsi kognitif, masalah pertuturan, gangguan emosi, masalah ketidakupayaan melakukan aktiviti seharian dan terdedah pada risiko komplikasi pos-strok. Kajian ini bertujuan untuk mengenalpasti tahap adaptasi awal dan lewat (3bulan) akibat kecacatan selepas perdarahan intraserebral primer, tahap pemulihan dan faktor-faktor yang mempengaruhi adaptasi awal di fasa pemulihan akut dan lewat iaitu tiga bulan selepas perdarahan intraserebral primer. Subjek adalah pesakit yang dimasukkan ke Hospital Universiti Sains Malaysia (Hospital USM) dan Hospital Sultanah Nur Zahirah (HSNZ) Terengganu, Malaysia semasa Jun 2009 dan Disember 2010 akibat perdarahan intraserebral primer. Soalan kajian yang digunakan termasuklan Ukuran Tahap Kebergantungan Untuk Berfungsi (Functional Independence Measure) (FIM), Skala Institud Kebangsaan Kesihatan Strok (National Institutes of Health Stroke Scale) (NIHSS), Senarai Semak Inventori Komplikasi (Complication Inventory Checklist) (CIC), Soalselidik Kesihatan Pesakit 9 – jenis skala tekanan (Patient Health Questionnaire 9-item depression scale) (PHQ-9-DS) dan Senarai Semak Tahap Pengetahuan tentang Stroke (Stroke Knowledge checklist) (SKC).

Subjek terdiri dari 66 (58%) lelaki dan 47 (41.6%) wanita. Secara purata umur adalah 55.0 (SP = 11.8) tahun. Hampir keseluruhan subjek adalah pengidap penyakit darah tinggi (95.6%). Lokasi perdarahan dalam otak yang utama adalah di basal ganglia (49.5 %) diikuti dengan dalam talamik (14.1%) dan kawasan lobar (20.3%) dalam otak. Lima belas pesakit (13%) menjalani rawatan pembedahan serta kombinasi dengan rawatan ubatan dan 98 pesakit (86 %) hanya mendapat rawatan ubatan. Secara purata jangkamasa

tinggal dalam hospital adalah 12 (SP = 14.1) hari. Purata (Sisihan Piawai) tahap adaptasi awal adalah 48.1 (30.1), bermaksud tahap adaptasi awal adalah di peringkat rendah. Sementata purata (Sisihan Piawai) adaptasi lewat (3 bulan) adalah lebih tinggi dari di peringkat awal adaptasi iaitu 93.2 (34.8) berbanding adaptasi di peringkat awal iaitu *t* (112) = -16.45, $p < .05$, 95% Cl [-50.6, -39.7], yang membawa maksud tahap adaptasi menunjukkan ada peningkatan pada tiga bulan selepas menjalani rawatan dan pemulihan. Analisia ujian regresi linear berganda menunjukan terdapat lima varibel secara signifikan menyumbang sebagai faktor yang mempengaruhi skor adaptasi awal, $R^2 = .52$, $F = 22.7$, $p < .05$). Jantina wanita (β = 9.6, $p = .023$), perdarahan dalam otak di bahagian luar lobar otak (β = -16.7, $p < .001$), tahap keterukan defisit neurologi (β = - 1.91, $p < .001$), infeksi salur pernafasan (β = -16.7, $p < .001$), dan tahap pengetahuan yang rendah tentang penyakit strok (β = 2.89, $p = .09$,) adalah yang faktor berkait dengan skor tahap adaptasi awal yang rendah. Analisis regresi linear berganda bagi adaptasi lewat (3 bulan), keputusan menunjukan terdapat enam variabel secara signifikan menyumbang sebanyak $R^2 = .65$, $F = 33$, $p < .05$, sebagai faktor yang mempengaruhi skor adaptasi lewat. Umur (β = -0.82, $p < .001$), skor adaptasi awal (β = 0.40, $p < .001$), tinggi pengetahuan strok (β = 2.78, $p < .001$), tiada jangkitan saluran kencing diperingkat lewat (3 bulan) (β = -29.1, $p < .001$), tiada tekanan perasaan diperingkat lewat (3 bulan) (β = - 0.98, $p < .001$), dan rawatan kombinasi pembedahan dan konservatif (β = 22.5, $p < .001$) mempengaruhi hasil adaptasi lewat. Pemahaman yang lebih mendalam tentang faktor-faktor yang mempengaruhi tahap adaptasi awal dan lewat selepas strok perdarahan adalah penting untuk perancangan intervensi pemulihan kejururawatan khusus yang bertujuan untuk mencegah komplikasi dan proses adaptasi dan pemulihan.

Kata Kunci: pendarahan intraserebral primer, strok, adaptasi, stroke deficit, komplikasi pos-strok, pengetahuan tentang strok.

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ACRM	: American Congress of Rehabilitation Medicine
ADL	: Activity Daily Living
CES-D	: Center for Epidemiological Studies Depression Scale
CIC	: Complication Inventory Checklist
CICPD	: Complication Inventory Checklist Post Discharge
CINAHL	: Cumulative Index to Nursing and Allied Health Literature
DSM	: Diagnostic and Statistical Manual of Mental Disorders
DVT	: Deep Vein Thrombosis
FIM	: Functional Independence Measure
GCS	: Glasgow Coma Scale
HSNZ	: Hospital Sultanah Nur Zahirah Kuala Terengganu
HUSM	: Hospital Universiti Sains Malaysia
ICH	: Intracerebral Haemorrhage
MDD	: Major Depressive Disorder
NIDRR	: National Institute on Disability and Rehabilitation Research
NIHSS	: National Institutes of Health Stroke Scale
PHQ	: Patient Health Questionnaire
PICH	: Primary Intracerebral Haemorrhage
PSD	: Post Stroke Depression
UTI	: Urinary Tract Infection
UMMC	: University of Malaya Medical Centre
SLR	: Simple Linear Regression
SPSS	: Statistical Package for Social Science

CHAPTER 1: INTRODUCTION

1.1 Primary Intracerebral Haemorrhage (PICH) and problem statement

Spontaneous or primary intracerebral haemorrhage (PICH) is the second most common type of stroke, and is estimated to comprise about 78% to 88% of all intracranial haemorrhages (Rathor, Rani, Jamalludin & Amran, 2012). The World Health Organization (WHO), defines stroke as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function with signs lasting 24 hours or longer or leading to death with no apparent cause other than of vascular origin" (Sacco, Kasner, Broderick and Caplan et al., 2013). According to the American Stroke Association (2013), a stroke due to intracerebral haemorrhage is defined as the rapid development of clinical signs of neurologic dysfunction as a result of the focal collection of blood within the brain parenchyma or ventricular system which is not caused by trauma (Sacco, Kasner, Broderick and Caplan et al., 2013). Hill, Silver, Austin & Tu, (2000) defined PICH as spontaneous intracerebral haemorrhage in the absence of secondary causes such as vascular malformation, vasculitis, moyamoya disease, aneurysm, cortical vein/sinus thrombosis, neoplasm, trauma, post-operative events, hyperviscosity syndrome, haemorrhagic diatheses, ischemic stroke, etc.

Worldwide reports show that the number of individuals who experienced a stroke increased by up to 68%, and the number of those who survived the incidence of a stroke has increased by 84% (Jaracz, Fudula, Gorna & Kozubski, 2014; Mansouri, Heidari, Asadollahi, Nazari et al., 2013). Delbari, Roghani, Tabatabaei, Rahgozar & Lokk, (2011) conducted a study to evaluate the profiles of stroke patients with respect to stroke rate, risk factor and one-month fatality. The annual stroke rate was estimated at 338/100000

(95% CI, 300-360) for inhabitants older than 45 years. The results of the subtypes were: 75% were due to ischemic infarction, 20.7% were due to intracerebral haemorrhage, and another 3% was due to an undetermined type of stroke. The mortality rate was 24.6% within the first month (Delbari et al., 2011).

The prevalence of intracerebral haemorrhage among Asians was higher than among Caucasians in the United States and Europe (Rathor, 2012). On the other hand, studies in Western countries have found that the prevalence of ICH is more common among blacks than whites (Qureshi et al., 2009). A study conducted in the West Coast of Peninsular Malaysia revealed that ICH was almost equally prevalent among the Malays (43.9%) and Chinese (39.4%)(Sia, Tan & Waran, 2007).

The pathophysiology of PICH is caused by the spontaneous rupture of small vessels damaged by chronic hypertension or amyloid angiopathy (Sacco, Kasner, Broderick and Caplan et al., 2013; Qureshi et al., 2009). PICH can be described as bleeding in the cerebrum. It occurs when the blood pressure is constantly high for a significant period of time, where the walls of blood vessels become weak causing the vessels to rupture and to leak blood into the brain. After the onset of intracerebral haemorrhage, the hematomas expand over time, and this may be associated with acute hypertension, a local coagulation deficit, or both (Gillespie, Bowen, Chung, & Cockburn et al., 2015; Lo Presti et al., 2014). The region surrounding the haematomas is characterized by oedema, apoptosis, necrosis, and inflammatory cells (Lo Presti et al., 2014; Qureshi et al., 2009). Haematomas increase injury by causing mechanical damage to the neurons and glia, followed by mechanical deformation resulting in oligaemia, neuro transmitter release, mitochondrial dysfunction, and membrane depolarization. A secondary episode of injury is started by the products of coagulation and haemoglobin breakdown, in particular, thrombin, which activate the

microglia. The microglia is purposely activated to promote the breakdown of the blood–brain barrier, vasogenic oedema, and apoptosis in the neurons and glia (Liebeskind, Kalkurni, Kirshner & Nassisi, 2011; Qureshi et al., 2009). The other mechanisms of PICH include the excessive use of anticoagulants, thrombolytic and antiplatelet agents, bleeding diatheses, iatrogenic anticoagulation, cerebral amyloidosis, and cocaine abuse (Rathor, 2012; Qureshi et al., 2009).

PICH has specifically been anatomically classified as lobar and non-lobar haemorrhages. A non-lobar haemorrhage is a haemorrhage that occurs in the epicentre of the brain in the putamen or caudate, thalamus, cerebellum, or brain stem; while a lobar haemorrhage is one that is located more peripherally, and usually expends to the brain surface. Lobar haemorrhages are divided according to the lobe (frontal, temporal, parietal, and occipital) or are known as bilobar if two contiguous lobes are involved or trilobar if three or more lobes are involved (Hill, Silver, Austin &Tu, 2000). According to Liebeskind et al. (2011), ICH usually affects the cerebral lobes, basal ganglia, thalami, cerebellum, and brain stem (predominantly pons). A haemorrhage that starts in the putamen, global pallidum, thalamus, internal capsule, deep periventricular white matter, pons, and cerebellum, specifically in a patient with known hypertension, is usually related to hypertensive small-vessel disease (Aries & Hunter, 2015; Morgenstern et al., 2010).

Patients with PICH present with a sudden onset of a focal neurological deficit, which progresses over minutes to hours, accompanied by headache, nausea, vomiting, decreased consciousness, and elevated blood pressure (Balami, & Buchan, 2012; Liebeskind, Kalkurni, Kirshner & Nassisi, 2011; Qureshi et al., 2009). The early progression of neurological deficits in many patients with ICH is frequently due to on-going bleeding and enlargement of the hematoma during the first few hours (Liebeskind et al., 2011).

Loss of consciousness occurs as a result of the initial area of brain damage and extended areas of damage due to secondary changes, such as increased intracranial pressure (Alverzo, 2005). The blockage of circulation in the brain or haemorrhage from the vessel-supplying area of the brain results in ischemia and tissue death in that area of the brain and the corresponding neurological deficits (Qureshi et al., 2009; Vanhook, 2009).

The nature of the disabilities resulting from PICH is categorized into physical and cognitive domains (Dalvandi, Heikkila, Maddah, Khankeh & Ekman, 2010; Leung, Cheng, Mak, Leung& Lee, 2010; Oh & Seo, 2010a). In terms of physical disability, the alteration in mobility, movement and sensory functions have been found to decrease the ability to perform functional activities and are significantly associated with the development of other medical complications (Oh, 2010; Leung, 2010; Dalvandi, 2010; Miller, 2010; Pandian & Arya, 2013). Stroke patients demonstrate a high dependence on others to perform functional activities of daily living such as self-care activities, sphincter control, transfers, and locomotion during the recovery stage (Aries & Hunter, 2015; Skolarus, Burke, Brown & Freedman, 2014; Leung, 2010; Oh & Seo, 2010; Almborg, Ulander, Thulin & Berg, 2010; Miller, 2010; Dalvandi, 2010; Green & King, 2010). Physical disability is usually associated with post-stroke complications such as respiratory infections, urinary tract infections, pressure ulcers, pain, deep-vein thrombosis and depression during the acute recovery phase and long-term rehabilitation phase (Kumar, Salem & Chaplan, 2010; Almborg, 2010; Miller et al ., 2010).

In terms of cognitive functions, about 25.0% of ICH patients are disabled in terms of problem solving, safety and social behaviour at six months after admission (Oh & Seo, 2010; Leung, 2010; Dalvandi, 2010). The rate of having cognitive deficits after ICH varies from 11.6% to 56.3% in the majority of hospital-based studies (Patel, Coshall,

Rudd & Wolfe, 2002). ICH patients with cognitive deficits after a haemorrhagic stroke have also been reported to be associated with emotional difficulties and depression. Post-stroke depression (PSD) has been estimated to occur in 18% to 50% of individuals who experienced strokes (Kuptniratsaikul et al., 2009). According to Taylor, Todman & Broomfield (2011), predicting and understanding the adaptation of patients to a stroke, therefore, poses challenges within the recovery period. PICH patients show symptoms of depression and have significantly lower functional scores both at the onset of a stroke and after six months, and are consistently associated with negative consequences, including poor recovery of survivors (Taylor et al ., 2011; 2010; Leung, 2010; Dalvandi, 2010).

The common risk factors for PICH are hypertension, particularly in those who are not complying with antihypertensive medication (Rutten-Jacobs, Maaijwee, Alebeek & Schaapsmeerders et al., 2011; Liebeskind, Kalkurni, Kirshner & Nassisi, 2011). Many studies stated that PICH was significantly higher among young adults and middle-aged persons(Wei et al., 2011; Umeano, Philips-Bute, Hailey& Sun et al., 2013). Studies have found that ICH occurs slightly more frequently among men than women (Zhou, Zhang & Arima et al., 2014; Al-Khaled et al., 2014; Weimer, Sacco, Diener & Konig, 2009; Yesilot, Koyuncu, Coban, Tuncay & Bahar, 2011). Even though the risk of ICH is higher in males than in females, the risk of dying from PICH is higher among females with ICH (Zhao et al., 2014).

1.2 Research Problems and Significance of the study

PICH is a stressful experience for patients. Many studies have reported that PICH is associated with a high rate of mortality, disability and poor functional outcomes, and it is estimated to affect over 1 million people worldwide each year (Rathor, 2012; Delcourt & Anderson, 2011; Bahao, 2009; Baseman et al., 2010; Oh et al., 2010). Baseman et al,

(2010) stated that mortality rates for PICH have been documented to be about 23.3% to 34.0 %, and 66% to 76.7% of survivors have been reported to be disabled. According to Jammali, Mclnnes, Markus & Fauk et al., (2011), patients with intracerebral haemorrhage and having a stroke had a significantly lower functional score in terms of physical and cognitive functions. Although PICH is associated with a high mortality rate, and most survivors are usually left with significant functional disabilities, however, the mortality rate pattern is decreasing due to improvements in early investigation and treatment (Ukraintseva, Sloan, Arbeev & Yashin, 2006). It is important to determine the degree of severity of PICH, degree of disability resulting from PICH and what are treatments provided in relation to the control of hypertension.

Rehabilitative care and treatment should begin as early as possible in the acute phase and be extended into community reintegration (Rettke & Geschwindner, 2013). Early rehabilitation for haemorrhagic stroke (PICH) is part of routine care in acute hospital settings, especially in neurosurgical units. An acute inpatient recovery phase begins immediately after patients with intracerebral haemorrhage, survived the critical condition and impairments. During the inpatient recovery phase, the patients are usually placed in a neurosurgical ward for rehabilitative care and treatment. They are usually referred for physiotherapy, occupational therapy and speech-language pathology treatment. Comprehensive and professional healthcare support by nurses will help to promote faster recovery, reduce the degree of disability, minimize post-stroke complications, promote independence, and enhance optimal adaptations to stroke disabilities. It is important to determine the prevalence of PICH patients having post-stroke complications and depression at acute inpatient recovery phase and at later post PICH and what are the care managements provided in relation to prevent post stroke complications. It is also important to determine the level of multidisciplinary team involvement such as

physiotherapy, speech therapy, nutrition, pharmacy and as well as family of the patients in care management.

Adaptation to a stroke-related disability is crucial in determining the level of a patient's ability to adjust to the sudden stroke disability and to live with the disability for a prolonged period of time following PICH. Adaptation is conceived as a process of responding to the functional, psychological and social changes that occur with the onset and experience of living with a disability (Taylor, Todman & Broomfield et al, 2011). The adaptation should be determined several times during the recovery process, starting from the patient's survival of the critical phase, usually in a hospital setting, immediately after discharge, and subsequently, during the long-term period of recovery, whether it is three months, six months or years, and usually during the time when the patients are at home or in a community setting (Morgenstern et al., 2014; Jammali, Mclnnes, Markus & Fauk et al., 2011).

Adaptation occurs when the patient participates in adjusting to the disabilities and is able to accept the disabilities (Taylor, Todman & Broomfield et al., 2011). Adaptation to disabilities as a consequence of intracerebral haemorrhage (PICH) is perceived as a patient recovers from the impact of physiological, functional, psychological, and social changes following a stroke.

Recovery after a stroke is viewed by improvements in clinical indicators that include physical, cognitive and emotional functioning and the ability to carry out the activities of daily living (Davis, Egan Dubouloz, Kubina & Kessler, 2013; Davis, 2013). Based on this perspective, adaptation involves mourning the lost abilities and the acceptance of one's disability (Davis, 2013; Taylor, Todman, Broomfield et al, 2011). This focus on

functioning and the acceptance of the disability is somewhat inconsistent with the perspective of those recovering from a stroke. In other words, adaptation and recovery with regard to a stroke-related disability after PICH are concerned with both the prevention of further disabilities and the reduction of the consequences of the functional disability. PICH patients and their caregivers should have access to stroke information and they need to be encouraged to participate in rehabilitation interventions. It is also crucial to ensure that the educational and informational needs of the stroke patients and their caregivers are met.

Early adaptation refers to patients who gain better recovery from stroke neurological deficits without post-stroke complications, show improvement in their abilities to perform functional activities, can be discharged from a hospital setting, and have adequate support from their family. It is important to determine the factors enhancing or inhibiting early adaptation in acute recovery phase. The critical variables that predicted as the factors that might affect the recovery process are patients' background such as age, gender and social-economic status, severity of ICH, severity of neurological deficit, location of brain lesion, ICH treatments, post stroke complications and length of stay (Wei et al., 2011; Umeano, Philips-Bute, Hailey & Sun et al., 2013; Zhou, Zhang, Arima & Zhao et al., 2014; Al-Asadi & Habib; LoPrestietal., 2014; Bahou, 2009; Yesilot, et al., 2011; Ordin, 2013; Indredravik, Rohweder, Naalsund & Lydersen, et al., 2008; Kuptniratsaikul et al., 2009; Vargas, et al., 2006). It is important to nursing management to focus on early response to stroke-related disability by giving attention and care related to the sudden neurological deficit, encouraging patients and their caregivers to participate in early rehabilitation interventions, and encouraging and motivating patients to gain early adaptation with their stroke disability. Hu, Hsu, Yip, Jeng & Wang, (2010) also stated that rehabilitation for patient in acute setting includes positioning, range of motion's exercises, mobilization,

sitting balance training, facilitation of limb and trunk control, and education of patients and family.

Later adaptation is the long-term physical and cognitive recovery in achieving maximum functional ability at home after being discharged from hospital setting (Livneh 2001). Most survivors are usually left with significant functional disabilities, with only 31% of patients with ICH being functionally independent at 3 months, and only 38 % of the patients surviving the first year (Oh and Seo, 2010; Bahao, 2009). A recent finding demonstrated that ICH patients have better outcomes compared to other types of strokes (Leung, 2010). The long-term effects of PICH are becoming more important to the public at large as well as for nursing and healthcare professionals. Thus, it is important to determine the long-term positive or negative adaptation outcomes because during this period of time, the majority of PICH survivors are still in the process of physical or cognitive rehabilitation to overcome their disabilities. Positive adaptation is the patients' recovery from critical phase following PICH and show improvement in ability to perform activities during early and at later in recovery phase. Study by Oh & Seo (2010) and Yesilot, et al. (2011), reported that better functional recovery occurred between three to six months after ICH. Almborg, et al., (2010) reported that the factors positively associated to later adaptation (3 month) outcome of post stroke patients include high independence in functional activities of daily living, presence or absence of psychological problem or depression, have social support and healthcare resources and absence of post stroke complications. The factors negatively affecting later adaptation (3 month) to achieve the maximum score of functional abilities include patients who developed stroke-associated infection (Shinohara, Yanagihara, Abe & Yoshimine, 2011), depression (Gaete & Bogousslavsky, 2008) and low stroke knowledge (Cameron, 2013; de Palva et al., 2012). So the focus of this study is to examine whether there is significant

improvement of patient's adaptation in gaining maximum recovery in functional disability, factors that affect early adaptation in response to stroke-related disability during acute inpatient recovery phase and later adaptation (3 month) outcome after experiencing PICH.

In Malaysia, there is an underestimation of the importance of immediate action for the patient with signs and symptoms of intra cerebral haemorrhage or haemorrhagic particularly stroke, at government hospitals. Although early rehabilitation for haemorrhagic stroke (PICH) is part of routine care in acute hospital setting especially in neurosurgical units in Malaysia, however, there are limited studies, including specific rehabilitation nursing care to predict adaptations and factors contributing to adaptations with stroke disabilities, specifically for patients with PICH, and particularly in the long term adaptation.

In summary, patients with primary intracerebral haemorrhage commonly experienced changes or disabilities in terms of their neurological status and functional activities, and are at risk of developing post-stroke complications and depression. Adaptations after experiencing a stroke are perceived as the patients' response to sudden and long-term stroke-related disabilities. However, there are factors predicting early and later adaptation of post primary intracerebral haemorrhage patients.

1.3 Research Questions

This study aimed to determine the functional adaptation outcomes at early and later (3 month) of post-PICH. The research questions of this study are delineated according to the two phase in order to answer the identified research problems.

Thus the research questions are as follows:

1.3.1 What are the profiles of early and later adaptation of post PICH patients?

1.3.2 Are there any improvements of functional adaptation between early phase and later (3 months) of PICH patients who admitted at the Hospital Universiti Sains Malaysia (HUSM) and the Hospital Sultanah Nur Zahirah, Kuala Terengganu.

1.3.3 What are the predictors affecting early and later (3 month) adaptation in achieving maximum functional recovery outcomes.

By understanding the increase or decrease in functional adaptation between early and later phase (3 month) and the predictors affecting of functional adaptation during both phases, it will be possible to plan for a new guideline for specific care for PICH patients during acute inpatient recovery setting, and to develop specific educational guidelines to promote good recovery outcomes for PICH patients.

1.4 Study Objectives

The main objective of this study was to assess early and later (3 months) of functional adaptation in achieving positive recovery outcomes, improvements and predictors affecting early and later of functional adaptation of PICH patients.

The specific objectives of the study are delineated according to the two phases;

Phase 1: During inpatient recovery phase post PICH;

1.4.1 To describe the profiles of early functional adaptation score at baseline of post PICH patients?

1.4.2 To determine the correlations between early functional adaptations score of post PICH patients with selected numerical variables [age, severity of neurological deficit, Glasgow Coma Score, depression acute, stroke knowledge, length of hospital stay and ICH treatment].

1.4.3 To determine the significant associations between socio-demography and clinical characteristics [availability of primary caregiver to give support, length of hospitalization, ICH treatments, severity of neurological deficits, depression, post-stroke complications and stroke knowledge of patients and their caregivers during the acute inpatient recovery phase] as predictors affecting early functional adaptation of PICH patients in achieving positive recovery from stroke disabilities.

Phase 2: Later (3 month) at home post PICH

1.4.4 To describe the profiles of later (3 month) functional adaptation of post-PICH patients

1.4.5 To determine the correlations between later (3 month) functional adaptation score of post PICH patients with selected numerical variables [age, severity of neurological deficit, Glasgow Coma Score, depression acute and at three month, stroke knowledge, length of hospital stay and ICH treatment].

1.4.6 To determine the changes in the score between early and later (3 month) functional adaptations, post-stroke complications and depression and,

1.4.7 To determine the significant associations between socio-demography and clinical characteristics [availability of primary caregiver to give support, severity of neurological deficits, length of hospitalization, ICH treatments, status of post-stroke complications during the acute inpatient recovery phase, status of later complications at three months, stroke knowledge of patients and their family

caregivers, early adaptation score, status of depression during acute inpatient recovery phase and later at three months] as predictors of functional adaptation of PICH patients at later (3 months) follow up.

1.5 Operational Definitions

1.5.1 Primary Intracerebral Haemorrhage (PICH)

Primary intracerebral haemorrhage (PICH) is defined as a spontaneous ICH that occurs after the sudden rupture of vessels related to hypertension-related degenerative changes or cerebral amyloid angiopathy or other mechanisms, including excessive use of anticoagulants, thrombolytics, and antiplatelet agents in the absence of secondary causes such as arteriovenous malformations and aneurysms, tumours, or impaired coagulation (Hill, Silver, Austin & Tu, 2000).

1.5.2 Early Functional Adaptations

This study defines early functional adaptation as the measurement of a patient's functional recovery in performance of functional activities during acute inpatient recovery phase post PICH. In this study, the early adaptations of the patients were assessed using a validated Malay version Functional Independence Measure (FIM) questionnaire (Musicco, Emberti, Nappi & Caltagirone, 2003) taken on day 2 to 14 post PICH.

1.5.3 Acute inpatient recovery phase

An acute inpatient recovery phase begins immediately after patients with intracerebral haemorrhage survived from critical condition and impairment. This phase last for weeks to months with the aim to reduce the degree of disability and provide a comprehensive and professional health care support in relation to establish community life. During inpatient recovery phase, the patients are usually referred for physiotherapy, occupational therapy and speech-language pathology treatment, further, during this phase the patients receive a comprehensive nursing care and stroke education in it's the goal of improving functional limitation or disability and the prevention of post stroke complications and depression.

1.5.4 Recovery from stroke-related disabilities

A positive adaptation is deemed as the patient's recovery from a critical phase following PICH and showing improvement and being independent to perform activities by improving physical, cognitive and mental functions during the early and later in recovery phases.

1.5.5 Later (3 months) Functional Adaptations

A later (3 months) functional adaptation is the outcomes of continuous physical and cognitive recovery at home. During this phase, recovery from critical physiological problems may improve, but recovery from the physical and cognitive disabilities can vary considerably. Improvements in physical and cognitive disabilities can continue depending on the emotional and cognitive resources, and later adaptation frequently requires support, care and training at the community level. In this study, the long-term adaptations

of the patients were assessed at 3 months using a validated Malay Functional Independence Measure (FIM) score questionnaire (Musicco, Emberti, Nappi & Caltagirone, 2003).

1.5.6 Post-stroke complications

The change in physical and cognitive abilities can potentially lead to the development of a variety of post-stroke complications. The post-stroke complications included in this study were chest infections, urinary tract infections, pressure sores and deep-vein thrombosis. This study used a Complication Inventory Checklist (CIC) to determine the status of complications at two weeks (CIC-ACUTE) and at three months (CIC-3 MONTHS) post-PICH.

1.5.7 Stroke Knowledge

Stroke knowledge is consists of information about stroke disease and management at home after suffering a stroke-related disability. The stroke patients and their family caregivers should be provided with information about stroke and its management at home prior to being discharged from the hospital. Those with knowledge on stroke may have enhanced recovery, improved adaptation to stroke-related disabilities and may avoid post-stroke complications and depression. This study used a Stroke Knowledge Questionnaire (SKQ) to evaluate the scores of patients and their family caregivers regarding stroke knowledge that included stroke illness, risk factors, treatment, dealing with signs of problems or recurrent strokes, management of depression and post stroke complications.

1.5.8 Post stroke depression

Depression is a term that has both a lay meaning as well as a meaning for psychiatric diagnosis which the person showed periods of sadness or "feeling blue," as well as feelings of loss and bereavement are a normal part of the human condition (Johnson, Minarik, Nyström, Bautista & Gorman, 2006). Post stroke depression considers as minor depression and sub-syndrome depression (Johnson et al. 2006). Minor depression is a term that is used in clinical practice in general hospital settings and in research. Minor depressive disorder is included in the current edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM) as a research diagnosis, meaning that there was insufficient evidence or professional agreement to include it as an official diagnosis at the time of publication (Johnson et al., 2006). Minor depressive disorder refers to one or more periods of depressive symptoms lasting at least 2 weeks but involving fewer symptoms and less impairment than major depressive disorder (MDD). Major depressive disorder (MDD) is distinguished by one or more major depressive episodes lasting at least two weeks and characterized by a depressed mood or diminished interest or pleasure for most of the day almost every day. It is accompanied by at least four out of nine depressive symptoms: depressed mood; diminished interest or pleasure; changes in appetite or weight; insomnia or hypersomnia; psychomotor agitation or retardation; fatigue or loss of energy; feelings of worthlessness or excessive or inappropriate guilt; diminished ability to think or concentrate, or indecisiveness; and recurrent thoughts of death, recurrent suicidal ideation, suicide attempts, or specific plans for suicide. The episodes include clinically significant distress or impairment in social, occupational or other important areas of functioning.

1.6 Thesis Organization

The background, research problems and significance of the study, research questions, objectives, regarding this study have been described in this chapter. The following components of the thesis are organised according to the focus on the chapters.

The related literature in the area of the impacts and adaptations in response to PICH-related disabilities and the contextual factors associated with early and long-term adaptations are presented in Chapter Two. The theories and concepts surrounding ICH or intracerebral stroke are also elaborated. The conceptual framework is described at the end of Chapter Two.

The research method, including the study design, sampling and data collection as well as the data analyses, is presented in Chapter Three.

Chapter Four describes the PICH patients who participated in this study, and reports the findings from the study. The results obtained from Phase I and Phase II are reported, with an emphasis on describing the findings on early and long-term adaptations and the relationship between early and long-term adaptation outcomes with selected variables.

The findings from this study were discussed in Chapter Five based on the research questions, with the main focus being on factors affecting early and long-term adaptation outcomes in response to stroke-related disabilities.

Chapter Six presents the implications, recommendations and conclusion from this study.

1.7 Summary

In summary, patients with primary intracerebral haemorrhage commonly experience changes or disabilities in terms of their neurological status and functional activities, and are at risk of developing post-stroke complications and depression. Adaptations following a stroke are perceived as the patients' response to sudden and long-term stroke-related disabilities. By understanding the factors that are related to the adaptation process, nurses will be better prepared to participate in meeting the needs of PICH patients, and to help in redesigning the inpatient rehabilitation nursing interventions specific to the promotion of recovery and the enhancement of adaptations to stroke haemorrhagic.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter describes the critical review of literature regarding the phenomenon of a stroke in relation to primary intracerebral haemorrhage (PICH) and its impact. The chapter is organised according to the five major topics of this study, namely, the primary intracerebral haemorrhage illness; theory related to this study; stroke-related disability related to intracerebral haemorrhage; the adaptation to stroke-related disabilities post-PICH; the factors associated with early and later adaptation; and lastly, the early and later recovery outcomes in response to stroke-related disabilities. This chapter also provides the related theories, conceptualization and justification of the conceptual framework for this study.

2.2 Primary intracerebral haemorrhage (PICH)

Primary intracerebral haemorrhage (PICH) is classified as a type of stroke, the occurrence of which has a negative impact on the individual. Intracerebral haemorrhage commonly occurs in the cerebral lobes, the basal ganglia, thalami, cerebellum, and the brainstem (predominantly the pons) **(**LoPresti etal., 2014; Liebeskind, Kulkarni, Kirshner & Nssissi, 2011; Qureshi, Mendelow & Hanley, 2009**),** especially in patients with uncontrolled hypertension (Broderick, et al., 1999).

Specific to PICH, haemorrhages have been divided anatomically into lobar and non-lobar subtypes (Hill, Silver, Austin & Tu, 2000). A non-lobar haemorrhage includes ICH, in which the epicentre of the haemorrhage is located in the putamen or caudate, thalamus, cerebellum or brainstem, while a lobar haemorrhage is defined as PICH, which is located

more peripherally, often extending to the brain surface. Lobar haemorrhages are divided according to the lobe (frontal, temporal, parietal, and occipital) or is known as a bilobar haemorrhage if two contiguous lobes are involved, or a trilobar haemorrhage if three or more lobes are involved (Hill, Silver, Austin & Tu, 2000). Haemorrhages that originate in the putamen, global pallidum, thalamus, internal capsule, deep periventricular white matter, pons, and cerebellum, particularly in a patient with known hypertension, are often attributed to hypertensive small-vessel disease (LoPresti etal., 2014). The literature states that patients with supra-tentorial intracerebral haemorrhage involving the putamen, caudate, and thalamus have contralateral sensory-motor deficits of varying severity owing to the involvement of the internal capsule (Lo Presti etal., 2014; Liebeskind, 2011). Abnormalities indicating a higher level of cortical dysfunction, including aphasia, neglect, gaze deviation, and hemianopia, may occur as a result of the disruption of connecting fibres in the subcortical white matter and the functional suppression of the overlying cortex, known as diaschisis; while patients with an infra-tentorial intracerebral haemorrhage have signs of brainstem dysfunction, including abnormalities of gaze, cranial-nerve abnormalities, and contralateral motor deficits. Ataxia, nystagmus and dysmetria are prominent when the intracerebral haemorrhage involves the cerebellum. If the cerebellum is involved, the patient is at high risk of herniation and brainstem compression (Liebeskind et al., 2011). Herniation may cause a rapid decrease in the level of consciousness, apnea, and death. Other signs of cerebellar or brainstem involvement include gait or limb ataxia, nausea and vomiting, hemiparesis or quadriparesis, hemisensory loss or sensory loss of all four limbs, eye movement abnormalities resulting in diplopia or nystagmus, oropharyngeal weakness or dysphagia, and crossed signs (ipsilateral face and contralateral body) (Lo Presti etal., 2014; Liebeskind, 2011).

PICH is the leading cause of long-term disability and is estimated to affect over 1 million people worldwide each year (Delcourt & Anderson, 2011).). Many studies have reported

that the overall mortality rate is about 32.5% (Toyoda, Steiner, Epple & Kern et al., 2013; Rathor, Rani, Jamalludin & Amran, 2012; Aries & Hunter, 2015). According to Morgenstern et al. (2010), PICH is significantly associated with more severe neurological impairments and higher mortality in the acute phase, with more than one-half of patients with PICH dying within the first month.

Similar with other types of strokes, the person with PICH typically experiences sudden and intense physical, cognitive, and behavioural changes (Davis, 2015; Leung et al., 2010; and Oh & Seo, 2010). The brain lesion that results from a stroke related to intracerebral haemorrhage can cause a combination of physical, psychological, cognitive, perceptual and/or behavioural changes in stroke survivors. The change is significantly associated with neurological deficits, which are portrayed in terms of altered consciousness, changes to vision, disability or weakness in any part of the body, loss of coordination, loss of balance, changes to sensations, cognitive deficits, difficulty in reading or writing, and difficulty in speaking or understanding others (Oh, 2010; Leung, 2010; Dalvandi, 2010). The potential for a complex disability to have an impact is greater following a stroke compared to other conditions or disorders that affect adults (Aries & Hunter, 2015). However, the recovery and prognosis for the residual disability and functioning of a patient with ICH are different compared to an ischemic stroke. The recovery of the ICH patient is more rapid in the first few weeks, but may continue for many months after the ICH, with approximately half of all survivors remaining dependent on others for the activities of daily living (Oh and Seo, 2010). Latest findings on all types of stroke found that ICH patients had a better outcome at recovery compared to other types of strokes and reported had better functional prognosis (Leing, et al., 2010: Paolucci et al., 2003). According to Ukraintseva, Sloan, Arbeev, & Yashin (2006), mortality rate that followed intracerebral haemorrhage decreased due to improvement in early investigations and

treatments. Thus, it is important to study what the factors contributing to the increase or decrease physical and cognitive functions of individuals with PICH.

Based on the age group, previous studies have shown that PICH is significantly more common among young and middle-aged persons (Wei et al., 2011; Umeano, Philips-Bute, Hailey& Sun et al., 2013), while other findings have also reported that the incidence of deep intracerebral haemorrhage is mostly seen in young and middle-aged persons (Qureshi et al., 2009). In Malaysia, a study was conducted by Rathor (2012) to evaluate the contribution of various risk factors to post-PICH outcomes, where the mean age was 58.30 years. It was indicated that among Malaysians, PICH is also common among middle-aged people.

In relation to ethnicity in Malaysia, Sia, Tan & Waran (2007) found that two major races, the Malays and Chinese, in the West Coast of Peninsular Malaysia presented in nearly equal proportions, accounting for 43.9% and 39.4%, respectively. In Malaysia, the ethnic composition consists of 81.9% Malays, 16.9% Chinese, and 1.3% others. The ethnic Malays are the majority because the hospital in this study is situated in area with large Malay rural population (Rathor, 2012). Meanwhile, in Western countries, studies have found that ICH is more commonly prevalent among the blacks than whites (Qureshi et al., 2009; Broderick et al., 1999). No studies have been carried out in Malaysia to investigate whether differences in race contribute to positive or negative adaptation outcomes.

Intracerebral haemorrhage can occur among males or females, and is associated with the highest mortality rate, with only 38 percent of affected patients surviving the first year (Zhou, Zhang, Arima & Zhao et al., 2014; Al-Khaled et al., 2014; Weimer, Sacco, Diener

& Konig, 2009). In terms of gender differences, many studies have reported that there were no significant differences in gender in death at 3, 6 and 12-month post-ICH (Zhou, Zhang, Arima & Zhao et al., 2014; Yesilot, Koyunco, Coban & Tuncay et al., 2011; Sheikh, 2007). However, other studies have also found that PICH is more prevalent among women than men (Zhou, 2014; Yesilot, 2011; Almborg, 2010; Cadilhac, 2010).

The common risk factors of stroke include diabetes mellitus (DM), hypertension (HTN), cardiac disorders, current or past history of smoking and hyperlipidaemia (Al-Asadi & Habib, 2014; Delberi et al., 2011; Gupta, 2010). Al-Asadi & Habib (2014) found that the most common prevalent risk factor of stroke is hypertension, which is about 66.2%, whereas the least common prevalent risk factor is heart failure (5.8%). Hypertension, which is specific to PICH, increases the risk of a haemorrhagic stroke, particularly in persons who are not compliant with antihypertensive medication, are 55 years of age or younger, or are smokers (Rathor, 2012; Sia, 2007). Sia, Tan & Waran (2007) confirmed that among patients with intracerebral haemorrhage in Malaysia, the common risk factors are hypertension (80.3%), diabetes mellitus (25.7%) and smoking (27.2%). The incidence increases due to improvements in nutrition, high prevalence of hypertension and lack of awareness of a healthy lifestyle. Another factor is the increased life expectancy, where the number of Malaysians aged 65 years and above increased at an average of 2.5% per annum between 1991 and 2000 (Poi, Forsyth & Chan, 2004). In relation to reducing the incidence of spontaneous ICH, effective blood pressure control using antihypertensive medications such as nifedipine, nitrodipine, hydrochlorothiazide, metoprolol, captopril and enalapril (Wei, 2011) should be reinforced among patients (Gupta, 2010)). According to Gupta (2010), hypocholesterolaemia, heavy alcohol consumption, smoking and long-term treatment with warfarin have been associated with an increased incidence of ICH.

Chiquete et al., (2007) also reported in a study of 56 patients with hypertension that the very elderly patients presented with ICH (50% women; aged 80–99 years).

2.3 Theory related to this study

Many theories and concept related to stroke such as disability, adaptation, quality of life, self-care. However, the most important theories and concept that were discussed in this study are related to disability and adaptation. It is important to examine the experiences of disability and how PICH patients adapt with stroke-related disability in relation to ensuring positive recovery. The justification in structuring the framework for this study was based on many previous studies, which had been conducted concerning intra-cerebral research and also other types of stroke, their impact and the factors influencing and inhibiting recovery and adaptation at the acute phase and long-term post-PICH period.

2.3.1 Concept of functional disability

World Health Organisation in the year 2010, defined disability as the effects of one or more such impairments on a person's normal level of skills or abilities (WHO, 2010). Figure 2.1 illustrates the phenomenon of loss or disability by the International Classification of Functional, Disability and Health (ICF). According to ICF, the loss or disability resulted from stroke can be categorized into five dimensions, firstly, loss of body functions and structure, followed by limitations in the performance of activities of daily living, inability to participate in physical and social cognitive activities as usual, and ways that personal and environmental factors influence how the disability is experienced as well as access to healthcare (Miller, 2010).

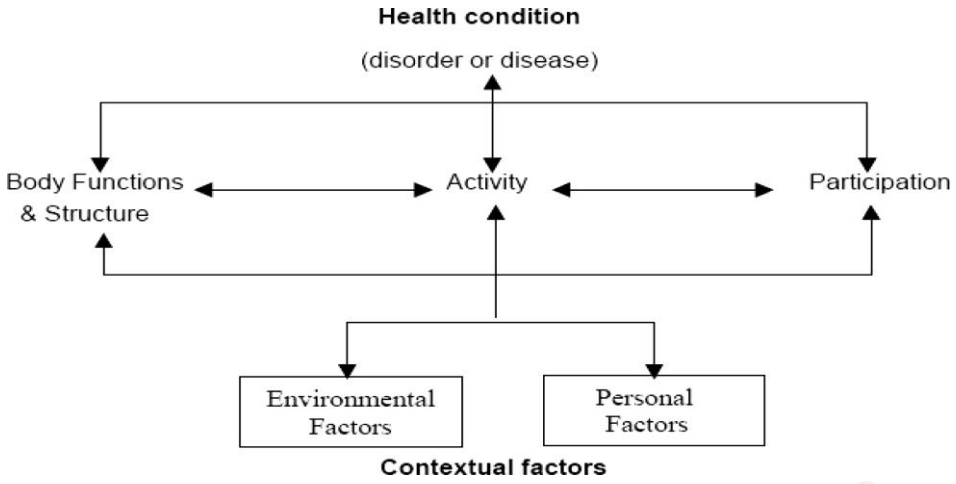


Figure 2.1: Diagram representing the ICF by WHO reflecting interactions between the consequences of a disease and contextual factors (Miller, 2010).

Pandian & Arya (2013) reported that motor deficits such as muscular weakness, abnormal synergy and spasticity significantly affect a stroke patient's level of independence in performing certain functions.

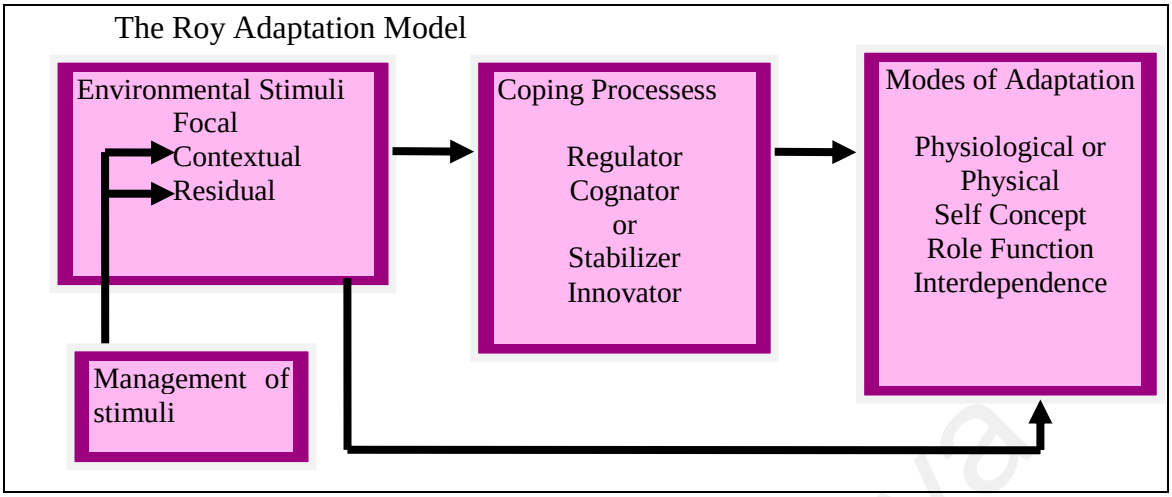
Many studies have reported that PICH patients frequently experienced restrictions in their participation or performance of basic physical, psychological and mental functions (Mollaoglu, Fertelli & Tuncay, 2010; Pandian & Arya, 2013; Norman, 2014; Rathor et al., 2012). Participation restrictions refer to the problems' stroke survivors encounter when re-establishing previous, or developing new, life and societal involvements (e.g., problems returning to working due to mobility and cognitive issues (Miller, 2010; Norman, 2014; Rathor et al., 2012). Studies reported that the participation in functional activities in PICH patients is restricted or limited due to a loss or deficit in their physical functioning after suffering a haemorrhagic stroke (Pandian & Arya, 2013; Rathor et al., 2012; Morgenstern et al. 2010).

2.3.2 Concept of Adaptation based on Roy's Theory of Adaptation

A disabling condition after experiencing an intracerebral illness is a severe threat (stimuli) to achieve a high level of adaptation (Davis, 2013). Adaptation to a stroke-related disability is crucial to ensure the successful recovery of patients. Adaptation, or coping behaviour, is the ability of a person to handle the demands made by the environment. Many patients, even those with minor physical, cognitive or emotional disabilities, experience difficulties when it comes to re-engaging in activities. However, in some cases, patients do manage to successfully adapt to the performance of activities, even though they have a significant physical, cognitive or emotional disability (Taylor, Todman, Broomfield et al., 2011).

Roy (2009) defined adaptation as on individual's response to disabilities or illness-related disruptions across a wide range of life domains. She further described a person as a bio psychosocial being, an adaptive system, a human being that is in constant interaction with a changing environment, and having a zone surrounding variable levels of adaptation (Ordin, 2013). The regulator mechanism receives stimuli from the internal and external environment, both of which is basically chemical or neural, and receives all input into the central nervous system. Body responses observed for the effect of autonomic responses, responsiveness of endocrine glands and the perception process (Roy & Andrews, 1999). The mechanisms of adaptation in Roy's model work within the four adaptive modes of physiological functions, self-concept, role functions and interdependence; therefore, a person is continually changing and attempting to adapt (Roy, 2009).

Figure 2.2: The Roy Adaptation Model



Adapted from Fawcett, J. (2009).

Roy (2009) described the physiological mode as focusing on the maintenance of basic human physiological needs. Physiological adaptation is a manifestation of interactions between the anatomical parts of the body, such as the organs and limbs, toward the processes of the disease, and the adoption of behaviours directed toward the resolution of physical and physiological problems (Roy, 2009).

The self-concept mode deals with psychic and spiritual integrity, including beliefs and feelings, and deals with interpersonal relationships (Roy, 2009; Ordin, 2012). The self-concept mode was represented in this study as the cognitive and emotional components of adaptation.

The third component of adaptation is the role function mode, which concentrates on the role of individuals as human beings and their involvement in social activities (Roy, 2009; Ordin, 2012). Patients with PICH may experience losses or disabilities that restrict or limit their functions as normal human beings *(*Miller et al., 2010*).*

Lastly, the interdependence mode deals with the social and relational integrity, as well as the provision and reception of social support (Roy, 2009; Ordin, 2012). The interdependence mode is represented as a social component of adaptation.

2.4 Stroke related disability following Intracerebral Haemorrhage

Disabilities following PICH are categories into physical and cognitive functional disabilities**.** Functional disabilities refer to the inability to perform basic and/or independent activities of daily living (Claiborne 2006). The impact of PICH on an individual is often portrayed in terms of loss or disabilities in physical, psychological and social functions (Miller, et al 2010; Dalvandi et al., 2010; Leung, et al., Oh & Seo, 2010; NINDS, 2011).

2.4.1 Physical dysfunctions related to PICH

In terms of physical dysfunctions, the results from many studies have indicated that patients with ICH stroke frequently experience a loss in motor functions, which is significantly associated with limitations or disabilities in the performance of functional activities and post-stroke complications (Skolarus, Burke, Brown & Freedman, 2014; Kwok, Clark, Ford & Durairaj, 2012; Leung et al., 2010; and Oh & Seo, 2010).

The loss of motor functions is the inability to regulate or direct the mechanisms essential to movement. The physical deficits include hemiplegia, hemiparesis, dysphagia, urinary and bowel incontinence, dysphasia and dysarthria (Aries & Hunter, 2015; Skolarus, Burke, Brown & Freedman, 2014; Leung, 2010; Oh & Seo, 2010; Almborg, Ulander, Thulin & Berg, 2010; Miller, 2010; Dalvandi, 2010; Green & King, 2010). Total hemiplegia can affect half the face and tongue as well as the arm and leg on the same side

(ipsilateral) of the body, but hemiparesis may affect only the face, upper extremity (arm), lower extremity (leg) or may affect one entire side of the body and the face. Mollaoglu, Fertelli & Tuncay (2010) stated that patients with stroke had lower mobility scores and experienced more severe mobility-related disabilities. This study confirmed that stroke, which is associated with loss of movement and sensation in the upper and lower extremities across the lesions in the brain hemisphere, is indicated as balance and perception problems throughout the body. In addition to perception problems, sensation and motor integration disorders and disabilities develop as a result of a stroke.

Stroke patients have a significantly lower level of physical performance such as in their walking speed, repeated chair stands and balance test. For example, Skolarus, Burke, Brown & Freedman (2014) found about 65% to 121% of stroke survivors are more likely to be dependent on others for self-care and mobility activities, and usually require help with bathing/showering (21%) and dressing (24.4 %). They concluded that stroke patients have a lower physical capacity and greater prevalence of activity limitations and physical symptoms.

It was reported in a previous study that hemiplegia or hemiparesis is frequently associated with dysphagia, which occurs because of a dysfunction in that part of the brain that controls the muscles for swallowing (National Institute of Neurological Disorders and Stroke (NINDS), 2011). Miller et al. (2010) stated that dysphagia (difficulty in swallowing) is experienced by 30% to 64% of patients during the early post-stroke phase and that 37% to 78% of the general stroke population usually require assistance in eating due to dysphagia (Miller, 2010).

Dalvandi et al. (2010), Leung et al. (2010), and Oh & Seo (2010) stated that the inability to control balance and coordination may restrict a patient with stroke in the performance of functional activities. The physical activities include self-care activities (eating, dressing, using the bathroom), control of bowel and bladder movements, and immobility, and patients frequently have to depend on others for help. It has been reported that ICH patients are frequently unable to feed or dress themselves, walk independently and communicate appropriately. Besides that, the PICH patients usually experience changes in other important functions that include taking care of their basic bodily needs, for example, to conduct the activities that are instrumental in daily living, work and leisure.

Another deficit related to stroke that prevents physical functions is the sensory and perceptual alterations that follow the incidence of PICH. Sensory and perceptual alteration encompassed the loss in the ability to see and feel touch, pain, temperature or position. Sensory and perceptual alteration has been mentioned as a factor that is associated with the limitation of patients to bath, dress or perform toileting activities on their own. Gillespie et al. (2015) in their Cochrane Review showed evidence of perception problems among 275 participants. All the subjects were given a sensory stimulation (e.g. shape recognition tasks) combined with strategy and functional training. However, the interventions that were described had too little replications for implementation in practice.

Previous research revealed that some patients with stroke may have visual problems such as hemianopsia or the inability to see the entire visual field. Stroke patients with sensory deficits demonstrate an inability to dress themselves, and to plan and perform movements of their arms and legs, while some stroke patients show an inability to plan and perform movements of the tongue, jaw and lips due to motor apraxia, a condition where an

individual is either unable to perform a voluntary action learned on a command, or may be able to perform an action spontaneously but cannot do so on a command. Motor apraxia includes dressing apraxia, which is the inability to dress oneself; limb apraxia, which is the inability to plan and perform movements of the arms and legs; and oral apraxia, which is the inability to plan and perform movements with the tongue, jaw and lips (Dobkin, 2005).

Sensory deficits resulting from stroke are also associated with the condition of loss of control of the bowels, with patients showing symptoms of constipation, faecal impaction, and bowel incontinence (NINDS, 2011). Stroke survivors may lose the ability to sense the need to urinate or the ability to control their bladder muscles. In terms of sensory functions, the results of a previous study showed that some stroke patients may experience pain, numbness or odd sensations of tingling or prickling in paralyzed or weakened limbs, a symptom known as paresthesia. Patients who have a seriously weakened or paralyzed arm commonly experience moderate to severe pain that radiates outward from the shoulder (NINDS, 2011).

2.4.2 Social cognitive dysfunction

Cognitive dysfunction occurs when a person loses the ability to understand, remember, and be aware of his or her surroundings following a stroke (Vanhook, 2009). A person with cognitive dysfunction faces difficulty in communicating effectively, in acting appropriately in social interactions, and in being involved in problem-solving and memory retention, depending on the site of the lesion and the severity of the stroke. Many studies have reported that limitations in the performance of physical activities are significantly related to cognitive deficits following a stroke (Taylor, Todman & Broomfield et al, 2011, Oh, 2010; Leung, 2010; Dalvandi, 2010, Patel, Coshall, Rudd &

Wolfe, 2002). Various hospital-based studies have reported a high prevalence of cognitive dysfunction after a stroke, ranging from 11.6% to 56.3% (Patel, et al., 2002). Cognitive dysfunction occurs due to the inability to communicate effectively or the loss of ability to think, remember or be involved in problem solving (Skolarus, 2014; Taylor, et al, 2011; Oh, 2010; Leung, 2010; Dalvandi, 2010; Vanhook, 2009). The difficulty in communicating among ICH patients results from a decreased level of consciousness due to increased intracranial pressure, and the direct compression or distortion of the thalamic and brain-stem reticular activating system based on large hematomas (Gillespie et al., 2015). A common communication problem is aphasia or apraxia. There are many types of aphasia. A patient with aphasia may have a problem with communication, whether verbal or non-verbal, which is usually associated with the word apraxia or dysarthria which occurs due to a dysfunction in the left temporal and parietal lobes of the brain (Dobkin, 2005). Damage in Broca's area, the language centre on the dominant side of the brain, can cause expressive aphasia. On the other hand, damage in Wernicke's area, the language centre located in the rear portion of the brain, can lead to receptive aphasia (NINDS, 2011).

Aphasia is a communication problem where the person has a defect in using and interpreting the symbols of language, and has lost the ability to understand communication or to express himself/herself in a spoken or written language. A person with aphasia or apraxia resulting from stroke may have difficulty in responding, understanding, speaking, and expressing feelings. Aphasia is associated with some or all forms of language use, such as speaking, writing, and understanding a spoken language. Patients with aphasia sometimes have difficulty in understanding a spoken or written language, and often have incoherent speech. They may be able to construct grammatically sound sentences, but their utterances may lack meaning. In a more severe condition called global aphasia resulting from serious damage to several areas responsible for language

functions, the patient may lose almost all of their speaking abilities and be unable to understand verbal and non-verbal communications (NINDS, 2011).

Skolarus, Burke, Brown & Freedman (2014) reported that stroke patients had a lower cognitive capacity compared to the control group. The stroke patients had more aphasia or dysarthria with poorer performance on word recall, and had less accurate clock drawings. In addition, the stroke patients were more likely to seek medical treatment for symptoms of depression and anxiety, which are frequently associated with participation restrictions that require the involvement of the family in the performance of activities. The research suggested that it is important to assess and diagnose the problems, and to treat the patient for depression and anxiety, and also to provide interventions to improve aphasia or dysarthria. It was also stated that it is important to have an understanding regarding participation restrictions among stroke survivors and to optimize stroke complications.

If the cognitive problems are severe, the stroke patient shows symptoms of apraxia, agnosia, or "neglect." Neglect, which is the loss of the ability to react to stimuli on the opposite side of the brain lesion, has been reported in 43% of patients with stroke in the right hemisphere (NINDS, 2011; Nassisi, 2008). Thus, a stroke patient with severe cognitive dysfunction (neglect) may not have any idea of one side of the body, the visual field or the surroundings, and may not be aware of the disability. He or she may also be unaware of the physical and mental dysfunctions as a result of the stroke. The impact from cognitive dysfunction after a haemorrhagic stroke has been reported to be associated with emotional difficulties and depression. Cognitive dysfunction can cause changes in the perceptions and interpretations of self-concept in the pattern of values, beliefs and emotions.

The assessment of the severity of a neurological deficit is usually conducted based on standardized clinical measures, such as the Scandinavian Stroke Scale (SSS; Scandinavian Stroke Study Group, 1985) and the National Institutes of Health Stroke Scale (NIHSS) (Brott et al., 1989). The NIHSS is a 15-item neurological examination stroke scale that is used to evaluate the effects of acute cerebral infarction at the levels of consciousness, language, neglect, visual-field loss, extra ocular movement, motor strength, ataxia, dysarthria, and sensory loss. The NIHSS is used mostly by stroke teams. It enables the consultant to rapidly determine the severity and possible location of the stroke. A patient's score on the NIHSS is strongly associated with the outcome, and it can help identify those patients who are likely to benefit from thrombolytic therapy and those who are at risk of developing haemorrhagic complications due to the use of thrombolytic drugs (Jauch, 2009). Glymour, Berkman, Ertal, Fay, Glass & Furie (2007) examined the relationship between NIHSS and physical, cognitive and social participation among stroke survivors, and found that NIHSS is able to predict physical ability, self-care activities and the ability to be independent in social participation. The study also found that the baseline NIHSS is significantly associated with physical function outcomes; a higher NIHSS is associated with a poor physical performance ability for cortical and non-cortical stroke patients.

2.5 Adaptation to stroke related disability

Generally, the degree of a patient's adaptation to stroke-related disabilities covers all domains of individual activities, including physical, emotional and impairments to memory, attention, communication and also problem-solving abilities (Kortte and Stevenson, 2012; Scheid, Walther, Guthke, Preul & VonCramon, 2006).

A patient's adaptation is viewed in terms of the four ways of adaptation across different domains of activities, including adapting in physiological dysfunction that included personal or self-care activities, the person's independence or dependence in mobility, in self-management of bowel and bladder elimination. The second way of adaptation is adapting in self-concept that cover in psychological functions through the ability to communicate, in remembering and adapting in role function and interdependence mode such as participate in social activities, problem-solving and the ability to make decisions. In terms of physical functions, a patient who has sensory, motor and cognitive deficits resulting from stroke may regain the capacity to carry out the activities of daily living (ADL), such as feeding himself/herself, dressing, bathing, and toileting, even though some degree of residual physical impairment may remain (Almborg, Ulander, Thulin & Berg, 2010; Oh & Seo, 2010). While for cognitive function, a current review by Gillespie, Bowen, Chung, Cockburn, Knapp et al., (2015) found that cognitive rehabilitation for attention deficits, spatial neglect and motor apraxia, all improve in standardized assessments of impairment immediately following treatment, but the improvements may not persist and do not enhance everyday functions. There is currently no evidence that memory deficits, perceptual disorders or executive dysfunctions respond to cognitive rehabilitation interventions.

Adaptation with stroke-related disability after PICH is concerned with both the prevention of further disability and reduction of the functional disability consequences. Positive adaptation to stroke disabilities occurs when a patient gains recovery in physical and cognitive functions during the early post-ICH phase and improves in long-term stroke outcomes. Patients with stroke functional disabilities at admission are able to increase their performance of personal activities of daily living at discharge and 2–3 weeks after staying at home.

In order to measure the recovery and level of independence in functional abilities, rehabilitation professionals rely on functional assessment tools such as the FIM to determine a patient's ability to perform a variety of physical and cognitive tasks (Cournan, 2011). Generally, the degree of a patient's adaptation to stroke-related disabilities covers all domains of individual activities, including physical disabilities, emotional dysfunctions and impairments to memory, attention, communication and problem-solving abilities (Kortte and Stevenson, 2012; Scheid, Walther, Guthke, Preul & VonCramon, 2006).

According to Petrina, (2012), patients recover after stroke in two different conditions. In first condition of recovery, patients showed decrease neurologic impairment occurred spontaneously effects from treatments or from other interventions that enhance neurologic functioning. A patient showed improvements in physical activities, able to communicate effectively, participate in decision making, memory ability increase, or other primary neurologic functions. The second type of recovery occurs when the stroke patient showed increase independence to participate in performing daily function's activities within the physical disability.

2.5.1 Measurement of functional adaptation to stroke-related disabilities

The functional adaptation should be determined several times during the recovery process, starting from the patient's survival of the critical phase, usually in a hospital setting, immediately after discharge, and subsequently, during the long-term period of recovery, whether it is three months, six months or years, and usually during the time when the subjects are at home or in a community setting (Morgenstern et al., 2014; Jammali, Mclnnes, Markus & Fauk et al., 2011). Stroke patients should understand their

condition after experiencing a stroke, such as loss of body functions associated with the loss of functional abilities, and find solutions to overcome their problems. During the early and later recovery phases, PICH patients begin to adjust or adapt to physical and cognitive dysfunctions. They may have difficulties in performing activities that are physiological, psychological, and socio-cultural in nature. It is important to identify the level of functional adaptation of stroke-related disabilities that covers physical and psychosocial domain of an individual's life. In relation to determine the degree of patients' ability to adapt with stroke-related disability, a standard assessment tool that covers of all domains of functional activities, which include physical, psycho and social domains are used.

A functional assessment is defined as a "systematic and objective measure of person's level of function in a variety of domains" (Lawton, 1971, p.466). The function is measured continuously to determine a patient's adaptation towards a goal and the need to modify the goal in order to achieve improvements in the patient's health status and independence in functional activities (Cournan, 2011). The goal of the assessment during inpatient rehabilitation phase identifies the level of patient adapting to the disability and to help the patient to adapt as much as possible to the performance of functional activities (Ordin, 2013; Kortte and Stevenson, 2012; Cournan, 2011).

The measurement of adaptation to stroke-related disabilities is generally varied because of the diverse nature of the associated disabilities that include physical and emotional dysfunctions, and impairments to memory, attention, communication, and problem solving (Cournan, 2011; Scheid, Walther, Guthke, Preul & von Cramon, 2006). Several instruments have been developed to determine a patient's ability to adapt in the performance of a variety of physical and cognitive tasks and improvements following

rehabilitation, for example, the Glasgow Coma Scale (Teasdale & Jennett, 1974), the Bathel Index (Mahoney & Bathel, 1965) and the Functional Independence Measure (FIM: Uniform Data System for Medical Rehabilitation, 1996) (Cournal, 2011). In this study, the Functional Independence Measure (FIM) tool was used to determine the adaptation of patients to stroke-related disabilities. The FIM was developed in 1983 by the National Institute on Disability and Rehabilitation Research (NIDRR) and the American Congress of Rehabilitation Medicine (ACRM). The tool was also designed to measure the type and amount of independence of a person with a disability to adapt in performing basic life activities. In other words, the level of adaptation towards the disability can be determined. Many studies have used the FIM to predict positive functional adaptations in rehabilitation populations (Vincent-Onabajo, Hamzat & Owolabi, 2014; Passalent, Tyas, Jaglal & Cott, 2011; Badriah et al., 2013; Davis, 2013; Bottemiller, Bieber, Gignac, Coff & Badley, 2000; Basford & Harris, 2006; Cavanagh, 2000). The Functional Independence Measure (FIM) is a standard assessment tool for rating a stroke patient's level of independence in performing functional skills such as dressing, bathing, walking and communicating (Kortte, Stevenson, Hosey, Castillo, & Wegener, 2012; Couman, 2011; Ottenbacher, Hsu, Granger & Fiedler, 1996).

For example, a study by Gignac, Coff & Badley (2000) used FIM to examine the perceptions of independence and dependence among older adults with chronic illnesses and disabilities. They examined the behavioural efforts of these adults to manage their disabilities and how these adaptations differed across several domains of activities. Overall, the data revealed that when people perceived that their independence has been affected and/or when they feel dependent, they are more likely to report feeling helpless, believed that they were not coping successfully, and that they were having difficulty in tolerating and adjusting to the demands of their condition.

This study used FIM, along with standard measures of the level of dependence in the performance of functional activities, to reflect the complex process of adaptation in the early and long-term phases of recovery. The FIM is the most popular tool that is used to measured outcomes in medical rehabilitation units or hospitals. Rehabilitation providers, including nurses, need to be experts at both scoring and understand the output from this tool. The data from the FIM are used to examine patient outcomes for several purposes, such as adaptation to stroke-related disabilities (SRD) post-PICH (Cournan, 2011).

A study by Bottemiller, Bieber, Basford & Harris (2006) on the FIM Score, FIM Efficiency, and Discharge Disposition following inpatient stroke rehabilitation found that FIM scores and FIM efficiencies are related to the stroke patient's degree of adaptation to functions, and can be used to determine the effectiveness of treatment. They are usually used as the baseline for deciding on whether to discharge a patient from hospital and to determine long-term recovery outcomes. The outcomes of patients who have been assessed using FIM scores are understood and play an important role in determining whether the patient can be discharged to either the home or a district hospital near to the patient and his/her family (Bottemiller, Bieber, Basford & Harris, 2006). Based on these findings, it was suggested that future research should use components of FIM scores to assist in the development of clinical pathways that would assist in discharge planning for stroke patients. FIM scores are useful for measuring the degree of disability and to assist in determining the needs of patients with stroke problems, and can provide guidance in the development of clinical pathways that would assist in discharge planning, and in the monitoring of the patient's progress.

In terms of long-term adaptation, it has been found that the FIM score is suitable to be used as a tool to determine whether the stroke patient is able to adapt to the disability and gain recovery in functional activities. For example, Passalent, Tyas, Jaglal & Cott (2011)

used FIM in their study as an outcome measure at follow-up following discharge from inpatient rehabilitation, and concluded that most of the changes in the FIM scores were seen between admission and discharge, with the maintenance of functions being seen between discharge and follow-up. The results of this study showed that the discharge and long-term total FIM scores are highly correlated, and there is minimal overall mean change in the total FIM scores from discharge to long-term adaptation (Passalent, Tyas, Jaglal & Cott, 2011).

According to Baseman et al. (2010), adaptations to stroke-related functional disabilities mean regaining levels of motor and cognitive abilities and independence in the activities of daily living that were present before the onset of the stroke. This concept of adaptation has been identified as an important standard in measuring the success of a rehabilitation process.

2.6 Early and later functional adaptation in response stroke related disability

Early adaptation is the level of patient's ability to adapt with the disability after having a stroke consequence. The degree of adaptation to stroke-related disability was determined by examining the level of their ability to perform functional activities, are able to be discharged from a hospital setting, and have adequate support from their family during acute inpatient recovery phase. The ability of individual with stroke adapts to the disabilities, the motivation of the patient, the support of the family, and the intensity of the therapy and rehabilitation (Rathor, 2012). For a person who has experienced stroke disabilities, the adaptation to return to a normal life becomes a priority. In other words, improved recovery is when the patient shows improvements in physical, cognitive and

mental functions, and is able to adapt to participate in performing functional activities starting in early until long-term post-PICH.

An acute inpatient recovery phase begins immediately after patients with intracerebral haemorrhage survive from critical conditions and impairment. During the inpatient recovery phase, the patients are usually placed in a neurosurgical ward for rehabilitative care and treatment. During this stage, the patients are usually referred for physiotherapy, occupational therapy and speech-language pathology treatment. Concurrently, the patients should receive a comprehensive rehabilitation nursing care and stroke education with the goal of improving functional limitations or disabilities, and preventing post-stroke complications and depression. Acute inpatient recovery care facilities focus on improving the health status, while inpatient rehabilitation facilities focus on adapting to the stroke disabilities. In order to achieve the main goal of stroke recovery, the patients with stroke-related disability have to achieve optimal functional recovery (Stokowski, 2007). Morgenstern et al., (2010) stated that the recovery after ICH is faster in the early phase post ICH. However, approximately half of all patients remain dependent on others for activities related to daily living for a few months.

A study by Ostwald (2008), found that predictors of functional status among stroke patients during acute recovery inpatient found that the improve of physical function was associated with improve cognitive function, low stroke severity, improve physical and high social participation. This study also found that functional status and neurological status were found associated with the stroke-related quality-of-life. In terms of cognitive function, the result from this study found that higher stress was associated with high cognitive dysfunction, high-stress symptoms, have emotion's problems, poor memory and communication problems. Stokowski (2007) stated that in the acute post-stroke period,

functional improvements may occur as a result of improved brain activity in the areas affected by ischemia, oedema, and metabolic injury, later at the long term period. Cortical reorganization, an activity or use-dependent process is responsible for functional recovery.

In other words, the level to which the person with PICH can regain adaptation to functional activities may be limited by the stroke-related disabilities such as neurological deficits, location of brain lesions (Bahou, 2009; Yesilot, et al., 2011), environmental factors, such as the patient's background, post-stroke complications, stress, ICH treatments, length of stay (Indredravik, Rohweder, Naalsund & Lydersen et al., 2008; Dobkin, 2005) and social support (Rettke & Geschwindner, 2013).

Otherwise, the later adaptation is the long-term physical and cognitive recovery in achieving maximum functional ability at home after being discharged from a hospital setting (Almborg, Ulander, Thulin & Berg, 2010). A patient who has sensorimotor, cognitive, or behavioural deficits resulting from stroke may continue to regain the capacity to carry out activities of daily living (ADL), such as feeding himself/herself, dressing, bathing, and toileting, even if some degree of residual physical impairment remains (Oh & Seo, 2010; Yesilot, Koyuncu, Coban, Tuncay & Bahar, 2011; Almborg et al., 2010). It is necessary for stroke patients to maximize their participation in the rehabilitation planning and treatment process. The independence to participate to perform these daily living activities can increase the ability through adaptation and training in the presence or absence of natural neurologic recovery (Petrina, 2012). Further, Leung et al., (2010) also demonstrated that functional recovery in haemorrhagic stroke patients is predicted by the age, pre-training functional level, and cognitive abilities that are measured during admission to rehabilitation training. With regard to the long-term

outcomes, the results of a previous study reported that patients who adapt positively to stroke-related disabilities are more independent with activities of daily living, show no indications of psychological problems or depression, have social support and healthcare resources, and experience no post-stroke complications (Almborg, Ulander, Thulin & Berg, 2010).

The findings from an analysis of the sub-areas of functional abilities showed that all such abilities, for example, self-feeding, grooming, toileting and dependence on others, significantly improved during the six-month period after admission. The patients with stroke functional disabilities at admission were able to increase their performance of personal activities of daily living at discharge and 2–3 weeks after staying at home (Almborg, Ulander, Thulin & Berg, 2010).

In conclusion, adaptation to a stroke-related disability was started during the acute post-stroke period and continues until a few months to years as a result of improved brain activity in the affected areas. Individuals with stroke should have strategies during early recovery from neurological deficits in order to regain their ability in functional activities, and to prevent post-stroke complications and depression (Almborg, Ulander, Thulin & Berg, 2010; Bahou, 2009; Yesilot, et al., 2011). The degree of disability depends on many significant variables, including the severity of the stroke, location of brain damage, severity of neurological deficits, demographic characteristics, post-stroke complications, treatment, rehabilitation participation and family support. Positive long-term adaptations are proven if there is no evidence of post-stroke complications, no depression during the acute phase and at the long-term recovery phase, and there is evidence of stroke knowledge.

2.7 Factors predicting functional adaptation

The ICF theory of disability stated that there are factors might influence positive or negative adaptations (Miller, 2010). The predicted factors that may influence or inhibit adaptation following primary intracerebral haemorrhage (PICH) are the patients' socio-demographic, clinical characteristics, such as the severity of neurological deficits, stroke knowledge among patients and family caregivers, evidence of post-stroke complications and early functional status, have a direct effect on the positive or negative early adaptation of patients in response to the sudden and long-term outcomes of PICH illness. The research findings suggested that the severity of cerebral dysfunction (Qureshi et al., 2009), high functional disabilities (Samsa & Matchar, 2004), low stroke knowledge among caregivers (Rodger et al., 2001) and the presence of post-stroke complications (Longhorne et al., 2000) are critical factors in determining the adaptation to changes.

Support is provided through interpersonal relationships with the spouse or other family members acting as agents for rescue, assistance, protection, and identity. The spouse or other family members can provide assistance when needed, and assist in recovery by keeping the recovering person on course, and treating the person with respect by acknowledging his or her successes (Jammali-Blasi et al., 2011; Ostwald, et al., 2008). Social support was associated with better outcomes during post stroke (Chau et al, 2010; Grant, 2004).

2.7.1 Socio-demographic characteristics

The factors that may influence or inhibit adaptation to stroke-related disabilities following primary intracerebral haemorrhage (PICH) are the patients' socio-demography, such as, age, gender and socioeconomic status.

2.7.1.1 Age

Almborg, Ulander, Thulin & Berg (2010) reported that age is significantly associated with the ability to perform functional activities, and that a younger age is associated with better physical functions. Stroke patients who are below 80 years of age have a higher rate of survival following a stroke compared to those over 80 years of age, while in terms of adaptation after a stroke, younger people have reportedly been associated with a high adaptation to stroke-related disabilities. In a similar study by Niemi et al. (1988), it was found that patients in the older age group of between 51 to 64 years, have a higher level of disability compared to those in a younger age group of between 17 to 50 years. However, according to Kim, Warren, Madill & Hadley (1999) in their literature review, there were no significant associations between the age and ADL capacity. They concluded that good health, marital status, socioeconomic status and better educational status were associated with positive adaptation outcomes. Meanwhile, a study by Umeano et al. (2013) revealed that women who are younger and have a history of substance abuse were more likely to have an incidence of ICH compared to men. The findings of a multivariable analysis showed that advancing age had a greater effect on the prediction of discharge outcomes among women compared to men. The result indicated that for younger patients, the female sex was protected, but at an age of more than 60 years, the female sex was a risk factor for discharge to hospice or death. Cadilhac, Dewey, Vos, Carter & Thrift (2010) studied the different factors for ischemic stroke and intracerebral haemorrhage (ICH), and found that greater stroke-related cases of fatality occured at a younger age, but there was a longer life expectancy with disability after the first 12 months for people with ICH. Moreover, since ICH is commonly experienced among younger people, those that survived also had a greater duration of disability since these survivors will have a

greater life expectancy. It was also revealed that people with ICH incured a greater loss of health over a lifetime than people with ischemic stroke.

Al-Khaled and Eggers (2014) conducted a study to determine the prognosis of patients treated conservatively for ICH, and found that 475 out of 549 patients survived during the early post-ICH phase and seventy-four died during hospitalization. The finding revealed that the patients with ICH who died during hospitalization were significantly older. At the follow-up after three months, 55 (18%) had died, and 254 out of the 549 patients with ICH survived with conservative treatment, while 20 (6%) patients were unavailable because they had moved to another place. The logistical analysis revealed that the factor associated with death at three months was those above of 80 years old age.

2.7.1.2 Gender

Gender is an associated factor affecting positive or negative early and long-term adaptations to stroke-related disabilities. Zhou et al. (2014), in their analysis, revealed that women were more likely to be dependent in the early phase of recovery and have a higher risk of dependency at 3 and 6 months after ICH. The worst outcome in female's gender and this was likely to be attributed in part basically to having more severe ICH. Another study by Jammali, Mclnnes, Markus & Fauk et al. (2011) investigated the 90-day outcome of post-stroke patients and examined the premorbid risk factors associated with these outcomes. It was found that haemorrhagic strokes, gender and subsequent strokes were statistically associated with poorer functional outcomes. This study reported that individuals with ICH or haemorrhagic stroke were more dependent at 90 days and had poorer health status compared to individuals who had suffered an ischemic stroke. The increased degree of dependency and reduced physical health status among ICH or

haemorrhagic stroke were related to the severity of the neurological deficit, the female sex and those who had their first stroke. This study suggested that it is important for future patient care to provide information to stroke patients and to provide appropriate levels of support for those who are discharged from the hospital with stroke-related deficits.

Weimar, Ziegler, Konig & Diener (2009), found that there was an association between the female gender and low adaptation because of lack of social support. Other authors have stated that there are gender differences in terms of the quality of life, and the finding of a study showed that there is a lower quality of life among females compared to males. This finding reflected a possible association between the female gender and the lack of social support and the occurrence of post-stroke depression (Almborg, Ulander & Thulin et al, 2010). Studies have reported that females with lower scores in physical functions, thinking and communication abilities after discharge were more likely to have physical impairments and limitations in their ADL (Carod-Artal & Egido, 2009). However, a study by Yesilot, Koyuncu, Coban, Tuncay & Bahar (2011) found that there were no significant differences between males and females in all variables, including risk factors, clinical features at admission, diagnostic studies and outcomes, except for the higher frequency of smoking in males. In a study by Chong et al. (2006), information on the functional recovery of stroke survivors was obtained through self-reports, and it was reported that more women than men experienced incomplete recovery, despite objective evidence of recovery. In another study, poorer functional recovery was observed in women, and the difference in coping and adaptation patterns between men and women were suggested as being responsible for the disparity (Green et al., 2007). It is worth noting that the characterization of gender roles in different cultures and societies can also contribute to the variations in reports on the influence of gender on recovery after a stroke.

2.7.1.3 Socioeconomic status

Socioeconomic (SES) status is one of the important socio-demographic variables associated with recovery after stroke. Lower socioeconomic status among ICH patients with stroke disabilities has frequently been found to be associated with limited capability to access appropriate rehabilitation, material and psychosocial resources that are needed for the process of recovery. Previous studies have stated that patients with a lower SES were at greater risk of stroke morbidity and stroke mortality compared with those in the higher SES groups (Putman, 2007). Cooper, Jackson & Weinman et al. (2002) found that patients in the lower SES groups attended fewer rehabilitation sessions after being discharged, which can delay their recovery.

2.7.1.4 Educational status

Honjo, Iso, Ikeda, Inoue & Tsugane (2009) examined the association between educational level and functional limitations among the patients with stroke in Japanese community, and found that a lower educational level was associated with a higher prevalence of physical functional limitations among both Japanese men and women. Another review regarding ICH stroke reported that lack of awareness of primary prevention and access to healthcare were associated with lower education among stroke patients (Adnan, 2001). Dalvandi, Heikkil, Maddah, Khankeh & Ekman (2010) stated that stroke patients were of the opinion that information and skills related to stroke care should be provided to them during their inpatient post-stroke treatment in order to have a better understanding on how they should deal with problems related to stroke. They also believed that there is a relationship between the needs of stroke survivors and the educational abilities of their caregivers.

2.7.2 Clinical characteristics

The clinical characteristics that are predicted to influence early and long-term adaptation to stroke disabilities include risk factors, location of brain lesions, the severity of neurological deficits, ICH treatment and post-stroke complications.

2.7.2.1 Severity of neurological deficits

The degree of disability significantly depends on the neurological deficits resulting from PICH. Many studies have reported that the severity of PICH determined the adaptation of PICH patients (Al Khaled & Eggers, 2014; Rathor, 2012; Almborg, Ulander, Thulin& Berg, 2010; Leung et al., 2010; Ostwald, 2008). Improved functional recovery among haemorrhagic stroke patients compared with stroke infarction is due to the good progress of neurological recovery (Al-Khaled et al, 2014; Paolucci, Antonucci& Grasso et al., 2003). It occurs because the mechanisms for neurological deficits from ICH may be caused by brain compression, and as the hematoma resolves, the neurological functions recover and the functional status improves. In the acute post-stroke period, functional improvements may occur as a result of improved brain activity in the areas affected by ischemia, oedema, and metabolic injury (Stokowski, 2007). Limitations in daily living activities have been shown to be associated with poor physical functions following a stroke. According to these findings, early disability is a strong predictor of care needs. This information was used as an indicator in communication with patients and their relatives in order to aid in the making of clinical decisions with regard to further aggressive and invasive management options in a clinical setting.

Al-Khaled and Eggers (2014) carried out a study to determine the prognosis of patients treated conservatively for ICH, and it was found that 475 out of 549 patients survived

during the early post-PICH phase, while 74 died during hospitalization. The finding revealed that the patients with ICH who died during hospitalization had more severe neurological deficits (NIHSS > 15), and suffered substantially greater complications, such as cerebral oedema. At three-month follow-up, 55 patients (18%) had died and 254 out of 549 patients with ICH had survived with conservative treatment, and 20 (6%) patients were unavailable because they had moved to another place. The logistics analysis revealed that the factors associated with the previous stroke were unconsciousness at admission, pneumonia during hospitalization and cerebral oedema. Even though ICH is a dangerous disease, this finding provides information of the short-term prognosis of patients who are treated conservatively, and the factors associated with mortality. Rost et al., (2008) predicted that pre-ICH cognitive impairment was associated with functional independence at 90 days after ICH. Cognitive ability scores increased in between one to a six-month period after PICH. The areas of cognitive ability that showed significantly improved over the 6-month post PICH, were attention ability, speaking and understanding, memory ability, problem solving, safety behaviour, and social involvement (Oh & Seo, 2010).

2.7.2.2 Location of the brain lesion

The location of the brain lesion has been predicted as a factor affecting adaptation in response to stroke-related disabilities depending on how much damage has occurred. Liebeskind et al. (2011) reported that the location of the brain lesion, as seen on the CT scan, can determine the cause of the haemorrhage, such as the presence of structural abnormalities, associated medical conditions such as hypertension and patient's age**.**

The inability to perform self-care activities in daily life is associated with the lesion in the left side of the brain, while people who have speech problems are usually among the patients with right-side brain lesion. (Oh, 2010; Leung, 2010; Dalvandi, 2010; Miller, 2010). Further, patients with right-side intracerebral haemorrhage or lesion had poor quality of life compared to those with left-side intracerebral haemorrhage (NINDS, 2008; Haan et al., 1995). Poor capacity to adapt with stroke-related disabilities among patients with right-side lesion is due to neurological deficits such as neglect of the left body space, insufficient awareness about the disease, and spatial disorientation. Right-side brain lesion can also cause communication problems.

A haemorrhage that occurs in the left hemisphere may cause the patient to move slowly and cautiously, and to experience right-visual-field deficiency. Right-sided lesions are additionally associated with neglect, anosognosia, and spatial disorientation, which may have a devastating effect on social functioning and thus on HRQOL. Patients may also have problems with orientation, self-consciousness, physical performance, and prosody. Patients with more severe supra-tentorial strokes, be it infarct or haemorrhage, experience poorer quality of living in all existential domains except psychological distress (NINDS, 2008; Haan et al., 1995). Christensen et al. (2009) stated that hypertensive people with intracerebral haemorrhages in the lobar area suffer from bad quality of life too.

Brain Lesion Profiles determine not only motor functional outcomes such as locomotion, mobility, and self-care, but also non–motor functional outcomes such as sphincter control and social cognition, although the delimiting size was determined by the total motor score in this study. This finding may suggest that large cortical or sub-cortical lesions in poor BLPs cause not only degeneration in the cortico-spinal tract, but also decrease in global neuronal activities. The decrease in global neuronal activities following diffuse brain

damage would impair cognitive function. The impairment of motor and cognitive functions further compromises the function of sphincter control (Chen, Tang, Chen, Chung, & Wong, 2000).

2.7.2.3 Functional status at baseline after PICH

The functional status during the early phase has been predicted as a factor that influences long-term adaptation. The functional status consists of physical and cognitive deficits. The results of a study found that the functional status at the early post-stroke phase was positively associated with functional outcomes (Almborg, Ulander, Thulin & Berg, 2010), thus indicating that the functional status in the early phase is strongly correlated to the functions on discharge. For example, patients with stroke functional disabilities at admission were able to increase their performance of personal activities of daily living on discharge and 2–3 weeks after staying at home (Almborg, Ulander, Thulin & Berg, 2010). Many studies have stated that functional abilities at the early phase are strongly linked to functional recovery in the stroke rehabilitation literature (Oh & Seo, 2010; Yesilot, Koyuncu, Coban, Tuncay & Bahar, 2011; Hinkle, 2006; Saloheimo et al. (2006).

Many studies have reported that functional recovery after stroke occurs in the first few months. For example, Green & King (2010) examined the impact of mild stroke on functional outcomes, QOL, depression, caregiver burden, and marital functions in a cohort of men with mild stroke and their wife-caregivers. The results revealed that the men with mild stroke showed significant improvements in their functional recovery during the follow-up period. Functional recovery occurred in the first few months after the stroke. However, it was observed that better recovery depended on many factors such as the physical functions. Green & King (2010) stated that full recovery was influenced

by other elements of physical function such as tiredness and malaise. The patients with mild stroke were usually independent in their ADL up to 12 months post-discharge.

2.7.2.4 Post-stroke complications

Individuals who have a stroke are at risk of several complications. During recovery from a stroke, many people experience significant stroke complications and struggle to improve important functional activities (Ordin, 2013; Cournan, 2011; Cavanagh, 2000). The complications occur as a direct consequence of the brain injury itself, from the disabilities and immobility resulting from the stroke or from the stroke-related treatment (Kumar, Salem & Chaplan, 2010). These complications will affect the neurological recovery process and the outcomes of stroke patients. The complications include cardiac complications, infections such as pneumonia and urinary tract infection, venous thromboembolism, fever, pain, dysphagia, incontinence, neurological stroke recurrence and depression (Shinohara, Yanagihara, Abe & Yoshimine, 2011; Kumar, Salem & Chaplan, 2010; Kuptniratsaikul et al., 2009; Vermeij et al., 2009).

In terms of infection, stroke-associated infections are a common factor of mortality and poor functional outcomes. Many studies have reported that stroke-associated infections occur within three days after admission to a hospital. Most infections are respiratory infection, pneumonia and urinary tract infection (UTI) (Johnson, Svendsen & Ingeman, 2012; Kuptniratsaikul et al., 2009; Stott, 2009; Vermeij et al., 2009). In terms of respiratory infection, pneumonia has been reported to occur frequently during hospitalization and is frequently associated with poor long-term stroke outcomes (Kumar, Selim and Caplan, 2010; Kuptniratsaikul et al., 2009; Stott, 2009; Vermeij et al., 2009). The risk factors of pneumonia include old age (> 65 years old), speech impairment,

severity of post-stroke disability, cognitive impairment, and dysphasia (Kumar et al., 2010). Active prevention and management are important in relation to improving stroke outcomes. Urinary tract infection (UTI) usually occurs within a seven-day post-stroke, and the risk factors are old age, use of catheter, stroke severity and the female sex, which are the predictors of stroke outcomes (Kumar et al., 2010; Stott, 2009; Vermeij et al., 2009; Kuptniratsaikul et al., (2009).

In terms of long term immobility resulting from a stroke, stroke patients are at risk of developing pressure sores and blood clots in the deep veins of the leg (Zeferino & Aycock, 2010). For early prevention of pressure sores and deep-vein thrombosis, it is important to encourage early mobilization by turning the patients every 2 hours, making them use padded heel boots and putting them on special mattresses. According to Kumar, Selim & Caplan (2010), DVT is a major problem after ICH, especially in patients with limb hemiparesis or paralysis, old age, and dehydration. A study reported that about 50% of DVT cases occur in the early post-stroke recovery phase, that is, within two weeks after hemiparesis and can cause limb oedema, tenderness, pain, fever, etc. (Hays, Wilkerson, 2010). DVT occurs as a result of muscle weakness, where the natural soft-tissue protection for joints is impaired, and it is associated with difficulty in walking and an increased lack of movement.

Another post-stroke complication is shoulder pain, which is the most common post-stroke complication. About 17% to 72% of stroke patients develop hemiplegia, and it frequently occurs among those who have little or no voluntary movement of the affected upper limb (Walsh, 2001; Kumar, Kassam, Denton, Taylor & Chatterley, 2010). The pain radiates outward from the shoulder due to weakness or paralysis of the arm or the pain results from lack of movement in a joint, ipsilateral sensory abnormalities and arm weakness

(Kumar, Kassam, Denton, Taylor & Chatterley, 2010; Gamble et al., 2002; NINDS, 2011). Shoulder pain develops due to ineffective care management, such as leaving the weak arm unsupported when the stroke survivor is sitting, standing, or turning in bed, frequently leading to impingement at the glenohumeral joint (Gamble et al., 2002; Zeferino & Aycock, 2010).

Indredavik & Rohweder et al. (2008) revealed that during the first week, 312 out of 489 patients (63.8%) experienced one or more complications. However, in the long term post-stroke follow-up at 3 months, the majority of the patients, i.e. 201 out of 244 patients (82.4%) experienced at least one complication, the most common of which was pain, which occurred in 134 patients (53.3%), followed by urinary tract infection in 68 patients (27.9%) and non-serious falls in 61 patients (25.0%) (Indredavik et al., 2008).

The post-stroke complications of ICH patients in this study were developed based on the definition of complications by Langhorne et al. (2000). The complication status at the acute phase was identified using the Complication Inventory Checklist (CIC-ACUTE). The CIC-ACUTE and the Complication Inventory Checklist (CIC- 3 MONTHS POST-STROKE) consists of 5 categories of evidence of respiratory infection, urinary infection, bedsores, deep-vein thrombosis and shoulder pain (Langhorne, et al., 2000).

In terms of post stroke complications (urinary tract infections, chest infections, pressure sores, deep venous thrombosis, shoulder pain and limb pain) , the finding of previous study revealed that post-stroke infections was associated with the older age group, the female gender, higher median NIHSS on admission, and vomiting at the onset of stroke (Oh, 2010; Leung, 2010; Dalvandi, 2010; Miller, 2010; Pandian & Arya, 2013). It has also been found that tube feeding was strongly associated with post-stroke respiratory infections (Vargas et al, 2006).

In summary, the most common complications during the first week are other pains, followed by fever, progressive stroke and UTI, while at the follow-up at three months, the most common complications are pain, followed by urinary tract infection and non-serious falls, whereas complications such as pressure sores and clinical signs of deep-vein thrombosis and pulmonary embolism, which might be regarded as immobilization-related complications, have almost disappeared from the modern stroke unit.

2.7.2.5 Post stroke Depression

The impact from cognitive dysfunction is that the person is unable to perform physical activities. It occurs due to the inability to communicate effectively or the loss of ability to think, remember or be involved in problem solving. A previous study found that nearly a quarter of the subjects were unable to get involved in problem solving, to ensure their safety and to be appropriately involved in social activities six months after admission (Oh, 2010). The research suggested that it is important to assess, diagnose the problems and treat the depression and anxiety, and also suggested appropriate interventions to improve aphasia or dysarthria. It also stated the importance of having an understanding of the participation restriction among stroke survivors and the need to optimize stroke complications.

Ostir, Ottenbacher & Ottenbacher (2011) studied on 544 patients with first time admitted with stroke to inpatient medical rehabilitation and three months after discharge regarding change in depression symptom status and how change in depression symptom influence functional status found there was significant association between change depression symptoms and functional outcome. This study also found that rate of depression was

greatest in the acute phases of recovery and declined over the subsequent 12 months. Although most patients recovered from their depression, a considerable minority reported more symptoms over 12 months follow up and approximately one –quarter of the sample neither consistently improved nor worsened, which underscores the dynamic nature of depression after stroke. Ostir et al., (2011) also stated that symptoms of depression changed during hospitalization after stroke and after discharge and suggest that the importance of component of depression assessment and intervention related to patient care and recovery of functional status.

Johnson et al. (2006) found that the prevalence of depression experienced by stroke patients during acute recovery until three months in the post-stroke rehabilitation phase is estimated to occur in about 10% to more than 50% of stroke patients. Buchanan, Elias & Goplen (2000) found that many haemorrhagic stroke patients experienced negative neuro bahaviors even if they achieved good physical recovery outcomes, and this change had a negative impact on the patients themselves and also on their families who, for example, experience psychological stress. Studies have also shown that a high percentage of those whose recovery is classified as good, experience debilitating emotional, behavioural and cognitive symptoms (Kirkness, Thompson, & Buzaitiset al. (2002). In contrast, stroke patients with depression had significantly lower functional scores both at onset and after six months (Ostir, Berges, Ottenbacher & Ottenbacher, 2011). Post-stroke depression was found to be associated with functional outcomes and increased length of hospital stays, thus affecting the quality of life and psychosocial burden, and led to increase morbidity and mortality (Kortte, Jennifer, Hosey & Castillo et al., 2012; Kuptniratsaikulet al., 2009; Carol, & Egido, 2009). Kortte, Jennifer, Hosey & Castillo et al. (2012) suggested that psychological problems following a stroke have a negative impact on the life role functions of the individual and disrupt the rehabilitation process

and outcomes. This study suggested that incorporating interventions that enhance hope and build on the individual's psychological strengths may be useful in improving participation outcomes following acute medical conditions.

Bay (2001) also specifically stated that a variance of 22% to 73% in the adaptation of stroke survivors was primarily explained by the presence of depression; functional abilities, especially in the upper extremities, and socialization, in particular, leisure activities. Bay (2001) suggested that the variables that are positively associated with adaptation are independence with activities of daily living, increased functional abilities, psychological problems or depression, presence of social support and healthcare resources, evidence of post-stroke complications, while the variables that are negatively associated with adaptation are psychological impairment, severity of impairment, severity of aphasia, inappropriate reactions to illness, pessimism, and the inability to return to work.

A study by Rathor et al. (2012) to predict the variables associated with functional outcomes in patient with PICH found that 77 survivors (70.6%) were functionally dependent and 32 (29.4 %) achieved functional independence. The results of the follow-up at one month reported that 48 (55.2%) were functionally independent while 39 (44.8%) were still dependent. Four out of the 109 survivors developed severe depression requiring intervention. At the follow-up at six months, 69 survivors (84.1%) were independent and 13 (15.9 5) were still dependent, while 5 survivors were lost due to default treatment and invalid telephone numbers. PICH patients are often neurologically devastated on presentation and their functional recovery depends on the family support, patient's motivation, ability to learn as well as the quality and intensity of therapy.

2.7.3 Rehabilitation Nursing

Rehabilitation is defined as the combined and co-ordinated use of medical, social, educational and vocational measures for training or retraining the individual to his or her highest level of functional ability (Miller, 2010). The overall objective of the rehabilitation of an individual with PICH is to achieve functional recovery as quickly and as fully as possible, and to enable them to adapt to any remaining stroke disability (Clarke, 2013; Miller, 2010).

The rehabilitation nursing service provided by a well-organized, multidisciplinary inpatient (stroke unit) care has shown evidence of being of great benefit in terms of improved survival, recovery and return to the home, compared to the conventional method of not having dedicated stroke wards. The rehabilitation of those patients with haemorrhagic stroke should start immediately. Rehabilitation is the training or retraining the individual with post intracerebral haemorrhage to gain highest level of functional ability by collaboration and co-ordinated use of medical, nursing, social, educational and vocational measures (Cross & Walker, 2008).

The main focus in rehabilitation nursing practice during acute inpatient is to do a risk assessment for stroke patients on admission and on a regular basis while in the hospital, and possibly after discharge. The risk assessment includes a measurement of the standardized level of consciousness, severity of neurological deficits, the risks of limitation or inability in moving and handling or functional disability, nutrition status, mood, falls, elimination, pain, wound care and post-stroke complications that include ensuring that actual problems (such as urinary infections) and potential problems (such as the risk of pressure sores) and DVT do not occur (Cross & Walker, 2008). In a literature

review, Presciutti (2006) stated the importance of assessing the patients' problem is to facilitate initial recovery and rehabilitation planning. The assessment also includes the ability for self-care, level of family support, social circumstances, medication, the effectiveness of coping with stressful situations when experiencing a stroke, and the level of requirement for assistance or a helper, and stroke knowledge for stroke patients.

Aziz (2010) suggested that it is important to concentrate on early response after a person's experience PICH by providing appropriate stimuli, encouraging adaptive strategies in daily functional activities and providing coping strategies in areas that are affected by the stroke. This involves all healthcare providers of working together, sometimes for prolonged periods, to develop a patient's optimum independence.

The acute inpatient rehabilitation care was focused on prevention post stroke complications such as infection, pressure ulcers, pain, deep-vein thrombosis and depression. Others focus is to ensure the stroke patients can discharge from hospital setting to home and community with the abilities to adapt to stroke-related disability (Vanhook, 2009). According to Long, Kneafsey, Ryan, & Berry, (2002), the nurse's responsibility in acute recovery rehabilitation involves six interlinked roles: assessment, co-ordination and communication, technical and physical care, therapy integration and therapy carry-on, emotional support, and involving the family caregiver.

The important rehabilitation of PICH patients involves physical therapy, alternative forms of communication, speech therapy, occupational therapy and intervention to control incontinence and to increase the ability to function. The most common disability that requires inpatient rehabilitation is the inability to walk safely. Therefore, the new recommendations suggest that this rehabilitation service model of coordinated care should be extended into the community (Badriah, Abe, Miyamoto & Babazono et al.;

Morgenstern et al., 2010). Badriah, et al. (2013) found that rehabilitation during the hospitalization stay at the rehabilitation unit and the discharge destination interact to influence the functional ability of the stroke patient after discharge from the hospital. The findings reported that among stroke patients, the effectiveness of therapy and the discharge destination interact to influence the patient's subsequent functional ability. Among the stroke patients who were discharged to rehabilitation facilities, the FIM score at 3 months after hospital discharge was higher. Stroke patients who were discharged to their homes showed a gradual decline in activities of daily living (ADL) over time, and overprotection by family members was a factor that caused the decline in ADL.

Kwok, Clark, Ford & Durairaj (2012) did a study regarding the association between pre-stroke disabilities and inpatient mortality and length of hospital stay after an acute stroke, and revealed that limitations in the activities of daily living are associated with poor physical functioning after a stroke. Another study by Hinkle (2006) found that functional abilities at the time of admission are strongly linked to functional recovery in the inpatient stroke rehabilitation literature. Saloheimo et al. (2006) stated that improved acute care of ICH patients enables more patients with moderate to severe disabilities to survive beyond the first critical days. They also suggested that the functional status reached after rehabilitation may be a major factor determining future survival.

It is important for healthcare professionals to focus on long-term rehabilitation with the aim, directly and indirectly, of increasing the independence of the individual. Meanwhile, Aziz (2010) suggested that stroke rehabilitation should encompass not only the physical aspects, but should also address all aspects of everyday life, including the psychological aspects and family and community reintegration. The stroke rehabilitation should also consider lifestyle changes, prevention of post-stroke depression and caregiver burden as

important issues to work on with the patient and caregivers. According to Ostwald et al. (2008), the long-term adaptation towards a stroke-related disability is a process where the patient has to adapt to neurological deficits that take a long time to recover from, the ability to perform functional activities, to be involved in effective communication, to perform decision making and to be autonomous in their own lives as a normal human being.

PICH patients who survive the early phase will be discharged and have to undergo a long-term rehabilitation process at home. Effective stroke rehabilitation, which is an important part of stroke management, must be given full consideration in order to promote better recovery and to prevent long-term complications among stroke survivors (Aries & Hunter, 2015; Clarke, 2013). According to Morgenstern et al. (2014), the rehabilitation process for a patient who has suffered ICH involves prevention strategies that include identifying problems related to stroke, providing treatment for medical conditions and medical complications, rehabilitation training to gain independence in activities, encouraging psychosocial coping and adaptation of patient and family, preventing secondary disabilities by promoting family involvement in caring for stroke survivors, enhancing adaptation or quality of life in view of residual disabilities, and preventing recurrent strokes.

Aziz (2010) suggested that it is important to make available early rehabilitation to stroke patients by providing appropriate stimuli, encouraging adaptive strategies in daily functional activities and providing coping strategies in areas that are affected by the stroke. This demonstrates the need to improve the prevention, treatment and rehabilitation of stroke in Malaysia. Aziz (2010) also suggested that stroke rehabilitation encompassed not only the physical aspects, but should address all aspects of everyday life, including

psychological aspects, and family and community reintegration. In relation to that, it is important for healthcare professionals to focus on long-term rehabilitation with the aim, directly and indirectly, of increasing the level of independence of the individual.

With regard to having better post-ICH adaptation outcomes, the clinical evidence suggests the importance of three management tasks in intracerebral haemorrhage: stopping the bleeding, removing the clots, and conservative treatment to control cerebral perfusion pressure (Qureshi, 2009) together with the use of other agents to control seizures, and to reduce swelling and pain (Liebeskind et al., 2011). The other important management for ICH is the prevention of post-stroke complications and early reinforcement to enhance adaptation, for example, by providing information to patients and family.

New recommendations state that all patients with ICH should have access to inpatient rehabilitation management that involves multidisciplinary professionals, and suggest that the rehabilitation should start as early as possible and should be continued in the community in order to reap the maximum benefits (Aries & Hunter, 2015; Clarke, 2013; Morgenstern et al., 2010). Multidisciplinary integration involves a team of healthcare professionals who will act together to integrate the physical, mental, emotional, and social aspects of the patient's healthcare needs.

2.7.3.1 Conservative medical treatment for PICH

Recently, the most appropriate therapy for the management of PICH has involved stopping the bleeding using recombinant human coagulation Factor VIIa (rFVIIa) to reduce hematoma growth, oedema, and total blood plus surrounding oedema (Mayer,

Brun and Begtrup et al., 2005), removing the clot using surgical evacuation of the hematoma (Mendelow, Gregson, Fernandes & Murray et al., 2005) and controlling cerebral perfusion pressure using hypertensive agents (Qureshi, 2009). The tree treatment was found to be associated with improved clinical outcomes and a reduction in mortality, although the total benefits of this treatment are still being studied. However, the literature points to the benefit of using recombinant activated factor VII to stop the bleeding of patients with spontaneous ICH. Recombinant activated factor VII was developed for the treatment for haemophilic patients with antibodies to factors VIII and IX, and it also proved to be successful when used as treatment to control bleeding in major trauma and surgical cases (Thompson, Sharon, Gerlach, Jornet al., 2007). The study proved that ICH patients who received recombinant human coagulation Factor VIIa (rFVIIa) had less hematoma growth, less oedema, smaller total lesion volume (blood plus surrounding oedema), improved clinical outcomes and a reduction of about 38% in the mortality rate (Mayer, et al., 2005; Langreth, 2011; Qureshi et al., 2009). Even though recombinant human coagulation Factor VIIa (rFVII) has been proposed for the treatment of ICH, many researchers have recommended that more investigations be carried out because a few trials have revealed no overall benefits from the treatment of ICH patients with rFVII (Nassisi, 2008).

Another important ICH management is to maintain adequate cerebral perfusion pressure by controlling the blood pressure through conservative treatment using medications. The agents (medications) of conservative treatment include hypertensive agents, osmotic therapy, anti-convulsion agents, antibiotics and antipyretics (Wei, 2011; Jauch & Kissels, 2009). Wei (2011) stated that the most important consideration as a secondary prevention of ICH is the lowering of the blood pressure. After the acute ICH period and in the absence of medical contraindications, the blood pressure should be well controlled at the recommended blood pressure of < 140/90 (Morgenstern et al., 2010). According to the

recommendation of the AHA, the mean arterial pressure should be below 130 mmHg in patients with acute ICH (Broderick, Adam & Barsan et al., 1999). Aggressive blood pressure management is important for ICH patients with severe hypertension on admission. The hypertensive agents that are suggested for use in an acute setting in managing hypertension are beta-blockers, e.g. Labetalol (Trandate), Esmolol (Brevibloc), Nicardipine (Cleviprex), and Fenoldopam (Corlopam). Other agents include sodium nitroprusside, Nitroglycerin (tridil), and Hydralazine (Apresoline) (Hays &Wilkerson, 2010), osmotic therapy (mannitol, hypotonic saline), anti-convulsion agents (e.g. Diazepam), and antipyretics (e.g. Acetaminophen) (Jauch, Kissels, 2009).

2.7.3.2 Removing the clots

Immediately after PICH, the patient was cared under neurosurgical management with focus on early determine of risk of complication and to save the patient life. Research finding suggests that there were three vital care management of a patient with intracerebral haemorrhage that includes early intervention to stop the intracerebral bleeding, surgery intervention to remove the clot, and controlling cerebral perfusion pressure (Qureshi, 2009).

Effective perioperative nursing care for patients with ICH is important during the early phase of post-ICH in relation to having better recovery outcomes. The removal of clots through surgical evacuation of the hematomas resulting from ICH is an important approach towards reducing expansion and decreasing the effect of the surrounding mass on the brain. Wei et al. (2011) stated that those patients with more severe strokes at presentation, as evidenced by poor GCS scores, were more likely to be surgical candidates. Even though the surgical evacuation of the hematoma, especially for lobar

haemorrhages or cerebellar haemorrhages, has been proven to improve outcomes (Mendelow, Gregson, Fernandes& Murray et al., 2005), recent studies comparing early surgery versus initial conservative treatment have failed to demonstrate any benefits of surgical intervention (Nassisi, 2008). The International Surgical Treatment in Intracerebral Haemorrhage (STICH) reported that surgical intervention had shown no statistically significant benefits over medical management for patients with ICH in general, although a subgroup analysis in a large randomized trial suggested potential benefits from surgery for patients with lobar ICH (Thompson, Sharon, Gerlach & Jorn, et al., 2007). According to the literature, the surgical evacuation of hematomas for supra-tentorial intracranial haemorrhages still does not indicate any specific outcomes (Nassisi, 2008; Mendaelow, Gregson & Femandes, 2005). For example, according to Nakona (2005) from the Hirosaki University School of Medicine in Japan, 26% of patients in an initial conservative treatment group needed surgery a few days after randomization. However, they suggested that the findings of the study did not directly challenge the usefulness of surgery for brain haemorrhage and suggested that there be appropriate selection of ICH patients for surgery. Recently, the findings of many studies have suggested that in order to obtain good surgical results for ICH, less invasive, safe and effective methods of clot evacuation such as endoscopic surgery, image-guided and stereotaxically-assisted evacuation of deep basal ganglia haematomas should be used. However, for superficial haematomas, craniotomy is still the preferred method (Mendelow, Gregson, Fernandes & Murray et al., 2005; Nakona, 2005).

2.7.4 Family support

Having functional and cognitive deficits, as well as personality and behavioural changes, and limitations or disabilities in activities in relation to stroke are associated with having

greater feelings of dependence, greater helplessness, and less ability to adapt to the disabilities. At home, the stroke patients are dependent on the family to help them in many healthcare tasks, including the administration and supervision of medications, rehabilitation activities and the performance of functional activities (Oh and Seo, 2010; Jammali-Blasi et al., 2011; Ostwald, et al., 2008). A study by Oh and Seo (2010) on ICH patients revealed that about 53.6% of the subjects were completely independent at one month, and this increased on assessment to 69.7% and75.0% at three and six months, respectively. The finding demonstrated that having a carer, a patient with stroke-related disability improves and independence to function in the activities of daily living. Jammali-Blasi et al. (2011) reported that many haemorrhagic stroke patients were alive and independent at 90 days following their stay in the acute stroke unit. According to Ostwald et al. (2008), long term adaptation towards a stroke-related disability is a process involving the adaptation of the patient to the neurological deficits, which take a long time to recover from, the ability to perform functional activities, to be involved in effective communication, to perform decision making and to be autonomous in their own lives as a normal human being.

In relation to that, it is important for healthcare professionals to focus on long-term rehabilitation with the aim, directly and indirectly of increasing the independence of the individual. Brauer, Schmidt & Pearson (2001) suggested that in the patient recovery setting, healthcare professionals should encourage PICH stroke patients and their families to participate in providing care to stroke patients in order to prevent the risk of stroke complications and to be willing to learn new ways of doing functional activities. According to a study by Oh &Seo (2010), caregiver support is important because about 53.6% of the subjects were completely independent at one month, and this increased on assessment to 69.7% and 75.0% at three and six months, respectively. Thus, this

demonstrated that recovery in terms of dependence on others was poorer than recovery as determined by feeding, grooming, and toileting abilities.

Brunelli et al. (2013) found that male stroke patients frequently received more support from family members, and mentioned the importance of having caregivers to help them in the activities of daily living. The social support of family and friends is important in improving the functioning of patients with hemiparesis or hemiplegia (Brunelli et al. 2013). Even though the results of a previous study highlighted the fact that women have a lower mortality rate than men, it is possible that men still have the support of the family to care for them while women live alone.

Family caregivers are encouraged to access information and education during acute care, rehabilitation, and community reintegration in order to improve the recovery and enhance the health status of stroke patients. De Palva (2012) suggested that nursing professionals should provide education and healthcare throughout the period of hospitalization, based on the certainty that the family is an important source of support for the welfare of the stroke patient. The preparation of patients and the family for discharge during the hospitalization of the stroke patient reduces expectations in terms of home care. Therefore, discharge from the hospital should be planned based on the reality and the needs of each individual, using the specifically organized discharge plan (de Palva et al., 2012)

Patients with stroke and their family caregiver should use adaptation strategies to deal with stress situations caused by stroke such as be involved in learning new skills and ways to manage stressors (Bronstein et al., 1991). Patients with stroke and their family caregiver are encouraged to access information and education during acute care,

rehabilitation, and community reintegration. It is crucial to minimize stroke's impact and post stroke complications by obtaining and provide information and education related to adapting with stroke disability. Results from previous research showed that a majority of stroke patient's desire information about stroke illness, conditions and care and to be involved in decision-making processes (Guadagnoli& Ward 1998). This confirms that patients' participation in different aspects of health care can significantly have a positive outcome on their recovery.

In acute inpatient rehabilitation phase, it is important to ensure that patient and caregivers participate in nursing care on treatment and physical care. Nursing care includes providing nutritional support, medication administration, wound dressing and infection screening (Long et al., 2000). It would be necessary to include the patients and caregivers at the team meeting while maintaining the existing time constraints and to establish a baseline to the level of participation that could be achieved. Once the feasibility could be established of having the patient present and able to address these questions, one could begin to increase the degree to which entire approach could be implemented (Ozer 2000).

It is important for healthcare professionals to readdress caregivers or family members with adequate support and education to assist them in meeting the demands of stroke survivors. It would be necessary to include the patient and caregiver in the team meetings while maintaining the existing time constraints and to establish an achievable baseline for the level of participation.

2.7.5 Stroke education

According to Cameron (2013), approximately 795,000 people in the United States suffered from new or recurrent strokes, and over 137,000 of these are fatal. Thus, over 650,000 stroke survivors were discharged from acute-care settings with instructions about the risk factors, medications, rehabilitation, and specific new care needs. Patient education is a support method to increase the patient's functional abilities and quality of life, and to reduce the rate of readmission (Cameron, 2013). However, a stroke disease can alter the patient's ability to communicate effectively with the nurse and create a difficulty in determining needs. Stroke education is to be provided in the same manner as education for other chronic illnesses, so a collaborative effort must be developed with the family to determine individual needs, abilities and learning styles. Specific to stroke, the patient and family caregivers' education must cover the prevention of a recurrence of the disease, disease-specific education and self-management. Disease prevention is dependent on the patient's specific risk factors; common areas for preventive focus are blood pressure and cholesterol management, medication adherence and early recognition of warning signs (Cameron, 2013; de Palva et al., 2012).

Baumann et al. (2014) conducted a study to explore the association between long-term adaptation (QOL) and socioeconomic factors, functional impairments and self-reported dissatisfaction with the information received, and home-care services among survivors at the long term period (2 years) after the onset of stroke. The results revealed that the perceived long term adaptation (QOL) of stroke survivors was markedly low for the following domains: emotion, sleep, cognition, communication, mobility, mental feelings, pain and fatigue (depression symptoms). These alterations are strongly associated to dissatisfaction with the information and help received, lack of coordination between

services, and concerns about the possibility of receiving help when necessary. In other words, Baumann et al. (2014) reported that several functional impairments were related to low scores in all the domains of activities, and it was found that motor, language, memory and sensory deficits have a high impact on long-term adaptation.

Other studies have suggested that stroke patients and family caregivers should have access to information that will contribute to the development of their skills and have adequate stroke knowledge before discharge (de Palva, 2012). Due to the significant number of stroke survivors who experience limitations on returning home, continuous and targeted education is crucial in order to minimize the impact and complications of a stroke. Many studies have highlighted the importance of providing information to patients and encouraging family caregivers to participate in providing care during the hospitalization of ICH patients so as to ensure that on returning to their homes and communities the stroke patients will be able to function by adapting to stroke deficits that may include deficits in cognition and functional abilities (Miller et al., 2010; Clarke, 2013; Badriah, 2013; Morgenstern et al., 2010).

According to Croquelois & Bogousslavsky, (2006), risk factors of stroke include systemic arterial hypertension, myocardial infarction, atrial fibrillation, fibrillation, diabetes mellitus, high-cholesterol levels, carotid artery disease, smoking and alcohol use, some of them depending on patients' habits. Effective health education to the patients who have had a stroke regarding factors contribute to stroke illness, lifestyle such as exercise, smoking, diet, weight, alcohol, stress management, is essential to prevention risk of recurrent stroke, post stroke complication and post stroke depression (Croquelois & Bogousslavsky, 2006). In preventing recurrent stroke, Canadian Best Practice Recommendations for Stroke Care (2006) suggested all persons with stroke should be

able to recognize and identify symptoms of hemiparesis, speaking difficulty, vision problems, headache, dizziness and take immediate action such as able to seek immediate medical attention. Hence, it is important to have strategies to prevent post stroke complications recurrent stroke and depression. Healthcare professional and clinician should provide a specific stroke education programme that stresses on prevention of risk factors. It is important to aware that stroke patient has the rights to receive information regarding their illness, different kinds of care and treatment and professionals must help patients to evaluate their alternatives and facilitate decision-making (Rodger et al, 2001).

Hoffmann et al., (2007), in their study found that patients who received stroke information on stroke may experience a slightly lower anxiety from admission to follow up and can lead to better quality of life. However, findings of previous studies stated that information regarding stroke disease, treatment, health teaching related to self-care management of physical and cognitive disability at home and community and rehabilitation services usually not given in proper way or well organize (Ostwald et al, 2008; Grant, Glandon, Elliott, Giger& Weaver, 2004; Ski & O'Connell, 2007).

Lack of information, leading to misconceptions, anxiety and fear, were believed to be a contributory factor to poor health status and emotional, both of which are common among stroke survivor and carer (Rodger et al, 2001).

Morgenstern et al. (2010) suggested that the importance of the inclusion of education for the patient and caregiver regarding secondary prevention with the objective of achieving rehabilitation goals. The success of these stroke-specific education and training programmes depends on the caregiver training and support (Morgenstern et al., 2010).

Stroke-specific education and training are recommended in the National Clinical Guidelines, but the content of such education is not specified, and there is an implicit assumption that this education should be targeted equally at all team members (Clarke, 2013). Disease-specific education should include information regarding the area of the brain affected by the stroke and a pathophysiological connection to any lasting effects the patient may be experiencing. The education should include detailed information concerning treatment options, completed procedures, rehabilitation plans and goals, and the role of medications and the importance of adherence (Cameron, 2013; Ho& Yan, 2010)

The stroke patients and their caregivers need to be equipped with knowledge and strategies regarding post stroke complications such as infections, pressure ulcers, pain, deep-vein thrombosis and depression in order to enhance adaptation. Wang, Chen, Liao & Hsiao, (2013), suggested, within the patient recovery setting, healthcare professionals should encourage PICH stroke patients and their families to participate in providing care to stroke patients in order to prevent the risk of stroke complications and be willing to learn new ways of doing functional activities. Once the feasibility of having the patient and caregivers present is established, then the degree of implementation of the entire approach can be increased (Wang, Chen, Liao & Hsiao, 2013).

The important strategies that focus on acute inpatient rehabilitation include providing technical and physical care to the stroke patients and encouraging the involvement of family caregivers (Delbari et al., 2011; Morgenstern et al., 2010; Long et al., 2000). The technical care includes providing nutritional support, medication administration, wound dressing and infection screening (Long et al., 2000). According to Clarke (2013), in relation to the prevention of the risk of aspiration, the ability of the stroke patient to

swallow should be assessed before providing drink and food. If a urinary catheter was used during the acute phase, it should be removed as soon as possible once the patient is able to control the bladder in order to prevent urinary tract infection.

To prevent the onset of a recurrent stroke, stroke survivors and their family caregivers must be educated regarding the most common risk factors for the recurrence of strokes such as hypertension, smoking, hypercholesterolemia and alcohol. According to Croquelois & Bogousslavsky, (2006), these risk factors include systemic arterial hypertension, myocardial infarction, atrial fibrillation, diabetes mellitus, high-cholesterol levels, carotid artery disease, smoking and alcohol use, some of which depend on the patients' habits. The Canadian Best Practice Recommendations for Stroke Care (2006) suggested that all stroke patients and their family members should be able to recognize and identify at least two signs and symptoms of stroke such as sudden weakness, sudden trouble speaking, sudden vision problems, sudden headaches and sudden dizziness, and know to take appropriate action such as to seek immediate medical attention. They should be given information about the risk factors, lifestyle management issues such as exercise, smoking, diet, weight, alcohol and stress management, and be counselled about possible strategies to modify their lifestyles and risk factors. They should be educated on how to manage comorbidities such as hypertension, heart disease, diabetes, high cholesterol, and smoking, which are essential to prevent recurrent strokes. Patients with PICH will be prescribed new medications to take or may have previous prescriptions changed, and it is suggested that patients should be informed about the rationale for each medication and its possible side effects. If the patient is unable to understand this information, the family caregivers should be educated about the medications (Morgenstern et al., 2010; Cross & Walker, 2008).

Delbari, Roghani, Tabatabaei, Rahgozar & Lokk (2011), suggested that a more aggressive stroke prevention regime with low-cost treatments to reduce the risk factors should be widely introduced to prevent primary and secondary strokes. The intervention schedule must be focused on the conceptualization of health and the illness so that those involved will continue to adhere to the orders and prescriptions by their medical doctors or nurses.

There is a need of information among stroke patient and their family caregivers regarding stroke illness, treatment, rehabilitation and strategies to prevent risk of recurrent stroke, post stroke medical complications and post stroke depression. Research found that the patients and their family needs of stroke education or information about stroke, the topics include understanding and managing the effects of stroke, reducing stroke risk, treatment and rehabilitation and managing effects of stroke after discharge (Hoffman, 2007). It is important for assessment of level of education needs of stroke patient and their caregivers and before discharge from hospital setting the patients and their family caregivers were determined the level of stroke knowledge using the stroke knowledge questionnaire. The most-used stroke knowledge was developed based on the stroke knowledge questionnaire by Hoffmann et al., (2007) and Croquelois & Bogousslavsky, (2006). Hoffmann et al. (2007) was developed Stroke Knowledge Questionnaire based on Patients' stroke knowledge questionnaire by Kotari in the year 1997 (Kotari et al., 1997). Many studies that use the criteria of Kotari (1997), found that almost half of patients or survivors admitted with a diagnosis of stroke did not know a single sign or symptom and not know a single risk factor and unaware that they are at risk of recurrent stroke. Furthermore, many people did not know the signs or symptoms of stroke or what to do if a stroke is suspected and therefore, present to a hospital too late to received medical treatment for improving clinical problems or neurological deficits. (Koenig, Whyte, Munin, O'Donnell, Skidmore et al., 2007; Hoffmann et al. 2007; Croquelois & Bogousslavsky, 2006).

Koenig et al., (2007) conducted a study to investigate stroke knowledge among stroke patients in inpatient after stroke and their caregivers to examine stroke knowledge using the Kothari stroke knowledge criteria (1977) and found that 50 percent patients and their caregiver had inadequate stroke knowledge and needed stroke education. This finding suggests a need for establishing effective patient educational programs. There is a need of the inpatient rehabilitation program that offers education to stroke patients and families. However, given the decreasing length of hospital stay, the best way is to conduct more study on the best way how to conduct education to the patients and families. A follow-up study by Weltermann, Homann, Rogalewski, and Brach (2000) using Kothari et al (1997) questionnaire was conducted to study patients' stroke knowledge. The purpose was to determine the level of knowledge among the stroke support group members. This study gave an overview that supports group needed to improve early recognition and reduce delays in the referral of stroke patients. The members of the stroke support group were asked about their knowledge of stroke symptoms, risk factors, and actions required in case of a stroke. The finding stated that members of the stroke support group had good stroke knowledge and well informed about all aspects of modern stroke care. Because of their knowledge and experiences, support group should be viewed as important partners of stroke patients and in community stroke education.

In conclusion, the need of stroke knowledge among stroke patients and their caregivers, perhaps general hospitals should shift from having no specific and general care facilities currently to the establishment of stroke units and specific stroke rehabilitation centres.

2.8 Early and later adaptation to stroke related disability

Positive adaptation to stroke disabilities occurs when a patient gains recovery in physical and cognitive functions during the early post-ICH phase and improves in long-term stroke

outcomes. Patients with stroke functional disabilities at admission were able to increase their performance of personal activities of daily living at discharge and 2–3 weeks after staying at home. The functional abilities that improved most remarkably were self-feeding, grooming and toileting abilities (Oh & Seo, 2010; Yesilot, Koyuncu, Coban, Tuncay & Bahar, 2011; Almborg, Ulander, Thulin & Berg, 2010). It is necessary for stroke patients to maximize their participation in the rehabilitation planning and treatment process. In terms of physical functions, a patient who has sensory, motor and cognitive deficits resulting from stroke may regain the capacity to carry out the activities of daily living (ADL), such as feeding himself/herself, dressing, bathing, and toileting, even though some degree of residual physical impairment may remain. For example, Oh &Seo (2010) found that functional disability scores progressively decreased over the 6-month period after ICH, indicating a significant progressive improvement in functional abilities between 1 and 3 months and between 3 and 6 months. In addition, a post-hoc analysis showed that these improvements in functional abilities between 1 and 3 months and between 3 and 6 months were statistically significant. An analysis of the sub-areas of functional abilities showed that all the sub-areas, for example, self-feeding, grooming, toileting and dependence on others, significantly improved during the six-month period after admission.

The results of a study on ICH patients by Oh and Seo (2010) revealed that about 53.6% of the subjects were completely independent at one month, and this increased to 69.7% and 75.0% at three and six-month assessments, respectively. The finding demonstrated that stroke-related disabilities are associated with dependence on assistance to function in the activities of daily living. Jammali-Blasi et al. (2011) reported that many stroke patients were alive and independent at 90 days following their stay in the acute stroke unit. Their study found that haemorrhagic stroke was associated with the female sex, increased dependency and reduced physical health status.

Regarding the difference between the level of adaptation to stroke-related disabilities in early and long-term outcomes, the results found that there are differences between early adaptations to stroke disabilities and later adaptation outcomes. For example, Oh & Seo (2010) found that the functional disability scores progressively decreased over the 6-month period after admission, signifying a significant progressive improvement in functional abilities. In addition, a post-hoc analysis showed that these improvements in functional abilities between 1 and 3 months and between 3 and 6 months were statistically significant. In the analysis of the sub-areas of functional abilities, the findings showed that all the sub-areas, for example, self-feeding, grooming, toileting and dependence on others, significantly improved during the six-month period after admission. Hinkle (2006) stated that functional ability at the time of admission is strongly linked to functional recovery in the inpatient stroke rehabilitation literature. Meanwhile, Saloheimo et al. (2006) stated that improvements in functional abilities in patients during the acute phase of ICH enabled more patients with moderate to severe disabilities to survive beyond the first critical days. They also suggested that the functional status reached after rehabilitation may be a major factor determining future survival.

Many studies have reported that functional recovery after stroke occurs in the first few months. For example, Green & King (2010) examined the impact of mild stroke on functional outcomes, QOL, depression, caregiver burden, and marital functions in a cohort of men with mild stroke and their wife-caregivers. The results revealed that the men with mild stroke showed significant improvements in their functional recovery during the follow-up period. Functional recovery occurred in the first few months after the stroke. However, it was observed that better recovery depended on many factors such as the physical functions. Green & King (2010) stated that full recovery was influenced

by other elements of physical function such as tiredness and malaise. The patients with mild stroke were usually independent in their ADL up to 12 months post-discharge.

The cognitive ability scores increased throughout the six-month period after admission, indicating a progressive improvement in cognitive abilities. Oh & Seo (2010) reported, the results showed good improvement. The cognitive ability scores increased in between one to six months after PICH. The areas of cognitive ability that showed significant improvements over the 6-month post-PICH period were attention ability, speaking and understanding, memory ability, problem solving, safety behaviour, and social involvement.

Individuals with stroke should have strategies for early recovery from neurological deficits so as to regain their abilities in functional activities and to prevent post-stroke complications and depression. Kwok, Clark, Ford & Durairaj (2012) did a study regarding the association between pre-stroke disabilities and inpatient mortality and length of acute hospital stay after stroke. They found that age, sex, stroke type, and severity of stroke influence the length of stay in the hospital.

In addition, their post-hoc analyses showed that these improvements in functional ability between 1 and 3 months and between 3 and 6 months were statistically significant. The findings on the sub-areas of functional abilities showed that all such abilities, for example, self-feeding, grooming, toileting and dependence on others, significantly improved during the six-month period after admission. The patients with stroke functional disabilities at admission were able to increase their performance of personal activities of daily living at discharge and 2–3 weeks after staying at home (Almborg, Ulander, Thulin & Berg, 2010). The functional abilities that improved most remarkably were self-feeding,

grooming and toileting abilities (Oh &Seo, 2010; Yesilot, Koyuncu, Coban, Tuncay & Bahar, 2011).

In relation to the difference between early post-stroke complications and later complications at three-month post-PICH, the findings from a study by Indredavik & Rohweder et al. (2008) revealed that during the first week, 312 out of 489 patients (63.8%) experienced one or more complications.

Stroke patients experienced the onset of complications during the first week, except for pain, UTI, and falls, which is often in the follow-up period. There were no significant differences in the baseline characteristics and in the frequency and type of complications during the first week between the group that was followed up for only 1 week and the group that was followed up for 12 weeks (Indredavik, Rohweder, Naalsund & Lydersen, 2008). This means that the severity of the stroke on admission is the most important risk factor for developing complications and there is no significant association between the risk factors for stroke and the development of complications.

Many studies have reported that post-stroke depression (PSD) is estimated to occur in one-third to half the individuals who experience a stroke, depending on when, where, and how these individuals are evaluated for depression (Green & King, 2010; Johnson, Minarik, Nystrom, Bautista, & Gorman, 2006; Kuptniratsaikul, Kovindha, Suethanapornkul, Manimmanakorn & Archongka, 2009). For example, Green & King (2010) examined the impact of a mild stroke on functional outcomes, QOL, depression, caregiver burden, and marital function in a cohort of men with mild stroke and their wives as caregivers. The finding revealed that the men with mild stroke demonstrated significant improvements in their functional recovery during the follow-up period, although full

recovery was often delayed by other elements of physical function and depression. So these losses in turn affected their independence and autonomy, and coloured their sense of self as previous activities and social contacts had become limited. This finding showed that psychosocial outcomes are not necessarily related to physical impairments due to a mild stroke, and may be associated to adjustments made to adapt to changes with regard to the relationship with the family caregiver and their functions. It is important to do further research in this area to determine which components of post-stroke psychosocial behaviour significantly influences the family caregiver or spouse in maintaining their relationship during the recovery period.

In contrast, stroke patients with depression have significantly lower functional scores both at onset and after six months (Ostir, Berges, Ottenbacher & Ottenbacher, 2011). Post-stroke depression has been found to be associated with functional outcomes and increased length of hospital stays, thus affecting the quality of life and psychosocial burden, and leading to increased morbidity and mortality (Kortte, Jennifer, Hosey& Castillo et al., 2012; Kuptniratsaikulet al., 2009; Carol, & Egido, 2009). Kortte, Jennifer, Hosey & Castillo et al. (2012) suggested that psychological problems following a stroke have a negative impact on the life role functions of the individual and disrupt the rehabilitation process and outcomes. This study suggested that incorporating interventions that enhance hope and build on the individual's psychological strengths may be useful in improving participation outcomes following acute medical conditions.

A study by Rathor et al. (2012) to predict the variables associated with functional outcomes in a patient with PICH found that 77 survivors (70.6%) were functionally dependent and 32 (29.4 %) achieved functional independence. The results of the follow-up at one month reported that 48 (55.2%) were functionally independent while 39 (44.8%)

were still dependent. Four out of the 109 survivors developed severe depression requiring intervention. At the follow-up at six months, 69 survivors (84.1%) were independent and 13 (15.9 5) were still dependent, while 5 survivors were lost due to default treatment and invalid telephone numbers. PICH patients are often neurologically devastated on presentation and their functional recovery depends on the family support, patient's motivation, ability to learn as well as the quality and intensity of therapy.

Bay (2001) suggested that the variables that are positively associated with adaptation are independence with activities of daily living, increased functional abilities, psychological problems or depression, presence of social support and healthcare resources, evidence of post-stroke complications, while the variables that are negatively associated with adaptation are psychological impairment, severity of impairment, severity of aphasia, inappropriate reactions to illness, pessimism, and the inability to return to work.

Baumann et al. (2014) conducted a study to explore the association between long-term adaptation (QOL) and socioeconomic factors, functional impairments and self-reported dissatisfaction with the information received, and home-care services among survivors at the long term period (2 years) after the onset of stroke. The results revealed that the perceived long term adaptation (QOL) of stroke survivors was markedly low for the following domains: emotion, sleep, cognition, communication, mobility, mental feelings, pain and fatigue (depression symptoms). These alterations are strongly associated to dissatisfaction with the information and help received lack of coordination between services, and concerns about the possibility of receiving help when necessary. In other words, Baumann et al. (2014) reported that several functional impairments were related to low scores in all the domains of activities, and it was found that motor, language, memory and sensory deficits have a high impact on long-term adaptation.

Positive early and long-term adaptations are proven if there is no evidence of post-stroke complications, no depression during the acute phase and at the long-term recovery phase, and there is evidence of stroke knowledge. There is some evidence that patients with ICH show slightly faster gains in recovery compared with other types of stroke, especially ischemic stroke.

2.8.1 Summary

In summary, there are factors that have been predicted to influence early and later adaptation outcomes in stroke-related disabilities. In the early phase, as determined by Ostwald (2008), the predictors of adaptation to stroke-related disabilities during the acute inpatient recovery phase include the severity of the stroke using NIHSS, depression, age, sex, social-economic status and complications. Another study by Hinkle (2006) and Livneh (2001) also found that impairments resulting from illness, risk factors, pre-existing disabilities, cognitive decline, delirium, comorbidity, post-PICH stroke complications contribute as factors that affect adaptation in response to stroke-related disabilities during the acute post-stroke recovery phase. In relation to long-term adaptation outcomes, Livneh (2001) stated that the factors which influence adaptation outcomes include social demographic characteristics, disabilities resulting from illness, personality characteristics, and social situation and support. The research findings suggested that the severity of cerebral dysfunction (Qureshi et al., 2009), high functional disabilities (Samsa & Matchar, 2004), low stroke knowledge among caregivers (Rodger et al., 2001) and the presence of post-stroke complications (Longhorne et al., 2000) are critical factors in determining the adaptation to changes.

2.9 Conceptual framework of study

Theoretical framework for studies of adaptation with stroke-related disabilities among patients was emerged when searching the epidemiology of PICH, its impact and factors influence and inhibit recovery and adaptation at acute and long term post PICH. Adaptation with stroke-related disability is crucial in relation ensure recovery of patients end with success outcome. Although there are many theories and concepts surrounding PICH such as disability, adaptation, quality of life, and self-care, the most important theories and concepts discussed in this study are related to disabilities and adaptations. In addition, the conceptual framework for this study was also based on the significant issues pertaining to the loss and disability related to stroke phenomena and adaptation of post-PICH patients and the factors associated with the adaptation.

The conceptual framework of this is study to inform the study direction and it was developed to determine the total score of patients' functional adaptation related to stroke-disability after having a stroke due to PICH and to examine the predictive factors of early and long-term adaptation in achieving maximum functional recovery. The conceptual framework was developed based on the theoretical definition of impairment, loss and disability by ICF, 2001 (Miller, 2010) and the based on four modes of Roy's Adaptation Model (2009) cited in Ordin, (2013) (Figure 1). This study measures the degree of functional adaptation according to adaptation modes that include of adaptation in physiological, psychological, role and social dysfunction.

2.9.1 Adaptation to physiological dysfunction

Roy (2009) described the physiological mode of adaptation as focusing on the maintenance of basic human physiological needs. Physiological adaptation is a

manifestation of interactions between the anatomical parts of the body, such as the organs and limbs, toward the processes of the disease, and the adoption of behaviours directed toward the resolution of physical and physiological problems (Roy, 2009).

In this study, intracerebral haemorrhage is defined as a small, deep-penetrating rupture of the arteries that cause bleeding into the brain parenchyma. Bleeding can occur in the cerebral hemispheres, basal ganglia, brainstem, cerebellum, or the ventricles, causing initial tissue injury. The experience of intracerebral haemorrhage illness, is viewed as a stress response for humans in the area of physiological, psychological, and social functions. According to ICIDH, loss of body functions and structures includes impairments of structures and physiological and psychological functions that result from a primary (e.g hemiparesis or hemiplegia, abnormality in gaze and extra-ocular movements (gaze), altered visual fields (visual), facial palsy (facial), limb ataxia (ataxia), alteration in sensation, language, dysarthria and neglect and depression or secondary (e.g., contractures, decubiti) consequence of stroke (Gillespie, Bowen, Chung. & Cockburn et al., 2015; Pandian & Arya 2013; Liebeskind et al., 2011; Miller, et al., 2010*).*

2.9.2 Adaptation to psychological dysfunction

The psychological of adaptation deals with psychic and spiritual integrity, including beliefs and feelings, and deals with interpersonal relationships (Roy, 2009; Ordin, 2012). Impairments to thinking and memory occur because of damage to those parts of the brain that are responsible for communication, memory, learning, and awareness (Aries & Hunter, 2015; Leung, 2010; Dalvandi, 2010; Vanhook, 2009). The alteration in communication and social interaction occurs because of damage to any of the language-control centres in the brain, thus causing language impairments such as the inability tospeak, write, and understand spoken and written languages (Skolarus, 2014; Taylor,

Todman & Broomfield et al, 2011; Oh, 2010; Leung, 2010; Dalvandi, 2010; Vanhook, 2009; Secrest & Zeller, 2007).

The recovery phase may be prolonged and the person may experience frustration, anger, depression, and isolation if they could not adapt with the physical and cognitive disability (Skolarus, 2014; Taylor, Todman & Broomfield et al, 2011; Oh, 2010; Leung, 2010; Dalvandi, 2010; Vanhook, 2009; Secrest & Zeller, 2007).

2.9.3 Adaptation to role dysfunction

The role function mode of adaptation concentrates on the role of individuals as human beings and their involvement in social activities (Roy, 2009; Ordin, 2012). Intracerebral haemorrhage or haemorrhagic stroke has a significant impact on an individual's life, particularly with regard to the performance of physical and cognitive functional activities of daily living (Dalvandi et al., 2010; Almborg et al., 2010). According to the ICF (2001), model limitations with regard to their activities level reflect the difficulties that stroke survivors experience in the performance of functional tasks, including ADLs (Miller et al., 2010). An activity limitation may range from a slight to a severe deviation in terms of quality or quantity in executing the activity in a manner or to the extent that is expected of people without the health condition.

(Miller et al., 2010). Physical disabilities such as paralysis, loss of sensation in limbs, disturbed balance and coordination, are significantly associated with a limitation or disability to perform functional activities, including mobility and other self-management tasks such as ADLs (Holley, 2007; Dalvandi et al., 2010; Leung et al., 2010; Oh & Seo, 2010).

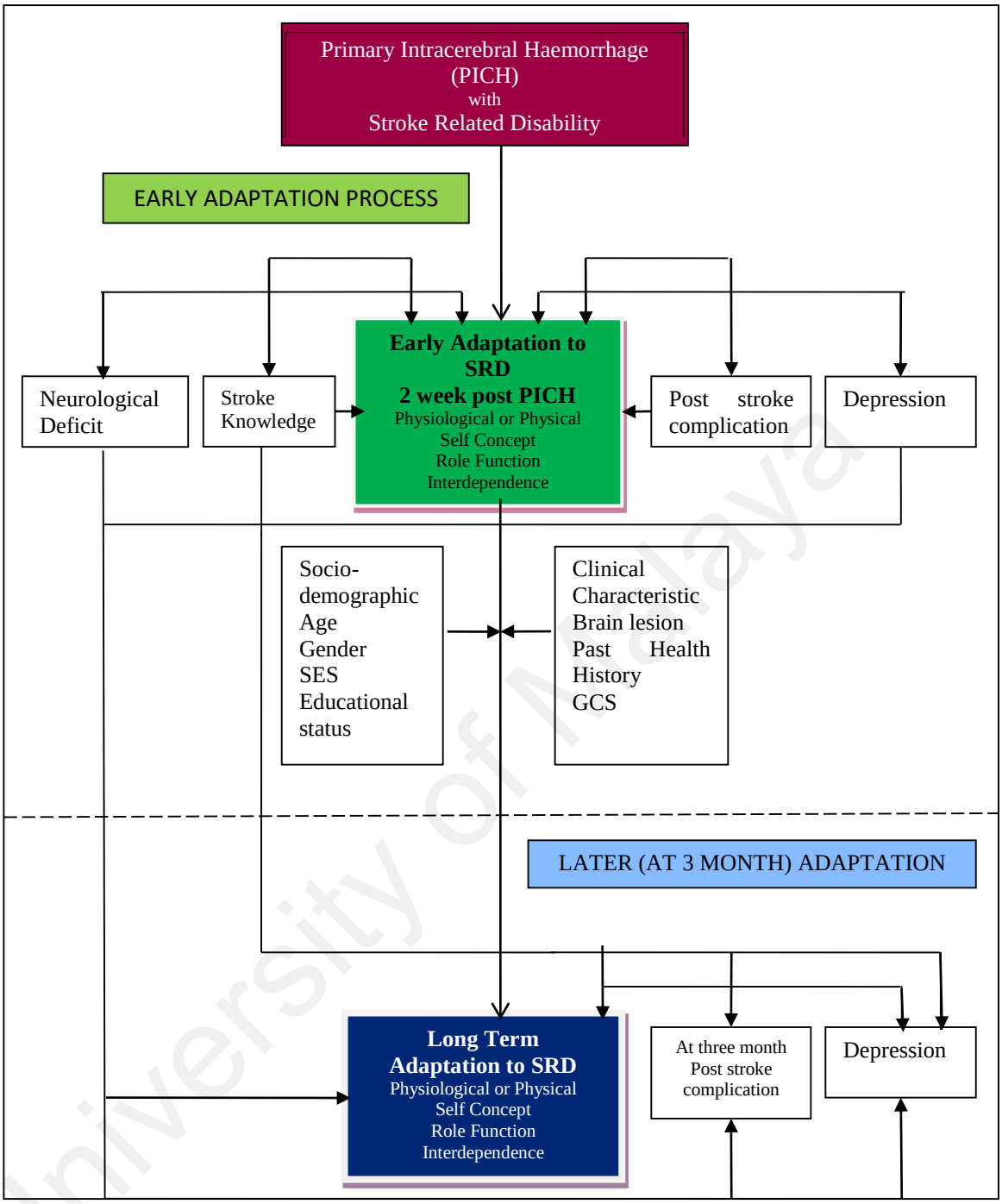


Figure 2.3: A conceptual model of Predictors affecting early and later adaptation to Stroke-Related Disabilities

2.9.4 Adaptation to Social Participation Dysfunction

The social participation dysfunction mode of adaptation deals with social and relational integrity, as well as reception of social support (Roy, 2009; Ordin, 2012). The social participation dysfunction mode is represented as a social interaction in the component of adaptation.

2.9.5 Factors influencing adaptation to stroke-related disabilities

The ability to adapt to stroke-related disabilities is depending on several factors. Miller et al. (2010) stated that these factors include the unique personal and environmental variables of each stroke survivor that influence how his or her disability is experienced, as well as access to healthcare. The personal factors include socio-demography and clinical characteristics, while the environmental factors are external attributes. In this study, the environmental factors included the availability of support from caregivers, post-stroke complications, post-stroke depression and the level of stroke knowledge (Miller et al., 2010).

2.9.5.1 Personal Factors

The personal factors include socio-demographic and clinical characteristics. It was found in a previous study that there is a strong positive relationship between increasing age and disability (Bagg, Paris & Hopman, 2002). The results of a previous study showed that age is negatively associated with physical functions, where younger patients are better able to function physically, and men are associated with a better health quality of life compared to women (Almborg et al., 2010). According to Paolucci et al. (2003), ICH patients, who

have a better rehabilitative prognosis, show significantly higher CNS scores and efficiency in terms of their neurological, functional, and mobility status.

2.9.5.2 Environmental Factors

The environmental factors that influence positive or negative adaptations are supported from healthcare professionals and caregivers, post-stroke complications and stroke knowledge.

2.9.5.3 Support of caregivers

Support is provided through interpersonal relationships with the spouse or other family members acting as agents for rescue, assistance, protection, and identity. The spouse or other family members can provide assistance when needed, and assist in recovery by keeping the recovering person on course, and treating the person with respect by acknowledging his or her successes (Jammali-Blasi et al., 2011; Ostwald, et al., 2008). Social supports were found associated with better outcome post stroke (Chau et al, 2010; Grant, 2004).

2.9.5.4 Post-stroke Complications

Another factor associated with recovery and adaptation to stroke disabilities includes post-stroke complications and depression. PICH patients with neurologic impairments and physical function deficits are at risk of medical complications during rehabilitation and while in the community. The most common complications recorded during the first week are urinary tract infections, chest infections, pressure sores, deep venous

thrombosis, shoulder pain and limb pain (Oh, 2010; Leung, 2010; Dalvandi, 2010; Miller, 2010; Pandian&Arya, 2013; Indredavik et al., 2008; Walker, 2008). Post-stroke infections have been associated with the older age group, the female gender, higher median NIHSS on admission, and vomiting at the onset of stroke. It has also been found that tube feeding is strongly associated with post-stroke respiratory infections (Vargas et al., 2006).

Post-stroke depression (PSD) is common after a stroke and haemorrhagic stroke. The incidence of PSD during the acute period (within three months) may range from fewer than 10% to more than 50% of stroke patients, depending on when, where, and how these individuals are evaluated for depression (Johnson, Minarik, Nystrom, Bautista & Gorman, 2006). Symptoms of depression have been estimated to occur in 18% to 50% of individuals who experience a stroke, and major clinical depression may occur in 10% to 14% of patients (Kuptniratsaikul, Kovindha, Suethanapornkul, Manimmanakorn & Archongka, 2009).

2.9.5.5 Stroke knowledge of ICH patients

Lastly, the factor associated with positive or negative adaptations post stroke is the participation of the patients and their caregivers in learning and developing new self-care strategies that facilitate recovery. Adequate stroke knowledge among stroke patients and their caregivers is perceived as a strategy for dealing with the goal of improving functional disabilities through a positive adaptation response and outcome (Cameron, 2013; de Palva, 2012).

2.9.6 Summary

In summary to the conceptual framework, the adaptation was assessed using FIM during two different periods. The early adaptation in response to sudden stroke-related disabilities was determined after the PICH patients had passed the critical period, usually at five days to two-week post-PICH, while the later at long-term adaptation was the outcome at three months of rehabilitation within a community. The differences between early and later at long-term adaptation to stroke may imply showed that patients are able to adapt to stroke-related disabilities and improve their recovery.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter describes the design, settings, sample population and sampling procedure, pilot study, research instrument, data collection method and procedure, data analysis and interpretation of the results and finally, the ethical considerations for this study.

3.2 Study Design

A prospective study design was conducted in which a group of patients with primary intracerebral haemorrhage was selected and to examine factors that may affect early adaptation during the acute recovery phase. Later, the primary intracerebral haemorrhage cohort was then followed-up at three months to determine the factors associated with 3 month adaptation (functional independence). This study also determines the percentage of improvement from early to alter (3 months) post PICH in motor and cognitive domains. The follow-up after three months was applied in this study based on the findings of the pilot study (The percentage of missing samples was higher. Thus, in order to avoid missing data, a three-month follow-up was more feasible than a six-month follow-up. Later, the primary intracerebral haemorrhage cohort was then followed-up at three months to determine the factors associated with 3 month adaptation (functional independence).

3.3 Study Setting

The data collection in Phase I (acute inpatient recovery phase) was conducted at two

main hospitals in the east coast of Malaysia, namely Hospital Universiti Sains Malaysia (Hospital USM) and Hospital Sultanah Nur Zahirah Kuala Terengganu (HSNZ). Both hospitals receive admissions and provide treatment for patients with intracerebral haemorrhage. In Phase II (long-term recovery phase), the selected patients were followed-up at home.

Hospital USM is a teaching tertiary care hospital in Kubang Kerian, Kelantan, which is six kilometres away from the city of Kota Bharu. It is a referral centre for patients with ICH from other hospitals in the east coast of Malaysia, including Hospital Sultanah Zainab Kota Bharu and all the district hospitals in Kelantan, Hospital Sultanah Nur Zahirah and other nearby district hospitals in Terengganu, such as Hospital Besut and Hospital Jerteh. HUSM is equipped with 747 beds to provide specific care and treatment for neurological problems, including ICH patients. Patients who have been stabilized after primary intracerebral haemorrhage are admitted to an intensive care unit, where appropriate medical and surgical treatment and close observations are conducted for risk of early deterioration. Later, patients are transferred to a surgical ward for acute recovery and rehabilitation. After patients have been stabilized, they are referred to district hospitals for continuation of care and treatment.

Hospital Sultanah Nur Zahirah Kuala Terengganu (HSNZ) has an 821-bed capacity to provide care to the population of Terengganu. HSNZ is the referral centre for five district hospitals, including Kuala Terengganu, Setiu, Dungun, Kemaman and Jerteh as well as for private medical care in the state of Terengganu. ICH patients who require immediate surgery in relation to ICH are referred to HUSM. Patients who have been stabilized are admitted to an intensive care unit for appropriate medical-surgical treatment and close observation in order to prevent risk of early deterioration for patients with spontaneous

intracerebral haemorrhage. Patients who survive the critical phase are admitted to the general surgical ward until they are discharged.

3.4 Sample and Sampling

The samples comprised of all PICH patients admitted within the sampling frame with GCS of 9 and higher and fulfilled the inclusion criteria were recruited. PICH patients were recruited from Hospital USM and HSNZKT who have fulfilled the criteria within the sampling frame with a GCS of 9 and higher. There were 147 post-primary intracerebral haemorrhage (PICH) patients admitted to Hospital USM and HSNZKT between June 2009 and December 2010 who met the criteria for this study. However, during the follow-up at three months, 26 patients (17.6%) died due to severe neurological status, medical problems and severe complications, such as respiratory infections and bed sores. Eight patients were excluded from the study because three of them were confirmed as not having intracerebral bleeding after a CT scan analysis and another five could not be contacted or found either by telephone or based on the addresses given. Thus, a total of one hundred and thirteen (113) post-PICH patients participated in this study. Figure 3.1 shows the flow and outcomes of the patients who were recruited in the study.

3.4.1 Inclusion Criteria

The inclusion criteria were: (1) patients over eighteen years old; (2) having intracerebral haemorrhage (ICH) on the initial CT scan; (3) Glasgow Coma Scale (GCS) of 9 or more than 9, and (4) in the recovery stage. Patients with a score of 9 or greater and a hematoma volume of less than 30 ml. had a mortality rate of 17% and potentially good patient outcomes (Adnan, Stanley, Joseph & Batjer et al., 2001).

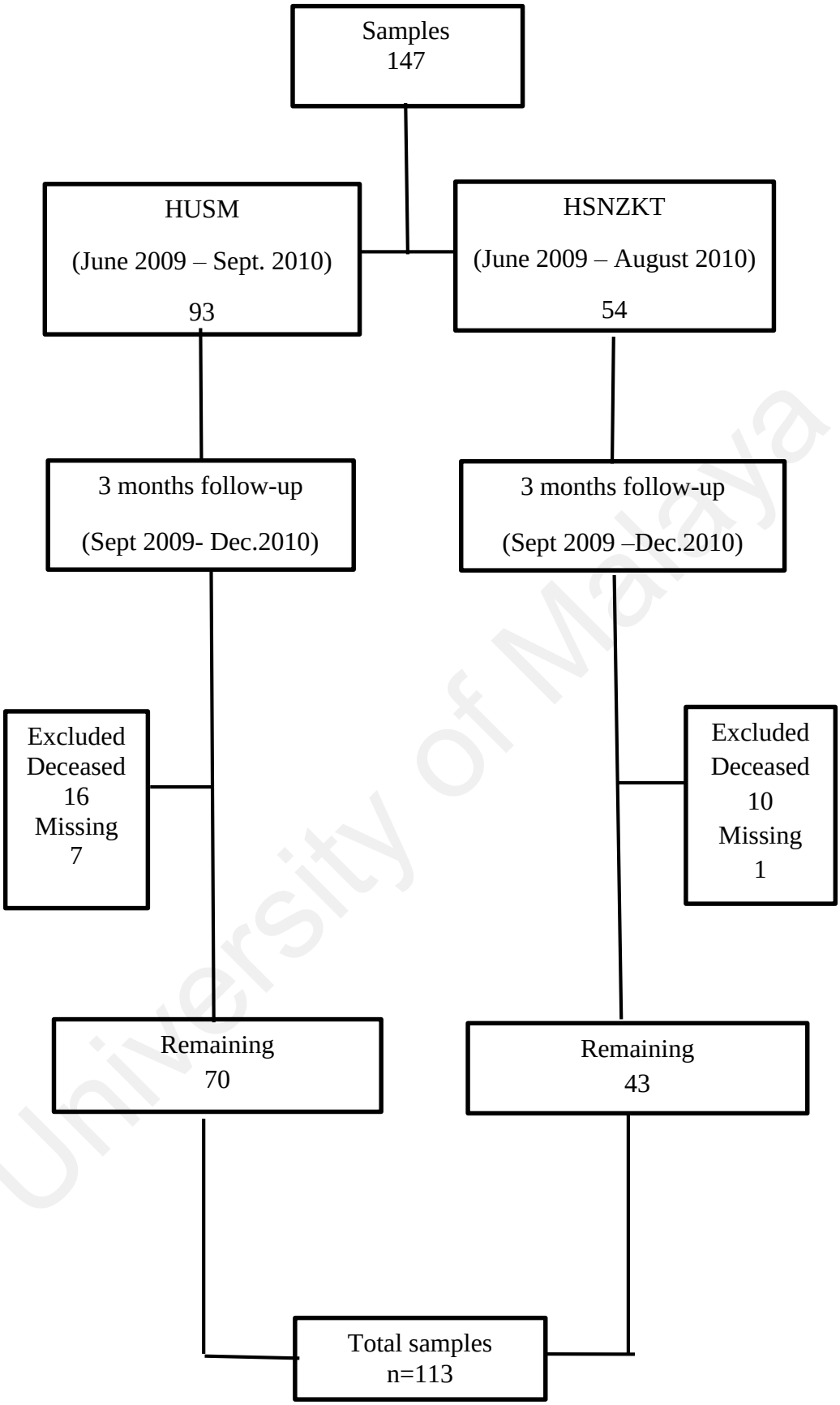


Figure 3.1: Flow of PICH patients who were included in the study and reasons for dropping out from the study

This study also determined the availability of a primary family caregiver in providing support to PICH patients. A primary caregiver for a hospitalized PICH patient is identified as a person with a responsibility to stay and help the patient at all times during hospitalization. The inclusion criteria for a family caregiver were (1) 18 years old or older; (2) a primary family member; and (3) responsible for caring and helping the patient at all times during the recovery phase. The caregiver variables that were collected for this research included age, sex and relationship with the stroke patient.

3.4.2 Exclusion Criteria

The exclusion criteria were: (1) patients with traumatic haemorrhage, haemorrhages secondary to a brain tumour or thrombolytic treatment, a haemorrhagic transformation of cerebral infarction, (2) patients with a vascular malformation or aneurysm, and those suspected of having secondary bleeding; (3) patients with subarachnoid haemorrhage and patients with previous ICH; and (4) patients with a Glasgow Coma Scale (GCS) score of less than 9, with bilateral fixed, dilated pupils, and impending death. Patients with a Glasgow Coma Scale (GCS) score of less than 9 were excluded based on the finding of Gupta, Jamjoom, Nikkar-Esfahani & Jamjoom (2010) that a decreased initial Glasgow Coma Scale score is one of the strongest predictors of the 30-day poor outcome and death.

3.4.3 Calculation of sample size

The sample size for this study was estimated at a level of significance (α) of 0.05 to the power of 0.80 (1-β) (Munro, 2001; Polit & Hungler, 1999). The sample size to determine the correlation between numerical variables with early adaptation (within two weeks)and later (at three months) adaptation was calculated using the single sample correlation by

Arun Varman Software (Arun Varman, 2008) (Table 3.1). It was based on the findings of a study by Rochette (2006), as shown below.

Table 3.1: Calculation of Sample Size for Correlation [a]

Variable	Alpha	power	Correlation coefficient (*r*)	N
Adaptation (QOL) – Copingstrategies	0.05	0.8	0.30 [a]	85
Adaptation - Complication (depression)	0.05	0.8	0.25 [a]	**123**
Stressful – Depression	0.05	0.8	0.29 [a]	91
Adaptation (QOL) – Controlled by self	0.05	0.8	0.33 [a]	70

[a]Rochette (2006)

The sample size to test for changes in the adaptation and depression scores over time was calculated based on a comparison of two means (*t* test) using PS software (Dupont and Plummer, 1998) (Table 3.2).

Table 3.2: Calculation of sample size to test for differences in adaptations to depression for acute and long-term outcomes

Variable	alpha	power	SD of mean difference	Mean difference	n per group
Adaptation acute and long-term outcomes (FIM score)	0.05	0.8	21 [a]	10	37
Depression acute and long-term outcomes (CESDO score)	0.05	0.8	5 [b]	3	24

[a] Darlington et al. (2007), [b]Hadidi (2008)

The sample size to determine the association between (i) early adaptation, and (ii) later (3 months) adaptation was determined based on the results of a study by Bagg et al. (2009). It was calculated using the Linear Regression – Danielsoper Software. http://www.danielsoper.com/statcalc/calc05.aspx (Table 3.3).

Table 3.3: Calculation of sample size to test the association between acute adaptation and long-term adaptation outcomes with predicted variables [a]

Outcome	Alpha	power	Expected number of significant predictors	R^2	f^2 [b]	N
Early adaptation	0.05	0.8	4	0.17	0.205	63
Long-term adaptation	0.05	0.8	14	0.17	0.205	102

[a]Bagg et al. (2002),[b] Anticipated Effect Size (f^2)

The highest sample size obtained from the sample size calculation for this study was n =123. In view of the fact that 10% of the participants dropped out, the estimated sample size for the present study was 123/0.9 = 136.

3.5 Variables and Instruments used in the Pilot Study

Seven instruments were used for the data collection in Phase I and II (Appendix A):

Phase I (at 5 days post-PICH during acute inpatient recovery): The instruments used were Demographic Data, Glasgow Coma Scale (GCS), Functional Independence Measure (FIM), National Institutes of Health Stroke Scale (NIHSS), Complication Inventory Checklist (CIC), Patient Health Questionnaire 9-item Depression Scale (PHQ-9-DS), and Stroke Knowledge Questionnaire (SKQ).

3.5.1 Translation process for the instruments

Four established questionnaires in English version were translated into Malay language and validated. The questionnaires include National Institutes of Health Stroke Scale (NIHSS), Functional Independence Measure (FIM), Patient Health Questionnaire 9-item depression scale (PHQ-9-DS) and Stroke Knowledge Questionnaire (SKQ). The Malay version of the questionnaires was developed by translating from the English to Malay version using forward and backward translation. The original questionnaires in the English language were translated to the Malay version using forward translation by two independence translator who are expert in Malay and English language. The comparison and synthesis of translated questionnaires were done. The blind backward translation of the translated questionnaires was done by two professional linguistic experts to the original English language and after that the two transacted version was compared to ensure the congruence of the Malay and English of the questionnaire (Sousa & Rojjanasrirat, 2014).

3.5.2 Validity of the instruments

The validation of the psychometric instruments involved two main parts: validity and reliability. The validity refers to the ability of an instrument to measure what it is designed to measure (Noorhayati, Aniza, Hazlina &Azman, 2015). The questionnaire for this study was validated using the face validity. Since all the instruments had already been published (except in Malaysia), the instruments were considered as appropriate for measuring each targeted construct. The face validity and construct validity were used to assess the targeted construct of the Malay version of the instruments.

3.5.3 Face Validity

Content validity of the questionnaires was then reviewed and analysed by an expert panel in area of neurology and stroke illness using face validity. Face validity is "the degree to which respondents judge that the variables of the instruments are appropriate and assessment objectives (Noorhayati, Aniza, Hazlina &Azman, 2015). The face validation required experts to review and comment on the whole questionnaire in terms of its presentation, arrangement, clarity and relatedness. Their understanding on each item was explored (Noorhayati, Aniza, Hazlina &Azman, 2015). The instruments were revised according to the suggestions from the panel review (Polit and Beck, 2006). Later, validity and reliability analyses were performed using SPSS software. The reliability of the research instruments is described in the following sections.

3.5.4 Reliability

The reliability of the National Institutes of Health Stroke Scale (NIHSS), Complication Inventory Tool (CIC), Patient Health Questionnaire 9-item Depression Scale (PHQ-9-DS) and Stroke Knowledge Questionnaire (SKQ) were tested on 30 ICH patients. Cronbach's alphas were calculated for internal consistency using correlation coefficients.

3.5.5 Test-retest reliability

Following the reliability testing, the test-retest reliability of the instruments was evaluated and represented by the intraclass correlation coefficient (ICC) with a 95% confidence interval. The test-retest reliability Alpha was 0.55, which falls in the category of fair strength agreement.

3.6 Pilot study

A pilot study was conducted before proceeding to the main study. The pilot test was a prospective cohort study in line with the main study. It was performed as similarly as possible to the proposed study, using similar patients, settings, questionnaires and data collection procedures.

3.6.1 Pilot Study Design and Setting

The data collection for the pilot study consisted of two phases, where selected ICH patients on admission were followed-up at home at three-month post-stroke. The pilot study was conducted at HUSM and HSNZ from June to September. 2009 after ethical approval was obtained from the Human Research Ethics Committee, USM and the Ethics Committee & Medical Research (Ministry of Health, Malaysia).

The purpose of the pilot study was to test the validity and reliability of the instruments, to correct and alter of the questionnaire if needed, to perform preliminary testing of the hypothesis, whether to change or retain the formulated hypothesis, to drop or develop a new hypothesis, to obtain ideas, to evaluate the usefulness for the data and to make an alteration in data collection approaches. It was performed as similar as possible to the proposed study, using similar subjects, settings, questionnaires and data collection procedures. The pilot data collection consists of two phases where selected ICH patients at admission were followed up at home at three and six-month post stroke.

3.6.2 Patient Selection

Approximately 20% (27) of sample required for full study was adequate for the aims as to test the validity and reliability of the instruments (Hertzog, 2008; Cohen 1992). Thus, a total of 30 subjects who were admitted to HUSM and diagnosed as having the intracerebral haemorrhage were approached for this pilot study. The inclusion criteria for the subjects include (1) evidence of having ICH on the initial CT scan, (2) GCS of 9 or more than 9 and in acute recovery stage (Hertzog, 2008).

3.6.3 Findings of the pilot study

This result of pilot study has provided the researcher's experience recruiting samples, accessing the research setting, study method, data collection procedure, research instruments and analysis. The results from the pilot study showed that overall, the administration procedures were feasible. Little changes were done to improve the main study result. Modification of the instruments was made based on the researcher's comment and suggestions, and the administration procedure was refined. The pilot study indicated the data collection for PICH should be done just before discharged and at three months. This approach was taken to avoid the probability of missing data, which were higher at six months.

As the conclusion to pilot study, the results showed that overall, the administration procedures were feasible. The pilot study indicated that the data collection for PICH patients should be done just before discharge and at three-month post PICH. This approach was taken to avoid the probability of missing data, which was higher at six months.

3.7 Study instruments

Seven instruments were used to collect the data in Phase I and II of the main pilot study. Phase I (at five-day post-PICH during the acute inpatient recovery phase): The instruments were Demographic Data, Glasgow Coma Scale (GCS), Functional Independence Measure (FIM), National Institutes of Health Stroke Scale (NIHSS), Complication Inventory Checklist (CIC), Patient Health Questionnaire 9-item Depression Scale (PHQ-9-DS), and Stroke Knowledge Questionnaire (SKQ).

3.7.1 Demographic Data

The demographic variables of the patient included age, sex, marital status, educational level, occupation and socioeconomic status. The caregiver variables collected were age, sex, marital status and relationship with stroke patients. The data of risk factors of ICH were smoking, alcohol, past health history (including hypertension, hypercholesterolemia, diabetes mellitus and heart disease) (Appendix A – Part 1.1).

3.7.2 Glasgow Coma Scale (GCS) (Teasdale &Jennett, 1974)

The Glasgow Coma Scale (GCS) **(**Appendix A – Part 1.1) is a standard scale that used to assess the level of consciousness (Teasdale & Jennett, 1974). It includes three items, which are eye opening, best verbal response, and best motor response. Lower scores indicate a greater degree of impairment. In this study, GCS was used as criteria for subject selection. Patients with GCS 9 or more than 9 and in recovery stages were selected as subjects in the study. Patients with a Glasgow Coma Scale (GCS) score of less than 9, with bilateral fixed, dilated pupils, and impending death were excluded (Appendix B).

The scores for GCS are listed as below:

Eye opening:	Spontaneous opening	= 4 score
	To speech	= 3 score
	To pain	= 2 score
	None	= 1 score
Best verbal response	Oriented	= 5 score
	Confused	= 4 score
	Inappropriate words	= 3 score
	Incomprehensible sounds	= 2 score
	None	= 1 score
Best motor response	Obey commands	= 6 score
	Localized pain	= 5 score
	Non-purposeful	= 4 score
	Flexion to pain	= 3 score
	Extension to pain	= 2 score
	None	= 1 score

The GCS is a scale that is used worldwide for determining the level of impaired consciousness, especially among those with brain injuries, and it is a valid measure of the severity of the impact from ICH stroke (Talukder, Islam, Hossain & Jahanet al., 2012). Many studies have reported that the GCS is a valid scale for determining a change in the level of awareness fora variety of neurological problems, such as subarachnoid haemorrhage (SAH) (Ogungbo, 2003) and traumatic brain injury (McLernon, 2014; Brain Trauma Foundation, 2007), drug overdose (Livingstone et al., 2000) and infections (Holdgate et al, 2006). In terms of reliability, the GCS showed a high level of agreement

between observations and also a consistency between the scores (Kombluth J, Bhardwaj, 2011; Baker, 2008). Many studies have revealed a high interrater reliability and accuracy in the GCS scores (Teasdale, & Jennett, 1974; Baker, 2008). Studies by Heard and Bebarta in the year 2004, showed a high interrater reliability, with the kappa indicated as being in the range of 0.85 (McLernon, 2014).

3.7.3 National Institutes of Health Stroke Scale (NIHSS)(Brott et al., 1989)

The severity of neurological deficits was examined using the National Institutes of Health Stroke Scale (NIHSS) (APPENDIX A –Part 1.2). The NIHSS was originally designed as a research tool to measure the severity of strokes (Brott et al., 1989), and the examinations for this study were conducted during the hospital stay of the patients at the acute recovery phase. The NIHSS consists of fifteen (15) neurological items that include the level of consciousness, language, neglect, visual field loss, extra-ocular movement, motor strength, ataxia, dysarthria and sensory loss. The total NIHSS score ranged from 0-42, with the highest scores indicating severe neurological deficits, and the lowest score of 0 indicating the absence of neurological deficits. The original scoring levels to determine stroke severities were categorised into: Mild, ranging from 1 – 5 (>25 percentile); mild to moderate, ranging from 5-14, severe, ranging from 15 – 24 and very severe, > 25 (Brott et al., 1989 available in rehabmeasure.org). However, in this study, ataxia was excluded, thus, a total of fourteen (14) NIHSS items were used in this study. In this study, NIHSS was assessing as a baseline during early phase post PICH. The reason of excluded items 7 ataxia it is because as during acute stays of ICH patients, they usually having alteration in conscious level, having right or left hemiparesis with mild or moderate dysarthria and sensory loss, and it is difficult to obtain a score for this item. Brown (2016), stated that ataxia is scored only if present out of proportion to weakness, and ataxia cannot be tested

on patient with presence of paresis or weakness. Even the score can be given as ataxia is absent in patient who cannot understand or paresis or paralyzed, however, this represents a redundancy in the overall score and may lead to falsely excessively high total scores (Brown, 2016). The patients usually could not follow instruction and lower ability to do movement especially among with low or moderate GCS scores. This reason supported by Goldstein et al. (1989) found that the scores of the observers with regard to limb ataxia were in poor agreement during determining the score of this item. Others study also reported that item ataxia was consistently found to be low (least) reliability indices because the scoring of these items have proven difficult in certain types of patients, especially in patients with altered conscious level and hemiparesis was stressed to the raters (Zandieh et al., 2012; Goldstein & Samsa, 1997).

Brott et al. (1989) stated that a high level of validity for the NIHSS scale (r = 0.68) was obtained when the NIHSS score was compared with the infarction volume, as measured by a CAT scan one week after the event. A study conducted by Lyden et al. (1999), which compared the score with the clinical outcome at three months, showed that there was a high validity (r=0.79), and that the correlation coefficients between the NIHSS and the Barthel Index, the Rankin Scale, and the Glasgow Outcome Scale were significant but modest in magnitude both at the baseline and two hours after a stroke (Lyden et al.1999). The original authors evaluated the reliability of the scale using the kappa statistic and found that while most items had good to excellent reliability (Cronbach alpha> 0.5), two items, dysarthria and consciousness, rated from fair to poor (Brott et al., 1989). Goldstein et al (1989) and Lyden et al. (1994), reported that of the 15 items making up the NIHSS, 13 items showed no statistical difference between assessors. The assessors had poor agreement on the score in examining facial palsy and limb ataxia (alpha < 0-3). The scores of the observers with regard to facial palsy and limb ataxia (alpha< 0.3) were in

poor agreement. The NIHSS correlated well with the clinical outcome of three months(r = 0.79), and the interrater reliability for the scale was high (kappa = 0.69), while the test-retest reliability was 0.66 to 0.77 (Ostwald, 2008). The reliability of the scale was tested using a correlation coefficient in the pilot study on 30 stroke patients before the main study with a Cronbach's alpha of 0.81. A reliability coefficient of 0.81 was considered high because0.70 is considered as an acceptable coefficient value for newly-developed instruments (Goldstein, Bartels & Davis, 1989; Lyden et al., 1999; Brott et al, 1989). Others study also reported that item ataxia was consistently found to be low (least) reliability indices because the scoring of these items have proven difficult in certain types of patients was stressed to the raters (Zandieh et al., 2012; Goldstein & Samsa, 1997). The reliability of the Malay version of the NIHSS was tested on 30 ICH patients during the pilot study prior to data collection.

3.7.3.1 Reliability

The reliability of the scale was tested using the correlation coefficient in the pilot study on 30 stroke patients before the main study, and Cronbach's alpha of 0.86 was obtained. A reliability coefficient of 0.86 was considered high because 0.70 is considered an acceptable coefficient value (Lyden et al., 1999). The reliability of the Malay version of the NIHSS was tested on 30 ICH patients prior to the data collection.

3.7.3.2 Test-retest Reliability

Following the reliability testing, the test-retest reliability of the NIHSS was evaluated using intra class correlation coefficient (ICC) with a 95% confidence interval. The test-retest reliability Alpha was 0.96, indicating high-strength agreement.

3.7.4 Functional Independence Measure (FIM) (Dodds, Martin, Stopor& Dego, 1993).

The patients' early adaptation to sudden stroke-related disabilities and long-term adaptations at three months post-PICH was measured using Functional Independence Measure (FIM-ACUTE and FIM THREE MONTHS) tools (Musicco, Emberti, Nappi & Caltagirone, 2003; Ottenbacher, Gonzales, Smith, Liig, Fiedler & Granger, 2001). The Functional Independence Measure (FIM) was developed in 1983 by the National Institute on Disability and Rehabilitation Research (NIDRR) and the American Congress of Rehabilitation Medicine (ACRM) (Musicco, Emberti, Nappi & Caltagirone, 2003).

The Functional Independence Measure (FIM) consists of 18 items, which measure a patient's degree of dependence or independence and need for care (Cournal, 2011). The FIM covers of two domains during early and long-term rehabilitation, namely motor and cognitive domains. The motor function is divided to 4 sub-domains; i.e. self-care, sphincter control, transfers and locomotion, while the cognitive function is divided into 2 sub-domains, i.e. communication and social cognition(Dodds, Martin, Stopor & Dego, 1993). The scores for each item within a sub-domain were added to make up the section scores, and these scores were summed up to produce the total FIM score.

The total FIM MOTOR SCORES ranged from 91 for complete independence to 13 for complete dependence. The scoring levels could also be categorized into an independent functioning range of 65.1–91, modified dependence range of 26.1–65.0, and complete dependence on a helper range of 13.0-26.0. The total FIM COGNITIVE SCORE ranged from 35 for complete independence to 5 for complete dependence. The scoring level could also be categorized into an independent functioning range of 25.1–35.0, modified

dependence range of 10.1–25.0 and complete dependence on a helper range of 5–10 (Nilsson, Aniansson & Grimby, 2000).

The total FIM scores ranged from 126 for complete independence to 18 for complete dependence. The scoring levels were categorized into an independent functioning range of 90.1–126, modified dependence range of 36.1-90, and complete dependence on a helper range of 18.0-36.

In this study, the FIM tool was used as an indicator of the patients' adaptation to stroke-related disabilities. The FIM tool was intended to measure what a patient was actually able to do or to reflect the adaptation to the disability after PICH. The ratings of the individual items focused on the amount of assistance needed by the person to complete the activity that was being evaluated (Ottenbacher, Gonzales, Smith, Liig, Fiedler & Granger, 2001). The patient's ability to perform the activities was scored on a seven–level scale representing the gradation from independent to dependent behaviour (Table 3.5). The scoring levels were later categorized into an independent functioning range of 90.1–126, modified dependence range of 36.1-90, and complete dependence on a helper range of 18.0-36.

Table 3.4: Description levels of functions and their scores for the Functional Independence Measure tool

Score	**Independence**	
7	Complete Independence (Timely, Safely)	NO HELPER
6	Modified Independence	
	Modified Dependence	
5	Supervision	
4	Minimal Assistance (Patient = 75%+)	HELPER
3	Moderate Assistance (Patient= 50%+)	
	Complete Dependence	
2	Maximal Assistance (Patient= 25%+)*)*	
1	Total Assistance (Patient = 0%+)	

(Dodds, Martin, Stopov&Dego, 1993)

3.7.4.1 Reliability

The FIM is valid for measuring the change in impact from a stroke. A study of stroke patients revealed that the FIM is valid for capturing minimal changes in the functional ability measure of ADL and functional abilities in the stroke population (Cournan, 2011). The FIM was considered valid because it had been tested for validity in more than 50 medical facilities across the United States and found to have faced validity (Granger, Cotter, Hamilton & Fiedler, 1993).

The reliability was tested in the pilot study with a sample of 30 in patients with intracerebral haemorrhage. The value of Cronbach's alpha for FIM was 0.94. The interrater reliability obtained by a previous study was 0.91 (Kenney, O' Connor &Enterlante, 2000), and the internal consistency of the total items was 0.96 (Ottenbacher, Gonzales, Smith, Liig, Fiedler & Granger, 2001).

3.7.4.2 Test-retest Reliability

The test-retest reliability of the FIM tool was evaluated and represented by the intra class correlation coefficient (ICC) with a 95 % confidence interval. The test-retest reliability Alpha was 0.90, which fell within the category of high-strength agreement.

3.7.5 Complication Inventory Checklist (CIC-ACUTE) (Langhorne etal.,2000).

The complication status of PICH patients at the acute recovery phase and at three month was identified using a Complication Inventory Checklist (Appendix A- Part 1.4 & Part 2.2). The CIC was modified based on a study by Langhorne et al. (2000). The CIC variables consisted of five categories marked by respiratory infections, urinary infections, bedsores, deep-vein thrombosis and shoulder pain. The post-stroke complications were given a score of 2 points for YES as evidence of having respiratory infections, urinary infections, bedsores, deep-vein thrombosis and shoulder pain or NO as evidence of being free from complications. The variables of stroke complications are summarized below (Table 3.5).

The instruments were revised according to the validated questionnaires suggested by a panel for this study. However, the CIC was considered as a new instrument that was purposely developed for this study, and no study had been carried out to examine the validity of the CIC. The face validity of the CIC was reviewed and analysed by an expert panel (Appendix B) for this study, and was revised according to the suggestions from the experts. No major corrections were necessary.

Table 3.5: Definitions of post-stroke complications during hospitalization and community follow-Up

Post-stroke Complication Variables	During Hospitalization	Community Follow-Up
1. Chest infection	Auscultatory respiratory crackles and fever or radiographic evidence, or new purulent sputum. -fever (T > 38 º C) -leukocytosis: WBC > 10.000 cell/mm with neutrophil > 80 %	Chest infection requiring medical help and/or antibiotic treatment
2. Urinary tract infection	Clinical symptoms of urinary tract infection or positive urine culture a. Fever (T > 38 º C) b. Urinalysis shows white blood cell count> 10 WBC	Urine infections requiring medical help and/or antibiotic Treatment
3. Pressure sore/skin break	Any skin break or necrosis resulting from either pressure or trivial trauma (skin trauma directly resulting from falls was not included).	Any skin break or necrosis resulting from either pressure or trivial trauma (skin trauma directly resulting from falls was not included).
4. Shoulder pain	Pain in the shoulder area requiring analgesia on 2 or more consecutive days.	Pain in the shoulder area requiring analgesia on 2 or more consecutive days.

Langhorne et al., (2000).

3.7.5.1 Reliability

The reliability was tested in this pilot study with a sample of 30 inpatients with ICH. The value of Cronbach's alpha for the Complication Inventory Checklist was 0.55.

3.7.5.2 Test-retest Reliability

Following the reliability testing, the test-retest reliability of the Complication Inventory

Checklist (CIC-ACUTE) was evaluated and represented by the intra class correlation coefficient (ICC) with a 95% confidence interval. The test-retest reliability Alpha was 0.55, which fell within the category of fair strength agreement.

3.7.6 Patient Health Questionnaire 9-item Depression Scale (PHQ-9-DS) (Kronish et al., 2012)

In terms of the depression status, there are many questionnaires available to determine depression such as the Zung (1965) and Hamilton, (1960) scales and the Centre for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977) and the Health Questionnaire (PHQ) (Spitzer et al., 1999) (Appendix A - Part 1.5 & Part 2.3). The Patient Health Questionnaire 9-item depression scale or PHQ-9 (Spitzer, et al 1999), a self-administered depression screening and diagnostic tool, was used in this study. All the subjects were screened for depression with the PHQ-9, a 9-item scale that assesses the 9 depression symptoms for frequency of occurrence during the previous two weeks. The PHQ-9 can be used as a screening tool, with the total score ranging from 0 (no depression symptoms) to 27 (all symptoms occurring daily). A PHQ-9 score of 10 has been found to have 88% sensitivity and 88% specificity for a diagnosis of major depression. The PHQ-9 can also be used as a diagnostic assessment, with major depression diagnosed if five or more of the nine symptoms have been present at least more than half the days of the past two weeks, and one of these symptoms are either depressed mood or anhedonia.

The PHQ-9 has performed with a similarly high diagnostic accuracy for both major depression and any depression in patients with PSD, and has performed just as well with stroke survivors as it has with the general medical outpatient population in which it was developed. The performance of the PHQ-9 does not differ with age, ethnicity, or gender.

The PHQ-2 has also performed quite well as a depression-screening tool, with nearly an identical performance to the PHQ-9 in identifying subjects with any depression. However, for a diagnosis and more complete clinical evaluation of depression symptoms, those scoring three on the PHQ-2 should be administered the additional seven items to complete the PHQ-9 (Williams et al., 2005).

A structured questionnaire was designed to identify symptoms of depression and for diagnosing depression, and it was validated for use in post-stroke patients (Kronish et al., 2012). Each of the 9 items asked for each of the symptoms of depression and scored according to the 4 point- Likert scale from (0) Not at all (1) Several Days (2) More Than Half the Days to (4) Nearly Every Day. The scores measured severity of depression range from 0 (absence of depressive symptoms) to 27 (most severe depressive symptoms). The subtotal scores of severity of depression were categories using four levels (Table 3.6).

A number of studies have been published in the West on the validity and reliability of the PHQ-9 as a diagnostic measure as well as its utility in assessing depression severity and in monitoring treatment responses (Kronish et al., 2012). However, as far as is

Table 3.6: Severity of depression

Mild depression	5-9
Moderate depression	10-14
Moderately severe depression	15-19
Severe depression	20 ++

(Pfeil et al., 2009)

known, no study has examined the validity of the Malay version of the PHQ-9 in Malaysia. The face validity of the Malay version of the Patient Health Questionnaire 9-item depression scale (PHQ-9-DS) was reviewed and analysed by an expert panel (Appendix A) for this study, and was revised according to their suggestions, with no major corrections.

A number of studies on the validity and reliability of PHQ-9, as a diagnostic measure as well as its utility in assessing depression severity and in monitoring treatment responses have been published in western countries (Poongothai et al 2009). However, to our knowledge, no study has examined the validity of the PHQ-9 in Malaysia using Malay language. The instruments were revised according to the expert's suggestions.

3.7.6.1 Reliability

The reliability of the PHQ-9-DS was tested on ICH patients and their caregivers. Cronbach's alpha was calculated for the internal consistency using correlation coefficients, and it was found that the Cronbach's alpha was 0.92.

3.7.6.2 Test-retest Reliability

The test-retest reliability of the PHQ-9-DS was evaluated and represented by the intra class correlation coefficient (ICC) with a 95% confidence interval. The test-retest reliability Alpha was 0.55, indicating fair strength agreement.

3.7.7 Stroke Patients and Caregivers' Stroke Knowledge Questionnaire (SKQ) (Kotari, 1977).

PICH patients and their relatives were assessed on their level of knowledge regarding stroke disease at two-week post-PICH and prior to discharge. The questionnaire was

developed from an instrument used by Kotari and co-workers at the University of Cincinnati (Hoffmann et al., 2007; Cross & Walker, 2008; Lindsay et al., 2008; Weltermann et al., 2000). The Stroke Knowledge Questionnaire assessment was composed of 7 items: their understanding of the symptoms of stroke, the risk factors, the body part affected by the stroke, and the actions required in case of a recurrent stroke, the follow-up and communication with the doctor, the way of controlling/managing depression, how to manage the disease in general, and how to manage symptoms of post-stroke complications (Appendix1.6).

The variables for stroke in the Stroke Knowledge Questionnaire were summarized in Appendix 1.7. The YES KNOWLEDGE (or excellent strong knowledge) was classified as follows: if they (1) know at least 3 stroke symptoms (good symptom knowledge), (2) know at least 3stroke risk factors (good risk factors knowledge), and (3)know that immediate hospital admission or call to the hospital emergency department in case of a stroke is required (good action knowledge), (4) know the importance of follow-up, (5) know of at least 3 ways to prevent and manage post-stroke depression, (6) know of at least 2 ways to manage the general illness during post-stroke and (7) know of at least 3 ways to manage symptoms of post-stroke complications. An answer guide was prepared to aid during the data collection (Table 3.7).

The stroke patients and caregiver were scored as having (NO knowledge) if they did not (1) know at least 3 stroke symptoms (good symptom knowledge), (2) knew at least 3stroke risk factors (good risk factors knowledge), and (3) knew that immediate hospital admission or call to the hospital emergency department in case of stroke (good action knowledge), (4) knew the importance of follow up, (5) knew at least 3 ways how to prevent and manage depression post stroke, (6) knew at least 2 ways how to manage the general illness post stroke and (7) knew at least 3 ways how to manage symptom of post stroke complications.

The total score of stroke knowledge of stroke and their caregiver are 30 and then classified under four categories; which were 'No stroke knowledge' ranging from 0-1 = 0-14.2 percentile), 'Low knowledge' (2-3 = 28.5-42.8 percentile), 'Average knowledge' (4-5 = 57.1-74.1 percentile) and 'High knowledge' (6-7 = 85-100 percentile).

The instruments were revised according to the expert's suggestions. Reliability of the Stroke Knowledge Questionnaire was tested on 30 ICH patients and their caregivers. Cronbach's alphas were calculated for internal consistency using correlation coefficients and found that the Cronbach's Alpha was .801.

3.7.7.1 Reliability

The reliability of the Stroke Knowledge Questionnaire was tested on ICH patients and their caregivers. Cronbach's alpha was calculated for the internal consistency using correlation coefficients, and it was found that the Cronbach's alpha was 0.93. The inter-items correlation is presented in Table 3.10. The results showed that there was a high correlation between the items in the Stroke Knowledge Questionnaire.

3.7.7.2 Test-retest reliability

Following the reliability testing, the test-retest reliability of the Stroke Knowledge Questionnaire (SKQ) was evaluated and represented by the intra class correlation coefficient (ICC) with a 95% confidence interval. The test-retest reliability for Alpha was 0.55, which placed it in the category of fair strength agreement.

3.8 Data Collection Procedure

The selection of samples for this study was according to the sampling criteria in the two phases; Phase I and Phase II. In Phase I, the data collection on the post-PICH patients was done within two weeks of admission at the acute inpatient recovery phase. The variables gathered included patient demographics, clinical characteristics, length of hospitalization, ICH treatments, neurological status, post-stroke complications (acute), post-stroke depression (acute), patients and caregivers' stroke knowledge and acute functional status (FIM ACUTE) (Figure 3.2). The data collection in Phase II was performed at three- month's post-PICH at the patients' homes. The researcher went to the patients' houses at the given addresses. The data collection procedure was done according to the same procedure as in Phase I. The variables collected included post-stroke complications (long-term), post-stroke depression (long-term) and adaptation outcomes to long-term stroke-related disabilities (Figure 3.2).

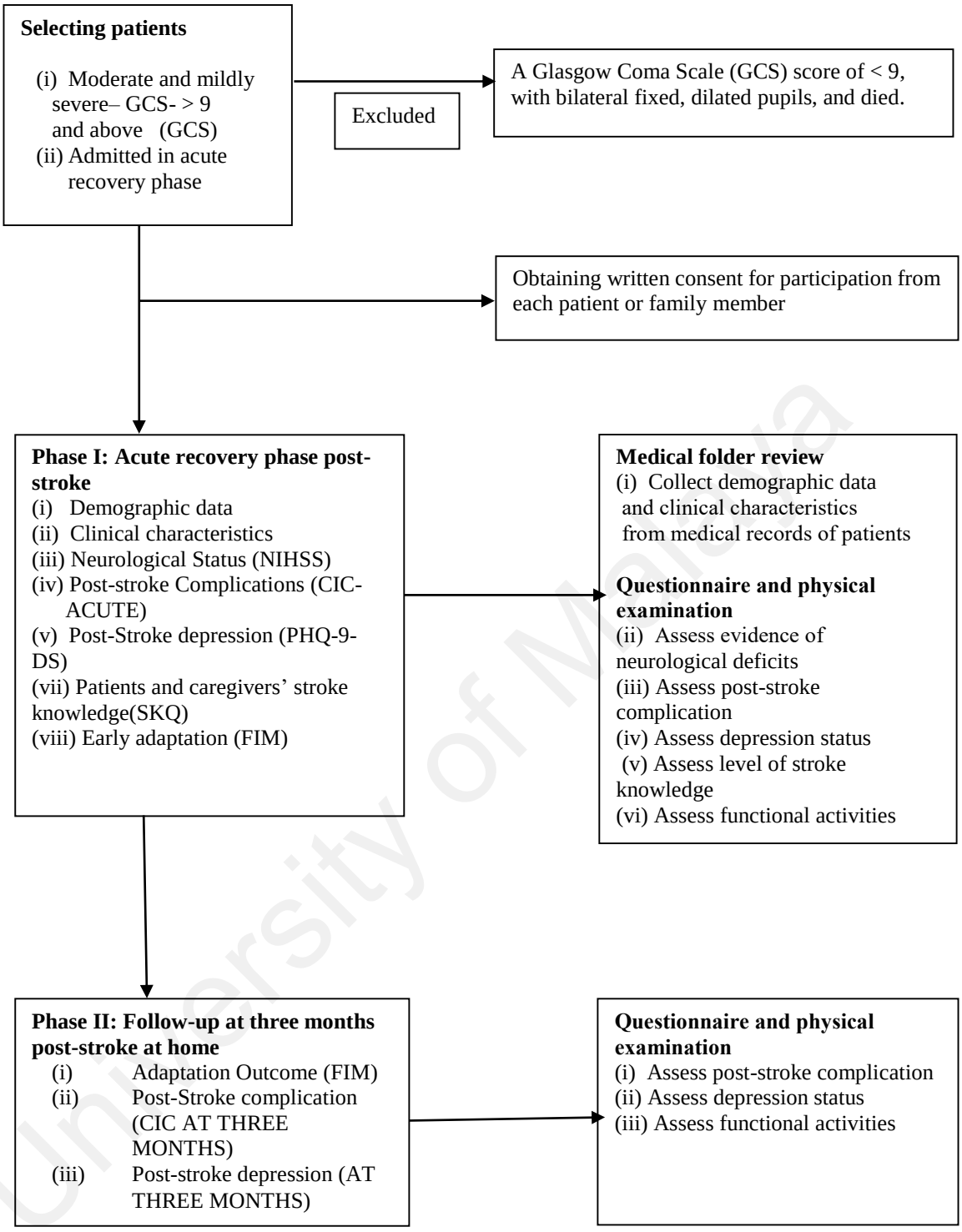


Figure 3.2: Data Collection Flowchart

3.8.1 Selecting patients according to the inclusion criteria

The selection of samples was based on the categories of severity of PICH that were determined using the GCS during the acute inpatient recovery phase. The patients who were diagnosed with PICH were reviewed in relation to the status of their illness according to the Glasgow Coma Scale documentation in their records and were chosen as the sample for this study if their GCS score was at least 9 and above.

A visit was then made to those patients who met the inclusion criteria in order to explain the purpose of the study and their possible contributions. Furthermore, the ethical considerations involved were explained to the patients, such as the fact that their involvement in this study was on a purely voluntary basis, and that they had the right to withdraw at any time without their present and future healthcare services being affected in any way. The patients were encouraged to ask questions and raise any queries at any time before or during the interview or assessment. Arrangements were made to conduct the assessment in a quiet area to ensure privacy. The written consents of the patients or their caregivers were obtained prior to the data collection. The data collection was conducted through the use of questionnaires or a checklist, and was supplemented with physical assessments for the clinical data (Appendix A). Face-to-face interviews were used during the data collection to obtain accurate data from the patients and their caregivers. These were supplemented by observations and physical assessments of the patients, including neurological assessments and observations of functional abilities and possible post-stroke complications, such as chest infections, urinary tract infections, bedsores, deep-vein thrombosis and shoulder pain. The assessment was performed by the researcher in the examination room to ensure privacy. The findings from the assessment were verified against the written assessments in the patients' medical records.

3.8.1.1 Demographic Data

The patient's demographic variables included age, sex, marital status, educational level, occupation and socioeconomic status. The risk factors of ICH are smoking, alcohol, status of previous health history (including hypertension, hypercholesterolemia, diabetes mellitus and heart disease).

3.8.1.2 Assessment of severity of neurological deficits

The severity of the neurological deficits was assessed. Interviews, observations and examinations were conducted according to the assessment criteria of the NIHSS, which consisted of 14 neurological items, including levels of consciousness, language, neglect, visual-field loss, extra ocular movement, motor strength, dysarthria, and sensory loss.

The examination and scoring were performed by checking the consciousness level, which included the level of responsiveness, the responses to two questions, and the ability to follow the commands given. After that, the patient was checked for the position of the eyes and the movement for gaze by looking at the position of the eyes at rest, and the spontaneous eye movements to the left and right. The patient was then asked to look to the left or right. Only horizontal eye movements were tested. In order to check the visual field, the patient was asked to count the fingers in all the four quadrants. The checking of facial movement was done by looking at the patient's face and noting any spontaneous facial movement and response to commands by asking the patient to smile, to puff out his or her cheeks, to pucker and to close his or her eyes forcefully.

Following that, the PICH patient was assessed in terms of the motor functions of the arm (left and right) by asking the patient to extend his/her arm in front of the body at 90

degrees (if sitting) or 45 degrees (if supine). To assess the motor functions of both legs, the patient was asked to hold the outstretched leg 30 degrees above the bed for five seconds. After completing the motor function assessment, the patient's sensory functions in the proximal parts of all four limbs were examined with a pin, and they were asked to describe how they felt about the stimulus. Their language function was tested by showing the patient standard groups of objects and making them read a series of sentences. Later, the patient was asked to read and pronounce a standard list of words from a sheet of paper to determine the problem of dysarthria. The last NIHSS assessment involved examining the patient's ability to recognize simultaneous cutaneous sensory and visual stimuli from the right and left sides. (The details of the NIHSS examination and the scores are given in Appendix C).

3.8.1.3 Assessment of status of post-stroke complications

The patient was then assessed on the status of acute stroke complications using the Complication Inventory Checklist (CIC-ACUTE), which consisted of 4 categories of evidence of respiratory infections, urinary infections, bedsores, and shoulder pain. Lastly, it was also observed whether the patients were experiencing pain in the shoulder area requiring analgesia on two or more consecutive days.

During the follow-up with the patients at home, it was determined whether complications occurred at three-month post-PICH using the Complication Inventory Checklist Post-Discharge (CICPD). The patients were checked for evidence of chest infections. They were considered as having a chest infection if they had symptoms of it, had a positive chest assessment and required medical help and/or antibiotic treatment. The PICH patients were also checked for problems with urine elimination or infection, and if they required medical help and/or antibiotic treatment during their rehabilitation at home.

After that, it was determined whether the patients had any skin breaks or necrosis resulting from either pressure or trivial trauma (skin trauma as a direct result of falls was not included). It was also determined whether they had any episodes of blood clots in the leg requiring medical treatment, and lastly whether they experienced any pain in the shoulder area requiring analgesia on two or more consecutive days.

3.8.1.4 Depression Status

The PHQ 9-item Depression Scale (PHQ 9-item DS) (Kronish et al., 2012) questionnaire was used to evaluate the presence of depressive symptoms during the first 2 weeks after PICH and at the follow-up after three months. The assessment was done by the researcher herself on both phases on the patients with some information obtained from patients' caregivers. The assessment was done using in person interview, observations and examinations in relation to have a clear evidence of depression according to criteria of the PHQ 9-itemDS.

3.8.1.5 Stroke Knowledge

The Stroke Knowledge Questionnaire (SKQ) (Kotari, 1977), was used to determine the level of knowledge of the patient and their family caregivers regarding stroke and the management of PICH by asking open-ended questions regarding stroke symptoms, risk factors, and the body parts that are affected by a stroke. In the close-ended questions, they were asked about the appropriate action in the event that stroke symptoms occurred. The patients and their caregivers were also questioned as to whether they were aware of the importance of following up and communicating with the doctor, and the ways to prevent depression and post-stroke complications.

3.8.1.6 Early Adaptation (Functional Status at the Acute Phase) and Later Adaptation Outcomes (Functional Status at Three Months)

The early adaptation and later adaptation outcomes of the disabilities resulting from stroke-related disabilities post-PICH were determined using the Functional Independence Measure (FIM acute) tool (Dodds, Martin, Stopor& Dego, 1993). . The FIM acute domains were assessments of the motor and cognitive functions, with the motor function variables, including self-care, sphincter control, transfers and locomotion, while the cognitive function variables included communication and social cognition. Using FIM, the patients we reassessed in terms of their level of independence in performing functional activities.

The early functional adaptation (acute phase) was assessed during acute inpatient recovery phase within day 2 to 14 after admission or prior discharge, and the later (3 month) functional adaptation outcome was determined during a follow-up at the patients' homes in the community areas (at three months post-PICH). The patient's ability to perform functional activities in the physical and cognitive domains was assessed using FIM.

3.9 Data Analyses and interpretation of results

All the data were entered and analysed using the Statistical Package for Social Science (SPSS) version 19.0 for Windows. The data were checked and cleaned, while the distributions and frequencies were examined.

Descriptive statistics were used to explore the mean, standard deviation (SD) or median and interquartile range (IQR) for the numerical variables. The categorical variables were presented in the form of frequencies and percentages.

In order to confirm that the patients showed functional improvements after the rehabilitation treatment, the FIM scores obtained at the early adaptation were compared with the long-term adaptation post-PICH. A paired t-test was applied to test the significant differences between the total FIM, the cognitive FIM, and the motor FIM scores between the acute and long-term stages.

The correlation between age, severity of PICH (GCS), severity of neurological deficits (NIHSS), acute post-stroke depression, and stroke knowledge, with total early adaptation was performed using Pearson's correlation analysis.

Univariate analysis between selected variables with early adaptations and long-term adaptations were tested using Simple Linear Regression.

In the multivariate analysis, a multiple linear regression analysis was used to measure multiple associations between early adaptation sand a group of 15 potential predictor variables. Multiple linear regressions were also used to determine the factors that affect the long-term adaptation process (Table 3.8). The level of significance was set at 0.05. Beta coefficients with 95% confidence intervals were obtained for those factors that were significant in the final model.

3.10 Ethical Considerations

The data was collected after approval was obtained from the Human Research and Ethical Committee, USM and from the Ministry of Health (Appendix). Written informed consent either from the patients or the patients' family caregiver was obtained prior to the commencement of the interviews. The consent form included statements about the researcher, purpose of the study, assurance of the patients' anonymity, voluntary nature of the participation in the study, freedom to withdraw from the study at any time, anticipated usefulness of the results, and the name and address of the researcher and other contact persons (Appendix A).

There might have been some questions that were sensitive or could lead to emotional discomfort during the assessment procedure. Therefore, before the assessment started, it was explained to the patients that they had the right to refuse to answer any questions, which made them feel uncomfortable. The patients were also informed that they had the right to ask questions at any time before or during the interview or assessment. If the patients showed any emotional feelings during the assessment, the assessment was discontinued, and they were comforted and allowed to express their feelings. Those patients who showed signs of depression were referred to the nurse in the ward or at the community area or were referred to the hospital.

Confidentiality and anonymity were strictly assured. The patients' personal particulars such as their name, registration number, address and telephone number were kept in file notes for each individual participant; a code number was used instead of the sample's name and it was restricted to the researcher's assessment only. The questionnaires were coded according to the sequence of the samples. A code number was put in every questionnaire and was deleted thereafter.

3.11 Summary

To summarize, this study involved patients with primary ICH who were in the acute inpatient recovery phase at HUSM, Kelantan and HSNZ, Terengganu. The patients were followed up at three months at home during the rehabilitation phase. It was designed to investigate the relationship between changes in the neurological status, post-stroke complications, depression status of post-primary intracerebral haemorrhage patients, and the degree of adaptation to stroke-related disabilities in the acute inpatient recovery phase (Early Adaptation and at three months (Long-term Adaptation Outcomes)). Adaptation is measured according to the physical and cognitive domains of the level of independence or ability to participate in functional activities.

Seven instruments were used to collect the data in phase I, namely (i)Demographic Data, (ii) Glasgow Coma Scale (GCS), (iii) National Institutes of Health Stroke Scale (NIHSS), (iv) Complication Inventory Checklist (CIC-ACUTE), (v) Functional Independence Measure, (vi) Patient Health Questionnaire 9-item Depression Scale (PHQ-9-DS), and (vii) Stroke Knowledge Questionnaire (SKQ). In phase II, four instruments were used, namely (i) Complication Inventory Checklist (CIC- AT THREE MONTHS), (ii) Functional Independence Measure, (iii) and Patient Health Questionnaire 9-item Depression Scale (PHQ-9-DS).

CHAPTER 4: RESULTS

4.1 Introduction

This chapter presents the descriptive findings of the socio-demographic characteristics, clinical characteristics, functional adaptation, severity of neurological deficits, post stroke complications, depression status and stroke knowledge scores of the subjects and their family caregivers. The correlations between functional adaptations with selected numerical variables, comparisons between the total scores for early and later (3 months) adaptations as well as the multivariate analyses of the factors that affected the early and later (3 months) functional adaptation are also presented.

4.2 Socio-demographic characteristics of respondents

The respondents comprised of 66 (58%) men and 47 (41.6%) women. Their mean (SD) age was 55.0(11.8) years, ranging from the age of 30 to 89 years old. Approximately two-thirds (64.6%) of the patients were below 60 years of age. The majority of the patients (92.9%) were married. Almost half (51.3%) of the patients received their education up to primary school and/or had no formal education. The occupational status of the patients varied. More than half of the patients did not have specific jobs (64.6 %) and half were classified as low-income earners earning less than RM1, 000 per month (46.9%). The majority of the patients were being cared for by their spouses (65.5%), while those who were separated or divorces (1.8%) were being cared for by their children (Table 4.1).

Table 4.1 : Socio-demographic characteristics of the PICH patients (n= 113)

Variable	Number	Percentage
Age (mean ± SD) [a]years - 55.4 ± 11.8		
Minimum age (years) - 30 years old		
Maximum age (years) - 86 years old		
Age (group)		
30 -39 years	10	8.8
40 -49 years	28	24.8
50-59 years	35	31.0
60- 69 years	27	23.9
70 -79 years	10	8
80 -89 years	3	2.7
Gender		
Male	66	58.4
Female	47	41.6
Race		
Malay	112	99
Chinese	1	1
Indian	0	0
Religion		
Islam	112	99
Buddhist	1	1
Marital status		
Single	6	5.3
Married	105	92.9
Widowed/ Divorced	2	1.8
Education		
No history of schooling	21	18.6
Primary school	37	32.7
Secondary school	47	41.6
Tertiary level	8	7.1
Occupation		
Government	20	17.7
Own enterprise	17	15.0
Farmer	3	2.7
Unemployed	73	64.6
Income per month		
RM[b] 3000and above	12	10.6
RM[b] 2000-2999	15	13.3
RM[b]1000-1999	33	29.2
RM[b] 700-999	29	25.7
RM[b] 699 and below	24	21.2
Caregiver		
Spouse	74	65.5
Children	30	26.5
Parents/siblings	9	8.0

[a] Mean and standard deviation
[b]1 Ringgit Malaysia = 4.34 USD

4.3 Clinical Characteristics

The clinical characteristics of the patients are presented in Table 4.2. The clinical characteristics included their medical condition, severity of ICH (GCS), location of brain lesion, severity of neurological deficits, complication's status, depression status and stroke knowledge at post-PICH. About two-thirds of the PICH patients were smokers (66.4 %) and the majority of them were hypertensive (95.6%), a quarter had heart disease (26.5%) and about ten percent had diabetes mellitus. Approximately three-quarters of the patients who met the selected criteria (75.2%) were categorized under mild altered level of consciousness (GCS 13-15) while a quarter (23.9 %) was in the moderate group (GCS 9-12). None of them were categorized in the severe group. The most common area of intracerebral bleeding was at the basal ganglia (54.8%), followed by bleeding in the thalamic (14.1%) and lobar areas (11.5%) of the brain. The finding revealed that 15 patients (13%) had undergone surgical management combined with conservative treatment, and 98 of them (86%) had received conservative treatment. The mean (SD) length of hospitalization was 11.9 (14.1) days.

Table 4.2: Clinical characteristics of the patients (n =113)

Variable	Number	Percentage
Smoking Status		
Yes	75	66.4
No	38	33.6
Medical condition		
Hypertension	108	95.6
Hypercholesterolemia	7	6.2
Diabetes Mellitus	11	9.7
Heart Disease	30	26.5
Location of intracerebral haemorrhage		
Lobar	13	11.5
Non-lobar		
Cerebellum	12	10.6
Thalamic	16	14.1
Brain stem	0	0
Basal Ganglia	62	54.8
Unspecified	0	0
ICH treatment		
Surgery & Conservative Treatment	15	13.3
Conservative Treatment	98	86.7
Length of hospital stay (mean ± SD) [a] - 11.9 ±14.1 days		

[a] Mean and standard deviation

4.4 Specific variable characteristics in acute recovery phase

The descriptive analysis of the specific characteristics of interest in this study at the acute recovery phase are presented in Table 4.3, which included the severity of the neurological deficits, post-stroke complications, depression status and the stroke knowledge of the patients and their family caregivers. Detailed descriptions of the specific variables are summarized in Table 4.3.

Table 4.3: Early Functional Adaptation and characteristics of specific variables in the acute phase post-PICH (n =113)

Variables	Mean (SD)[1]	95% CI[2]	Number (%)
Early Functional Adaptation(FIM [3])	48.1 ± 30.1	(42.5 , 53.7)	
High functional adaptation (18.0 - 54.0)[5]			73(64.6)
Moderate functional adaptation (4.1 - 91.1)[6]			28 (24.8)
Low functional adaptation (90.2 - 126.0)[7]			12(10.6)
Post-stroke complications at acute phase			
Respiratory infection			53(46.9)
Urinary infection			38(33.6)
Shoulder pain			20(17.7)
Pressure sore			9(8.0)
Deep vein thrombosis			3(2.7)
Post-stroke depression at acute phase	8.1±5.9	**(**7.0, 9.2)	
0-4(No depression)			34(30.0%)
5-9(Mild depression)			36(32.7%)
10-14(Moderate depression)			31(27.0%)
15-19(Moderately severe depression)			9 (8.0%)
20 and more (Severe depression)			3(2.6 %)
Total stroke knowledge	3.3 ± 1.69	(3.4, 4.1)	
No stroke knowledge (0-1 = 0-14.2%)			13(11.5)
Low stroke knowledge (2-3 = 28.5- 42.8%)			37(32.7)
Average stroke knowledge (4-5 = 57.1- 74.1%)			40(35.4)
High stroke knowledge (6-7= 85-100%)			23(20.4)

[1]Mean (SD)=Mean and Standard Deviation
[2] CI = Confidence Interval
[3]FIM = Functional Independence Measure assessed at acute phase
[4]NIHSS =National Institutes Health Stroke Scale
[5]Low functional adaptation =High dependence
[6]Moderate functional adaptation = Moderate dependence
[7]High functional adaptation = [7]Low dependence

4.4.1 Severity of Neurological Deficits

The severity of the neurological deficits in the acute recovery phase was determined using NIHSS. Figure 4.1 presents the normal distribution of the severity of the neurological deficits of the patients, which revealed that the total mean (SD) of the severity of neurological deficits was 12.1 (6.47).

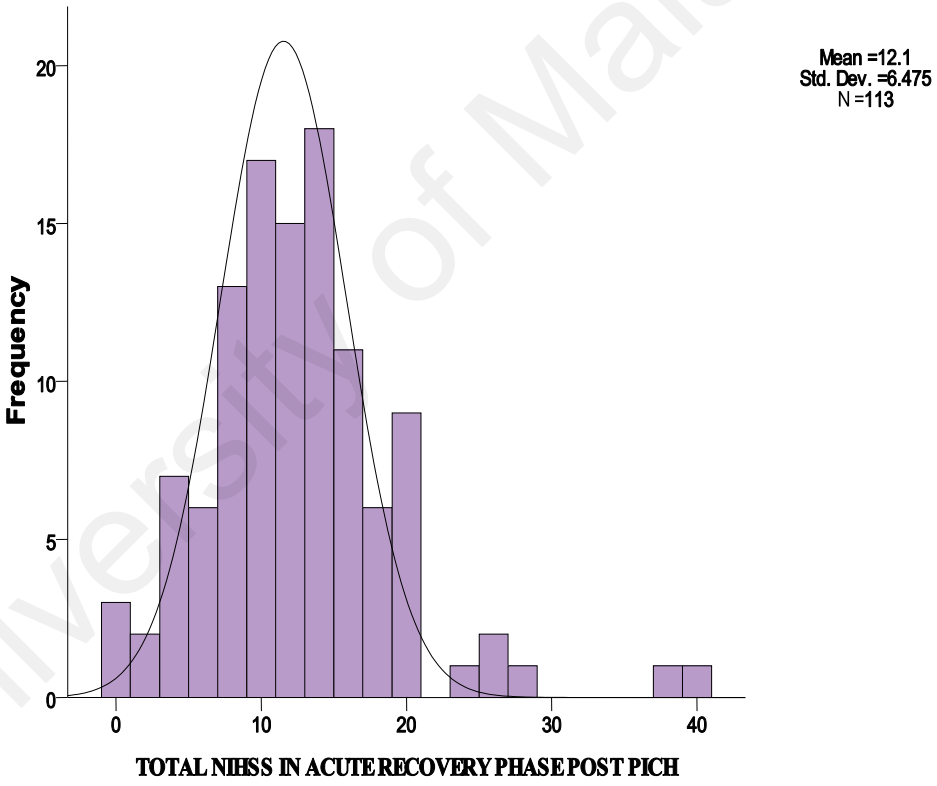


Figure 4.1: Distribution of neurological deficits in the acute recovery phase of post-PICH subjects (n=113)

The common neurological deficits were facial palsy (77.9%), motor function of left arm (63.7%) and leg (65.4%), motor function of right arm (42.5 %) and leg (45.1%), best

language (61.9%) and dysarthria (75.2 %). The detailed description of the severity of the neurological deficits is summarized in Figure 4.2.

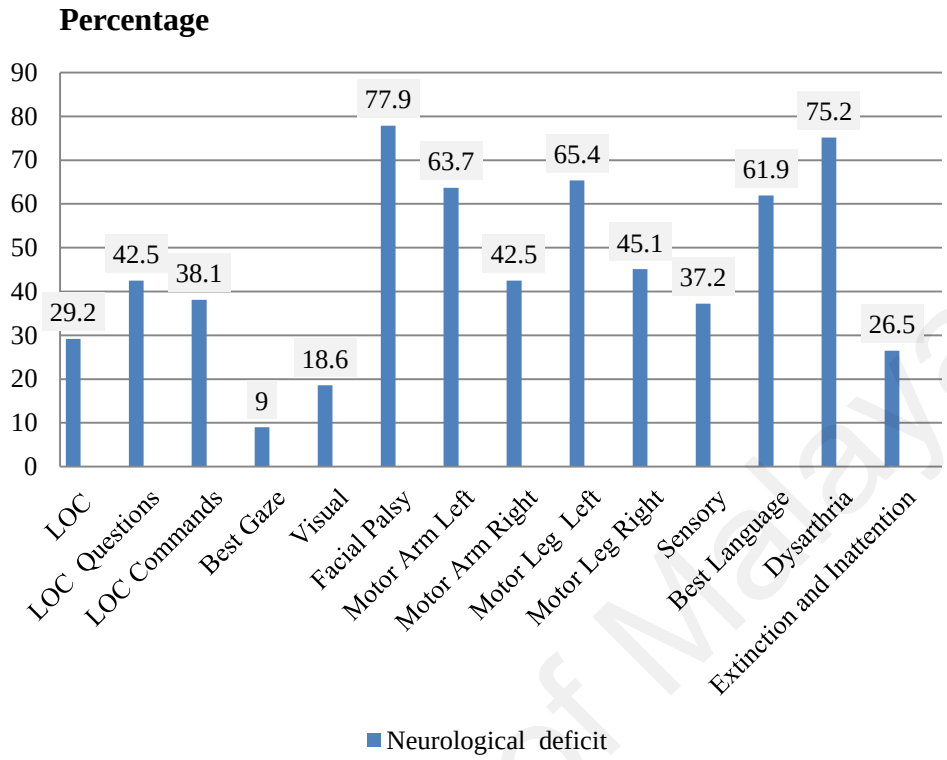


Figure 4.2: Percentage of individual items of neurological deficits (n=113)

4.4.2 Post-stroke complications during inpatient recovery phase

Post-stroke complications consist of respiratory infections, urinary infections, bedsores, deep-vein thrombosis and shoulder pain. Respiratory infections, urinary tract infections, bedsores, deep-vein thrombosis and shoulder pain were determined using the Complication Inventory Checklist (CIC). The most common complications that occurred during the acute phase of PICH were respiratory infections (46.9%), urinary infections (33.6%) and shoulder pain (17.7%) (Table 4.3).

4.4.3 Post-stroke depression at the acute recovery phase

The depression status at the acute stage was determined by the Patient Health Questionnaire 9-item Depression Scale (PHQ-9-DS) (Appendix A). The depression status was categorized from 0-4 (No Depression), 5-9 (Mild Depression), 10-14 (Moderate Depression), 15-19 (Moderately Severe Depression) and 20 and more (Severe Depression) (Table 4.3). About 70% of PICH patients experienced from mild to severe levels of depression during the acute recovery phase. The mean (SD) depression score was 8.1 (5.9) and it was skewed to the right (Figure 4.3). The analysis revealed that the percentage of patients with moderately severe to severe depression increased from 12.3% at the acute phase to 34.5% at the three-month post-stroke phase (Table 4.3).

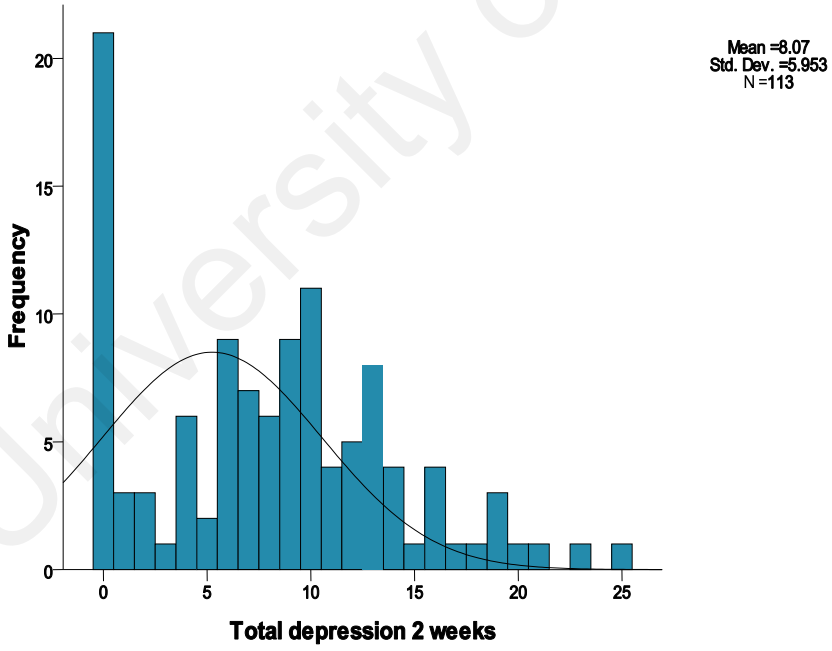


Figure 4.3: Total depression score in acute inpatient recovery phase

4.4.4 Stroke knowledge of patients and their family caregivers

The total mean (SD) for stroke knowledge was 3.33 (1.69) and it was normally distributed (Figure 4.4). More than half (55.7%) of the subjects had average to high knowledge about stroke illnesses, while less than half (44.2 %) of them had low or no knowledge about stroke illnesses (Table 4.3).

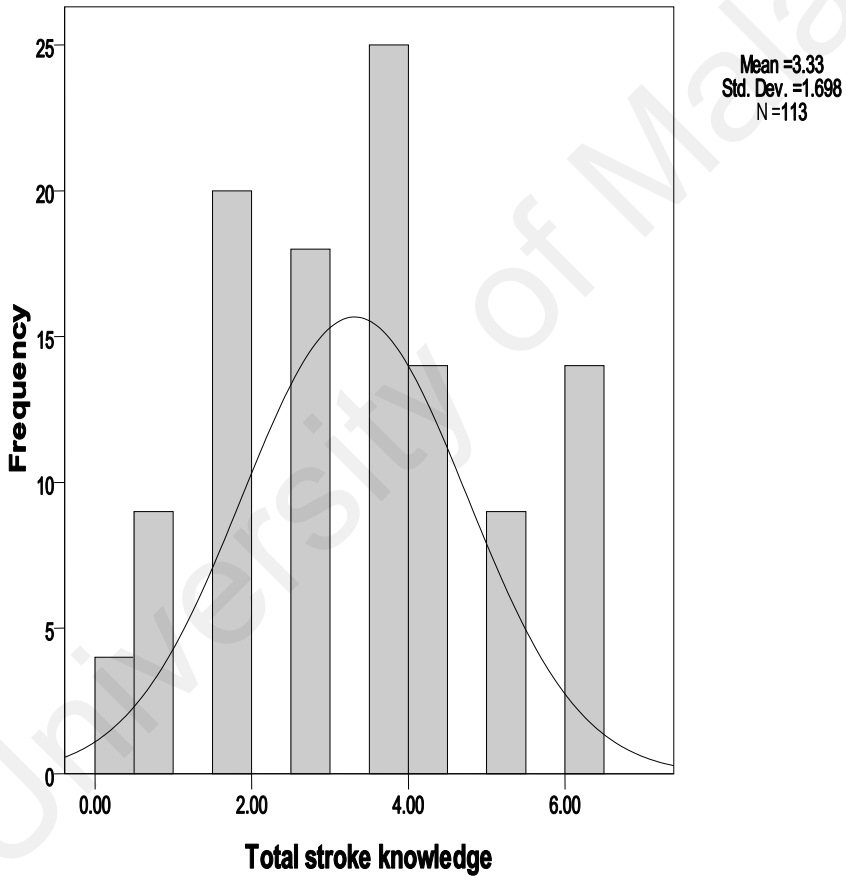


Figure 4.4: Distribution of total stroke knowledge in acute recovery phase post-PICH

The analysis of each item in the Stroke Knowledge Questionnaire revealed that the majority of the subjects had adequate general knowledge about stroke symptoms (69.0%) but most of them lacked knowledge on the risk factors (69.0%). The majority of the PICH subjects understood what to do if a recurrent stroke related to ICH occurred (82.3%), the importance of continued treatment, follow-up appointments at the hospital (79.6 %), and continued access to care and support from the caregiver during the recovery process (73.5%), but they were unaware of the importance of prevention (77.9%) and post-stroke complications (79.6%) (Figure 4.5).

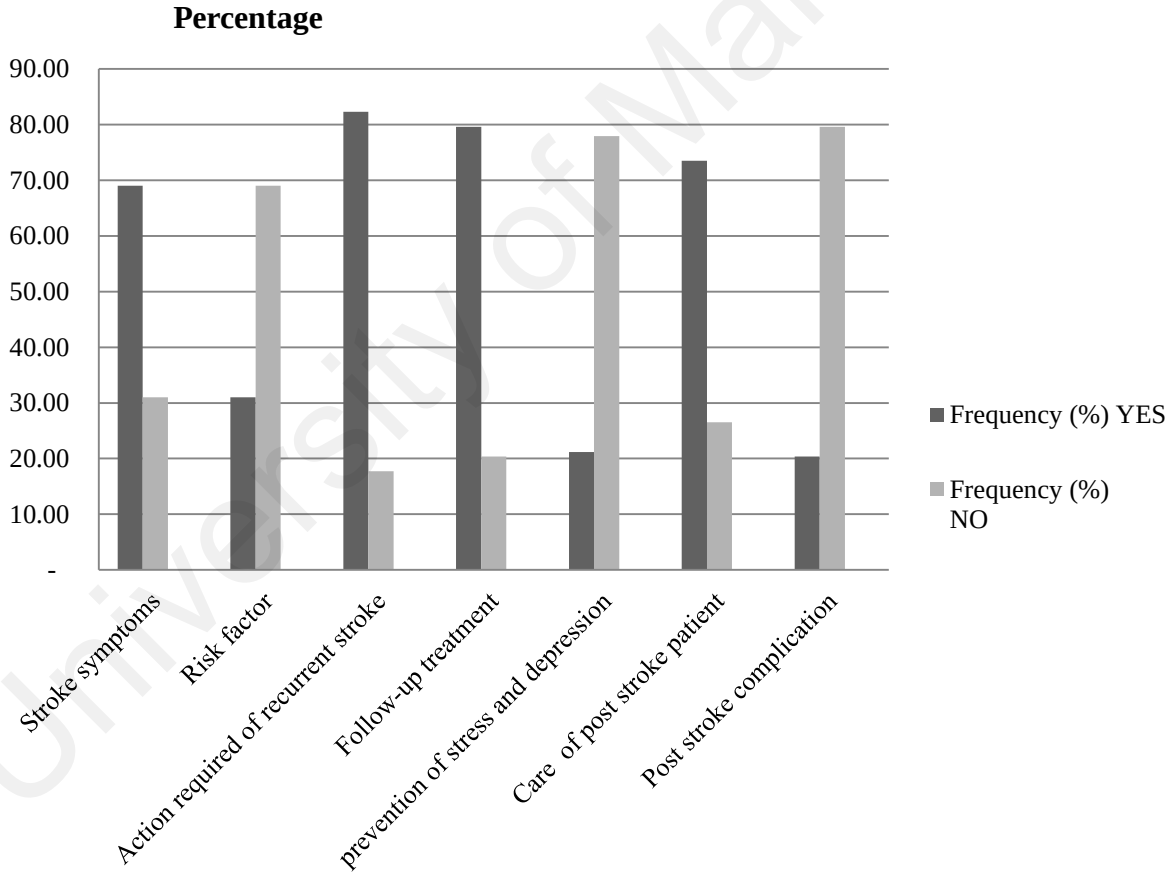


Figure 4.5: Percentages of patients and their caregivers' stroke knowledge at the acute recovery phase post-PICH

4.5 Characteristics of specific variables at three months

The specific characteristics of interest in this study, which included post-stroke complications and the depression status, are presented in Table 4.4, together with a detailed description of the specific variables.

4.5.1 Post-stroke complications at three months

The most common complications experienced by PICH survivors at three months post-PICH were shoulder pain (63.7%), followed by urinary tract infection for 10 patients (8.8 %) and respiratory infection for 8 patients (7.1%) (Table 4.4).

4.5.2 Post-stroke depression at three months

Figure 4.6 presents the normal distribution for the depression scores of the patients in the later (three month) functional recovery phase post-PICH. The mean (SD) was 10.8 (8.0), and it was skewed to the right. Nearly two-thirds of the patients (71%) experienced from mild to severe depression at three-month post-PICH (Table 4.4). Nearly two-thirds of the patients (71%) experienced from mild to severe depression at three-month post-PICH (Table 4.4).

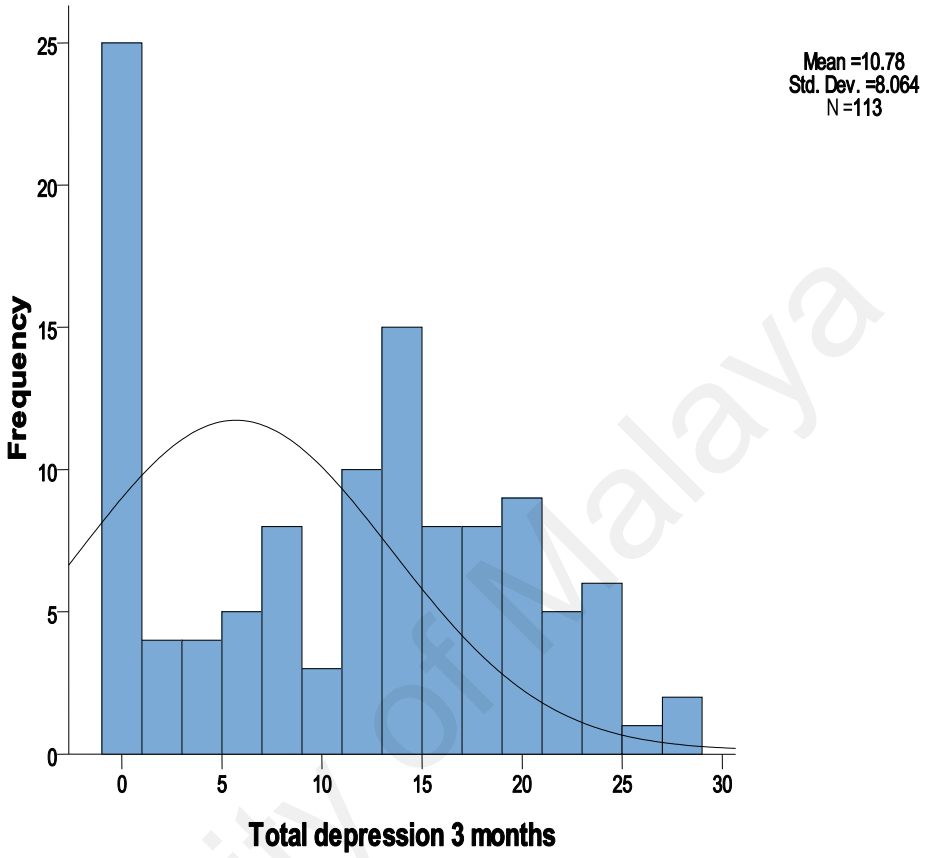


Figure 4.6: Total depression scores of three months post PICH

Table 4.4: Later (3 months) adaptation and characteristics of specific variables at three months post-PICH (n =113).

Variables	Mean (SD)[1]	95% CI[2]	Number (%)
Later (3 month) adaptation (FIM)	93.2 (34.8)	(86.7, 99.7)	
High functional adaptation (18.0 - 54.0)[5]			20(17.7)
Moderate functional adaptation (54.1 - 91.1)[6]			21(18.6)
Low functional adaptation (90.2 - 126.0)[7]			72(63.7)
Post-stroke complications at three months			
Respiratory infection			8(7.1)
Urinary infection			10(8.8)
Shoulder pain			72(63.7)
Pressure sore			5(4.4)
Deep vein thrombosis			2(1.8)
Post-stroke depression at three months	10.8 (8.1)	(9.3, 12.3)	
No depression (0-4)			33(29.2)
Mild depression (5-9)			15(13.3)
Moderate depression (10-14)			26 (23.0)
Moderately severe depression (15-19)			24 (21.2)
Severe depression (20 ++)			15 (13.3)

[1] Mean (SD)=Mean and Standard Deviation
[2]CI= Confidence Interval
[3]FIM = Functional Independence Measure assessed at three months
[4]NIHSS = National Institutes Health Stroke Scale
[5]Low functional adaptation =High dependence
[6]Moderate functional adaptation = Moderate dependence
[7]High functional adaptation = [7]Low dependence

4.6 Functional Adaptation Scores

The early and later (3 months) functional adaptation scores were measured based on the level of dependence or independence in performing the functional activities of daily living. It was measured using the Functional Independence Measure (APPENDIX A) (FIM ACUTE and FIM THREE MONTHS). A higher score in the Early Functional Adaptation and Later (3 months) Functional Adaptation outcomes indicated a positive

recovery towards stroke-related disabilities and the ability to be independent inthe performance of functional activities, while the lower score of Early Functional Adaptation and Later (3 months) adaptation outcomes indicated that the patient was in negative recovery and was highly dependent on the helper for the performance of functional activities.

4.6.1 Characteristics of Early Functional Adaptation

The distribution for the total score of Early Functional Adaptation was skewed to the right (Figure 4.7). This indicated that in the early inpatient recovery phase, most of the patients were unable to adapt to being independent in the performance of functional activities. The total median (IQR) of the Early Functional Adaptation was 33 (44), with a minimum and maximum score of 18 and 126, respectively (Table 4.5). About 65% of the patients fell within the category of negative adaptation (Table 4.5).

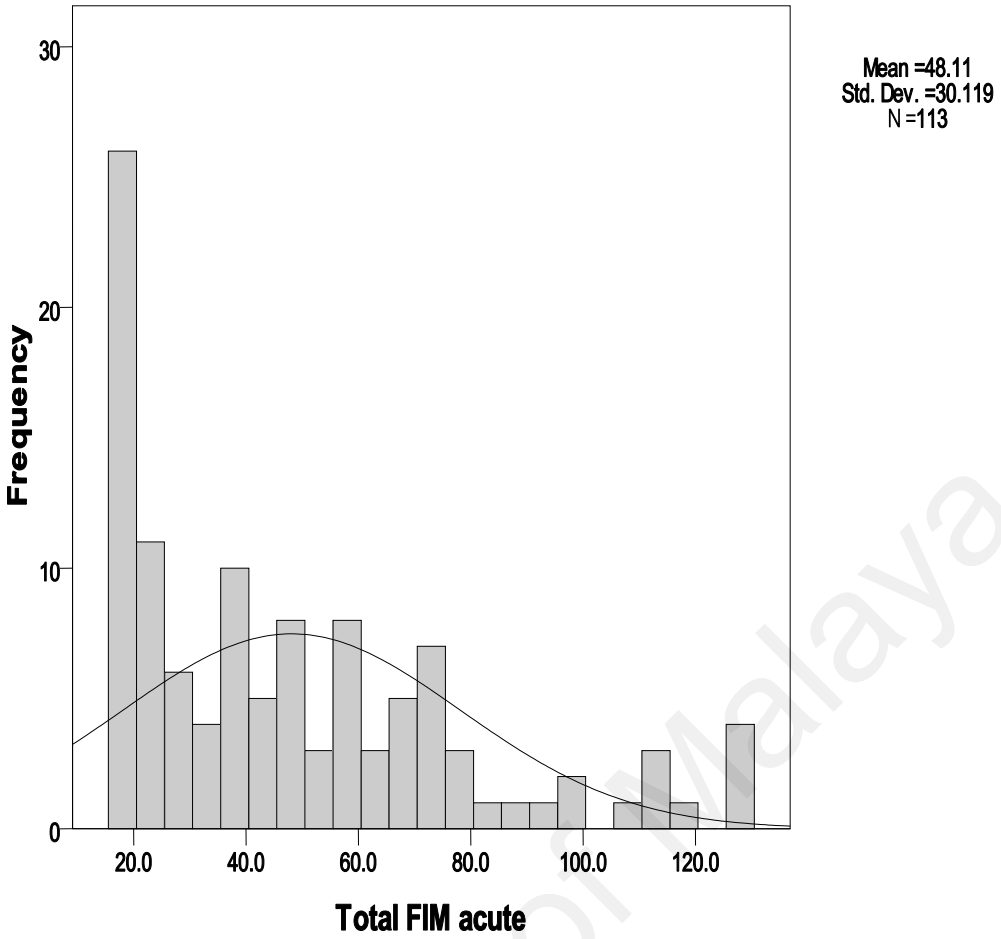
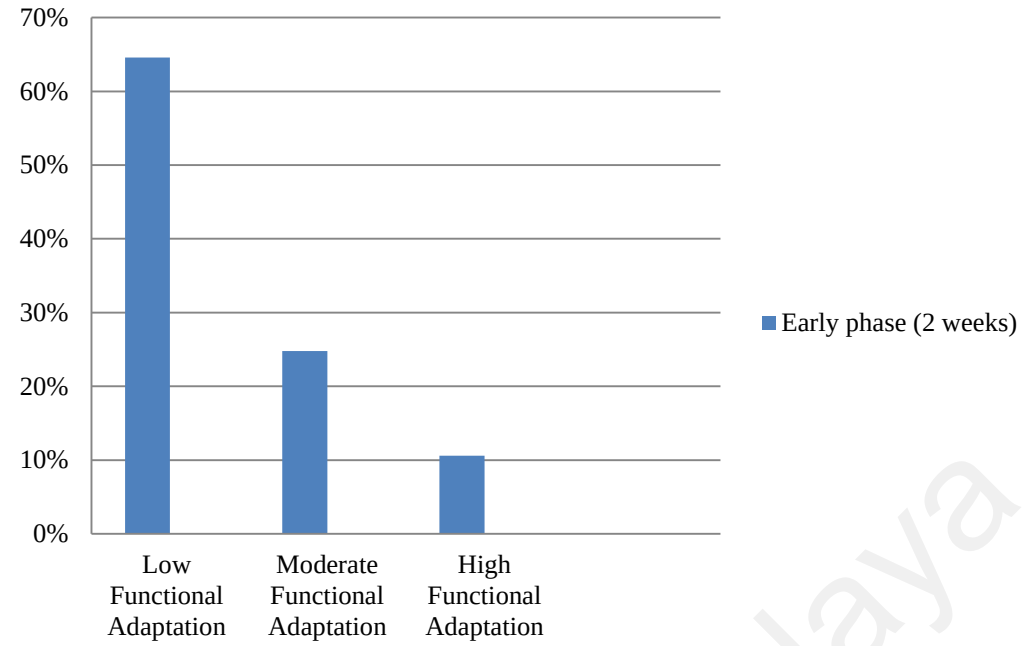


Figure 4.7: Distribution of early functional adaptation at acute recovery phase post-PICH

The total FIM ACUTE score (Early Functional Adaptation) was classified into 3 categories: high functional adaptation (90.1-126-0), moderate functional adaptation (54.1-90.0) and low functional adaptation (18.0-54.0) (Figure 4.8).



Low adaptation =High dependence
Moderate adaptation = Moderate dependence
High adaptation = [7]Low dependence

Figure 4.8: Early functional adaptation categories (n=113)

Table 4.5 presents the Early Functional Adaptation scores in two domains of functional ability. In the physical (motor) domain, the results revealed that the PICH patients showed high dependence on the helper in performing the self-care activities of daily living (eating, grooming, bathing, dressing upper and lower body, and toileting), with the median (IQR) of the scores, which ranged from 6 to 42, being 11 (12). They were also disabled in the control and self-care of bladder and bowel management, with the median (IQR) of the scores, which ranged from 2 to 14, being 2 (4). In terms of mobility, the PICH patients showed a high dependence on the helper to transfer them, such as from the bed to another place, with the median (IQR) of the scores, which ranged from 3 to 21, being 3 (6). Lastly, in terms of locomotion, the analysis found that the majority of the PICH patients showed a high dependency on their helpers for the performance of movements, such as walking, with the median (IQR) of the scores, which ranged from 2

to 14, being 2 (4). The total median (IQR) value ofthe physical functional activities, which ranged from 13 to 91, was 18 (26) (Table 4.5).

In the cognitive domain, the results revealed that the PICH patients were highly dependent on their helpers for communication activities, such as in comprehension and expression, with the median (IQR) of the scores, which ranged from 2 to 14, being 6 (8). Meanwhile, in terms of participation in social activities such as interacting with another person, problem-solving and memory retention, the PICH patients showed a high dependency on their helpers, with the median (IQR) of the scores, which ranged from 3 to 21, being 9 (13). The total median (IQR) value of the cognitive functional activities scored for early adaptation, which ranged from 5 to 35, was 15 (20) (Table 4.5).

Table 4.5: Distribution of Early Functional Adaptation (FIM scores) [a] of post-PICH patients according to functional domains (n=113)

Variable/score	Min[b]	Max[b]	Median	IQR	*p* value [c]
		PHYSICAL FUNCTIONS			
Total Self-care	6	42	11	12	.001**
Total Sphincter Control	2	14	2	4	.001**
Total Transfer	3	21	3	6	.001**
Total Locomotion	2	14	2	4	.001**
PHYSICAL SUBTOTAL SCORE	**13**	**91**	**18**	**24**	.001**
		COGNITIVE FUNCTIONS			
Total Communication	2	14	6	8	.001**
Total Social Cognition	3	21	9	13	.001**
COGNITIVE SUBTOTAL SCORE	**5**	**35**	**15**	**20**	.001**
TOTAL FIM	**18**	**126**	**33**	**44**	.001**

[a]FIM = Functional Independence Measure
[b]Min-minimum, max-maximum
[c]Kolmogorov-Smirnov,Shapiro-Wilk normality tests
**Skewed to the right

4.6.2 Characteristics of later (3 months) functional adaptations

The total score for the later (3 months) functional adaptations was skewed to the left (Figure 4.9). The majority of the subjects were able to adapt and showed positive recovery outcomes toward stroke disabilities, and were able to perform functional activities with less dependence on their helpers at three months. The total median (IQR) of the long-term adaptation was 108 (57) with a minimum and maximum score of 18 and 126, respectively (Table 4.6).

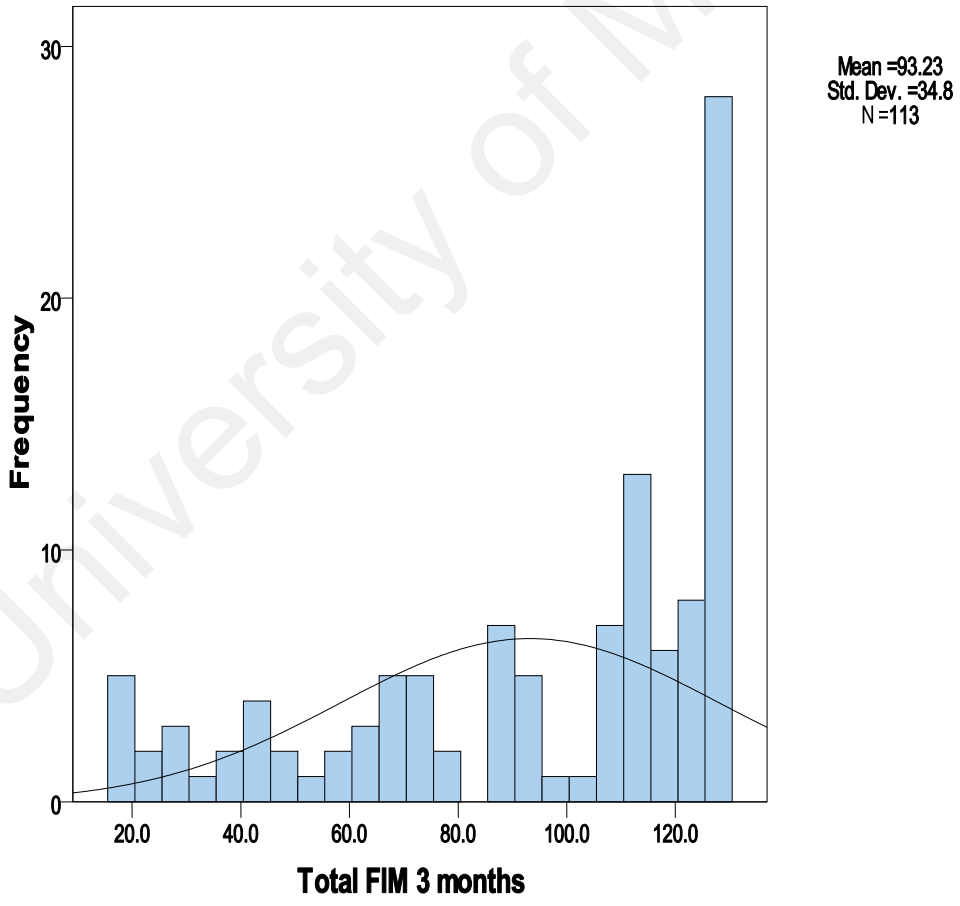


Figure 4.9: Distribution of later (3 months) functional adaptations of post-PICH subjects (n=113)

The total score and total mean of the later (3 months) functional adaptations were classified into three categories: high functional adaptation (90.1-126-0), moderate functional adaptation (54.1 -90.0) and low functional adaptation (18.0-54.0) (Figure 4.10). The results indicated that at the follow-up after three months, about two third of the patients were able to adapt and showed positive recovery outcomes toward stroke disabilities, and were able to perform functional activities with minimal dependence on a helper.

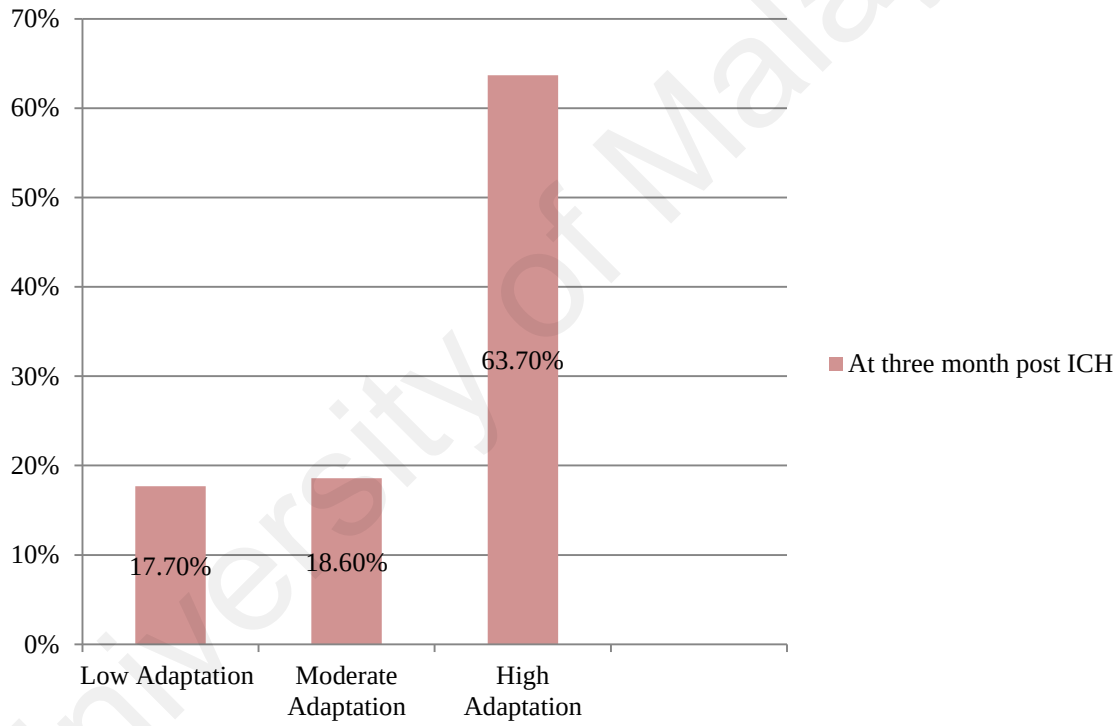


Figure 4.10: Categories of Later (3 month) functional adaptation (n=113)

Table 4.6 shows that the patients gained independence in physical abilities at three-month post-PICH. More than half the subjects were able to perform the self-care activities of daily living (eating, grooming, bathing, dressing upper and lower body, and toileting) at three months, where the median(IQR) was 36 (24) for scores ranging from 6 to 42.

The patients also showed a high independence in bladder and bowel management, with a median (IQR) of 12 (8) for scores ranging from 2 to 14. The patients showed a moderate to high level of independence for movements, such as to transfer from the bed to another place, with a median (IQR) of 18 (12) for scores ranging from 3 to 21.

Lastly, the patients also showed a high independence in the performance of movements such as walking, where the median (IQR) was 12 (8) for scores ranging from 2 to 14. The median (IQR) value for the physical (motor) activities of long-term adaptation was 65.0 (52) for scores ranging from 13 to 91.

To summarize, the majority of the patients were able to adapt to the physical disabilities of a stroke at the follow-up at three months, where they showed moderate dependence on their caregivers for the performance of the self-care activities of daily living, control of sphincters for bladder and bowel, and to transfer or walk (Table 4.6).

Table 4.6: Distribution of later (3 months) functional adaptation (FIM[a]) of post-PICH (n=113)

Variable	Min[b]	Max[b]	Median	IQR	*p* value[c]
			PHYSICAL FUNCTIONS		
Total Self-care	6	42	36	24	.001*
Total Sphincter Control	2	14	12	8	.001*
Transfer	3	21	18	12	.001*
Locomotion	2	14	12	8	.001*
MOTOR SUBTOTAL SCORE	**13**	**91**	**65**	**52**	.001*
			COGNITIVE FUNCTIONS		
Total Communication	2	14	14	4	.001*
Total Social Cognition	3	21	19	6	.001*
COGNITIVE SUBTOTAL SCORE	**5**	**35**	**33**	**10**	.001*
TOTAL LONG-TERM ADAPTATION	**18**	**126**	**108**	**57**	.001*

[a]FIM = Functional Independence Measure
[b]Min-minimum, Max-maximum
[c]Kolmogorov-Smirnov,Shapiro-Wilk normality tests
* Skewed to the left

4.7 Correlation between total Early Functional Adaptation and selected numerical variables

The correlation between age, GCS, severities of neurological deficits (NIHSS), post-stroke depression scores, stroke knowledge, length of stay and total Early Functional Adaptation are presented in Table 4.7. There were negative fair to moderate significant correlations between the neurological deficit scores and the GCS (r = -.568, p < .001; r = -.371, p < .001), respectively with the total early functional adaptations. There were fairly significant correlations between stroke knowledge, length of stay and ICH treatment and early functional adaptations (r =.293, p < .001; r = .207, p < .001), respectively. However, there were no correlations between early functional adaptations

and age (r = -157, p > .001), and post-stroke depression at the acute inpatient recovery phase (r = -.111, p > 0.001) (Table 4.7).

Table 4.7 Correlation between total Early Functional Adaptation and selected numerical variables (n = 113)

Variables	*r*	*p* value [a]
Age (years)	-.157	.097
Glasgow Coma Scale	**-.371**	**.001**
Neurological deficits (score)	**-.568**	.001
Depression at acute phase (score)	-.111	.244
Total stroke knowledge (score)	**.293**	**.001**
Length of stay (days)	**-.197**	**.036**

[a]Pearson correlation coefficient, significant at <0.001
[b]NIHSS score
[c]FIM score
[d] PHQ 9-DS score
[e]SKQ score

4.8 Correlation between total later (3 months) functional adaptation and selected numerical variables

There were negative moderate and fair significant correlations between age (r =-.365, p < .001), severity of neurological deficits (r = -.419, p < .001), Glasgow Coma Scale (r =-.364, p < .001) and ICH treatment (r = -.370, p < 0.01), post-stroke depression at three months (r = -.433, p < 0.001), total stroke knowledge (r = -.485, p < .001), and length of stay (r = - 197, p < .001) with later (3 months) functional adaptations. In contrast, there were positive moderate correlations of early functional adaptations (r = .606, p < .001) with later (3 months) functional adaptations. No significant correlations between later (3 months) functional adaptations and depression in the acute inpatient recovery phase (r = .069, p > .001) were identified (Table 4.8).

Table 4.8: Correlation between later (3 months) functional adaptation with selected numerical variables using the Pearson correlation coefficient (n = 113)

Long-term adaptation	***R***	***p* value [a]**
Age (years)	-.365	**.001**
Neurological deficits (score)[b]	-.419	**.001**
Glasgow Coma Scale	-.364	**.001**
Early Functional Status (score) [c]	.606	**.001**
Depression score at acute phase [d]	.069	.469
Depression score at three months[d]	-433	**.001**
Total stroke knowledge [e]	.485	**.001**
Length of stay	-.197	**.036**

[a] Pearson correlation coefficient, significant at .001
[b]NIHSS score
[c]FIM score
[d] PHQ 9-DS score
e SKQ score

4.9 Differences between early and later (3 months) functional adaptations

The differences between the early functional adaptations cores at the acute recovery phase and the later (3 months) functional adaptation scores at three months were normally distributed and the mean (SD) was 45.12 (29.1) (Figure 4.11).

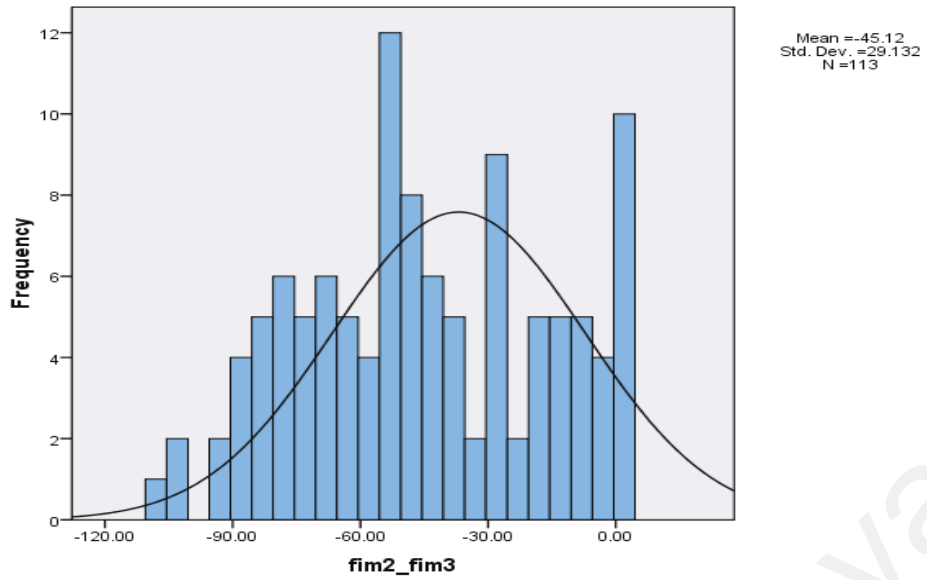


Figure 4.11: Distribution of differences of Early Functional Adaptation and later (3 months) functional adaptation scores of post-PICH patients (n =113)

There was a significant total mean difference between the early functional adaptation and later (3 months) functional adaptation scores t (112) = -16.45, p < .05 (Table 4.9). The later (3 months) functional adaptation scores were significantly increased by 45.1, 95% CI [-50.6, -39.7]. There was a significant difference in the physical functions between the acute phase and at three-month post-PICH t (112) = -15.4, p < .05, Cl [-40.3,-31.1] (Table 4.9). The adaptations to participation in self-care activities t (112) = -15.3, p < .05, CI [-18.3, -14.1] sphincter control t (112) = -15.3, p < .05, CI[-6.3,-4.8], transfer t (112) = -14.9, p < .05, CI [-9.5,-7.3], and locomotion t (112) = -14.8, p < .05, CI [-6.3,-4.8] had increased (Table 4.9).

There was a significant difference in the subtotal of the cognitive functional adaptation scores between the acute phase and at three-month post-ICH t (112) = -10.4, p < .05, 95% CI [-11.3,-7.7] (Table 4.9). The adaptations to participation in communication t (112) =

= -10.6, $p < .05$, CI [-4.6,-3.2] and social cognition t (112) = -10.0, $p < .05$, 95% CI [-6.7,-4.5] had improved (Table 4.9).

Overall, there was a significant improvement in the ability of the patients to adapt to participation in functional activities at three months. Figure 4.11 shows the percentages of early functional adaptation and later adaptation at three-month adaptation according to the level of adaptation. The results revealed that two-thirds (64.6%) of the patients had a lower ability to adapt to functional disabilities in the acute recovery phase of post-PICH. In contrast, the results at three months revealed that almost two-thirds (63.7%) of the patients achieved a high level of adaptation, became independent, and were able to adapt to stroke-related disabilities.

Table 4.9: Mean differences of Early Functional Adaptation and Later (3 months) Functional Adaptation (n=113)

Variable	Mean difference (SD)	95% CI of mean difference	*t* test	*p* value [a]
PHYSICAL FUNCTIONS				
Total Self-Care	-16.2(11.3)	-18.3,-14.1	-15.3	**.001**
Total Sphincter Control	-5.6(3.9)	-6.3,-4.8	-15.3	**.001**
Total Transfer	-8.4(6.0)	-9.5,-7.3	-14.9	**.001**
Total Locomotion	-5.5(4.0)	-6.3,-4.8	-14.8	**.001**
COGNITIVE FUNCTIONS				
Total Communication	-3.9(3.9)	-4.6,-3.2	-10.6	**.001**
Total Social Cognition	-5.6(5.9)	-6.7,-4.5	-10.0	**.001**
TOTAL SCORE	**-45.1 (29.1)**	**-50.6,-39.7**	**-16.45**	**.001**

[a]*Paired t test, significant at .001*

4.10 Post-stroke complications at three months post-PICH

Table 4.10 presents the status of complications among the subjects at three-month post-PICH. The most common complications experienced by the PICH survivors were shoulder pain (63.7%), followed by urinary tract infections for 10 patients (8.8 %), and respiratory infections for 8 patients (7.1%). The most common complications that occurred during the acute phase of post-ICH were respiratory infections for 53 (46.9%), urinary infections for 38(33.6%) and shoulder pain for 20 (17.7%) patients.

Table 4.10 shows the significant differences in the post-stroke complication items score between the early recovery phase and the three-month post-PICH using the McNemar test. The results revealed that respiratory infections, urinary tract infections, and acute shoulder pain during the acute recovery phase and at three months were significantly different ($\chi^2 = 41.2$, $p < .001$), ($\chi^2 = 21.4$, $p < .001$) and ($\chi^2 = .000$, $p < .001$), respectively. The descriptive analysis showed that the percentage of patients who had respiratory infections decreased significantly from 46.9% in the acute phase to 7.1% at three-month post-stroke. Similarly, urinary tract infections decreased from 33.6% in the acute phase to 8.8% at three-month post-stroke. In contrast, the percentage of patients with shoulder pain increased significantly from 17.7% in the acute phase to 63.7% at three-month post-stroke. However, pressure sores and deep-vein thrombosis showed no significant differences as there were very few subjects who experienced both complications.

Table 4.10: Differences between acute recovery phase and 3 months post-stroke complications (n=113)

Post stroke Complications	(Acute) Frequency (%)	(Three months) Frequency (%)	Chi-Square[a]	Sig. [b]
Respiratory infection	53 (46.9%)	8(7.1%)	41.2	.001
Urinary infection	38(33.6%)	10(8.8%)	21.4	.001
Shoulder pain	20(17.7%)	72(63.7%)	.000	.001
Pressure sore	9(8.0%)	5(4.4%)	.388	NS
Deep vein thrombosis	3(2.7%)	2(1.8%)	1.000	NS

[a]McNemar test
[b]significant at .05

4.11 Depression status at acute inpatient recovery phase and three months post-PICH

Figure 4.12 shows the normal distribution of the mean differences in the depression scores among the patients during the acute recovery phase and in the three-month post-PICH. The mean difference (SD) was 2.71(9.08). The analysis revealed that the percentage of subjects having moderately severe to severe depression increased from 12.3% at the acute phase to 34.5% at three-month post-stroke (Table4.11). It indicated that the frequency of having moderate to severe depression increased in between the early phase to the three-month post-stroke phase.

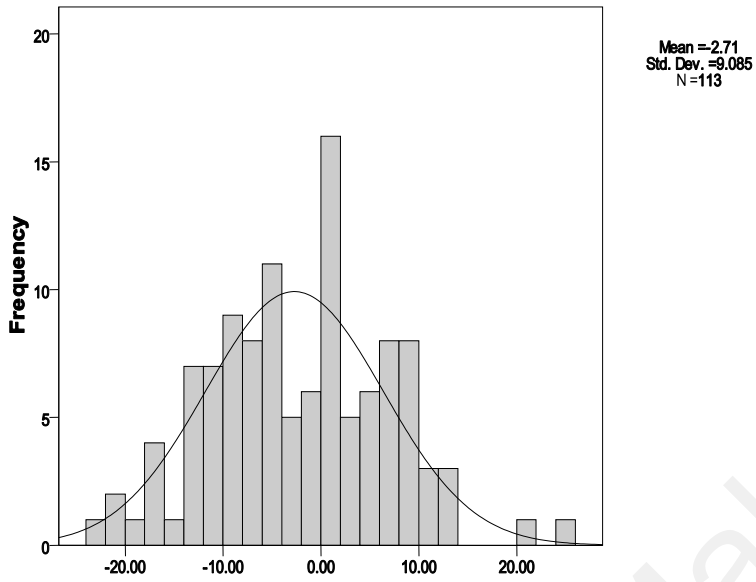


Figure 4.12: Distribution of mean differences of depression at the acute recovery phase and at three months post-PICH

The results revealed that the mean depression scores during the acute inpatient recovery phase and at three months post-PICH were significantly different (p = .002, 95% CI [-4.40, -1.02] (Table 4.11). The analysis showed that the mean (SD) depression score after three months post-PICH was significantly higher than during the acute recovery phase 8.07 (5.10) vs. 10.78 (8.06)]. There was a 95% level of confidence that the mean difference of depression between the acute recovery phase and at three months lay between 4.40 and 1.02.

Table 4.11: Difference between depression status at acute recovery phase and at three months-post PICH using the paired t test (n=113)

Variable	Mean (SD) Acute Phase	Mean (SD) at three months post-PICH	Mean diff (SD)[b]	95% CI of difference	t statistic(df)	*p* value[a]
Depression Score	8.07(5.95)	10.78(8.06)	2.7 (9.1)	-4.40, -1.02	-3.17	.002

[a] Paired t test, *p* value significant at .05

4.12 Predictors of Early Functional Adaptation

4.12.1 Association between study variables and Early Functional Adaptation using Simple Linear Regression

A simple linear regression analysis revealed that there was a significant unadjusted association between early functional adaptation and gender ($p = .038$), location of brain lesions (lobar and non-lobar) ($p = .025$), severity of PICH (GCS) ($p < .001$), neurological deficits ($p < .001$), respiratory infections at the acute phase ($p < .001$), urinary infections at the acute phase ($p < .001$) pressure sores ($p = .005$), stroke knowledge ($p = .002$), ICH treatment ($p = .029$), and length of stay ($p = .036$) (Table 4.12).

Table 4.12: Factors associated of Early Functional Adaptation after PICH using Simple Linear Regression (SLR) (n=113)

Variable	Crude *b*coeff[a]	r^2	t stat	*P* value [b]	(95% CI) of beta coefficient
Age	-.402	.025	-1.673	.097	(-.878, .074)
Gender	-11.912	.038	-2.104	**.038**	(0.691,23.133)
Education	-11.912	.066	2.802	.006	(-23.133, -.691)
Socio-economic status	3.402	.020	1.503	.136	(-1.082,7.885)
Family caregiver	-4.460	.009	-.998	.320	(-13.290,4.384)
Location of brain lesion	-15.698	0.404	-2.272	**.025**	(-29.390, -2.005)
Severity of PICH (GCS)	-25.780	.138	-4.211	.001	(-37.910 –13.650)
Neurological deficit	-2.642	.323	-7.271	**.001**	(-3.362,-1.922)
Respiratory infection in acute phase	-32.075	.285	-6.651	**.001**	(-41.631,-22.518)
Urinary tract infection in acute phase	-23.653	.138	-4.210	**.001**	(-34.638,-12.468)
Pressure sore in acute phase	-29.210	.070	-2.881	**.005**	(-49.303.-9.118)
Stroke knowledge	4.600	.086	3.230	**.002**	(1.778, 7.422)
Deep Vein Thrombosis in acute phase	-.108	.000	-.005	.996	(-42.880.42.664)
Shoulder pain in acute phase	13.054	.028	1.775	.079	(-1.577,27.626)
Depression in acute phase	-.559	.012	-1.172	.224	(-1.505,.386)
ICH treatment	18.227	.043	2.214	.029	(1.913,34.542)
Length of stay	-.422	.039	-2.118	.036	(-.816, -.027)

4.12.2 Predictors affecting Early Functional Adaptation using Multiple Linear Regression

The seven significant factors based on the simple linear regression results were included in the Multiple Linear Regression modeling. Five variables were significant after the regression. The regression model was later checked for linearity assumption, normality of residuals, possible 2-way interaction, multicollinearity and multivariate outliers.

4.12.2(a) Linearity and equal variance

The scatter plot between the numerical variables (gender, GCS, severity of neurological deficit and stroke knowledge) and residuals revealed that there was no linear relationship between the variables. The scatter plot of the residual versus the predicted variables also suggested that the linearity and equal variance of the model were met (Figure 4.13).

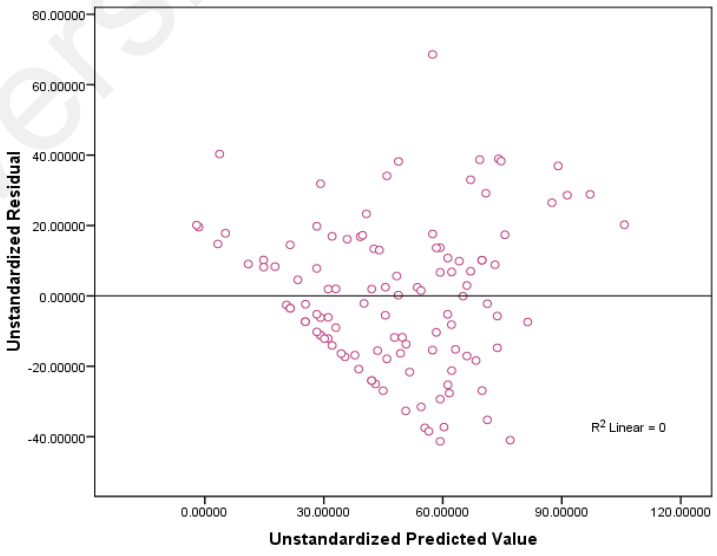


Figure 4.13: Scatter plot of Early Functional Adaptation and potential predictors

4.12.2(b) Checking for normality of residuals

Figure 4.14 shows the normal distribution of standard residuals. Thus, the normality assumption was met.

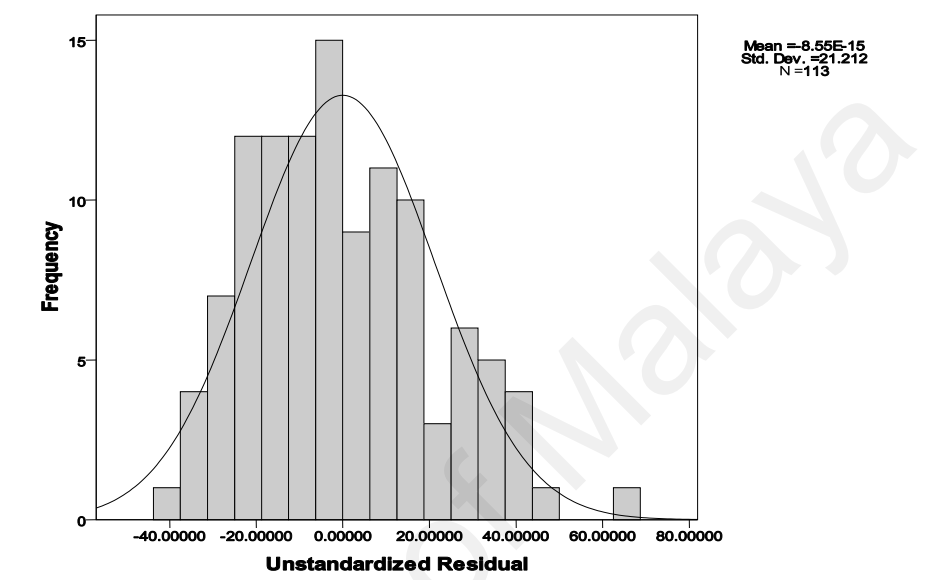


Figure 4.14: Distribution of standard residuals

4.12.2(c) Checking for interactions

A check of the interactions between two important clinical variables in the regression model showed that there was no interaction between the variables; the severity of the neurological deficit and gender (p = .534), and stroke knowledge and gender (p = .927). Thus, no interaction term was added.

4.12.2(d) Checking for multicollinearit

A multiple linear regression analysis also revealed that there was no multicollinearity among the predictors, and that the tolerance values were between 71-99%, and the VIF values were between 1.012 -1.399 (<10).

4.12.2(e) Checking for multivariate outliers

The multivariate outliers were examined to identify whether there were outliers and influential cases that might have had an impact on the regression solution. However, no multivariate outliers were detected.

4.12.2(f) Final model of early functional adaptation

There were five variables that significantly contributed to 52.0% (Adjusted R^2 = .52, F = 22.7, p < .05) of the variance of the Early Functional Adaptation score (Table 4.13). The female gender had a significant linear relationship with early functional adaptation (β = 9.58, *p* = .023). Females were associated with a lower score of 9.58 units for Early Functional Adaptation compared to the males, 95% CI [1.32, 17.84]. The results indicated that the female patients depended on their caregivers to meet their needs in ADL during the acute recovery phase compared to the males. The male patients showed they were able to be more independent in fulfilling their ADL needs. Those who had intracerebral bleeding in the non-lobar areas were associated with a lower score of 16.7 units for Early Functional Adaptation compared to the lobar areas (β = - 16.7, *p* < .001, 95% CI [-26.702, -6.697]. An increase in a unit of NIHSS score decreased the ability to adapt to stroke disabilities during the acute phase of post-PICH by 1.91 units, β = -1.91, *p* < .001, 95% CI [-2.646, -1.189]. Those who had respiratory infection were associated with a lower score of Early Functional Adaptation by -16.7 unit, β = -16.7, *p* < .001, 95% CI [-26.21,-7.23]. A decrease in one unit of the total score of stroke knowledge lowered the score of Early Functional Adaptation by 2.89 units (β = 2.89, *p* = .09, 95% CI [.72, 5.04].

Table 4.13: The predictors of Early Functional Adaptation among PICH patients (n= 113)

Variable	Adjusted (β)[a]	t stat	*p* value	(95% CI)
Sex [c]	9.58	2.30	.023	(1.32, 17.84)
Location of Brain Lesion [d]	-16.70	-3.31	.001	(-26.70, -6.70)
Neurological deficit (score)	-1.91	-5.22	.001	(-2.64, -1.19)
Respiratory Infection [e]	-16.71	-3.49	.001	(-26.21, -7.23)
Stroke Knowledge (score)	2.89	2.65	.009	(.72, 5.04)

[a]β Adjusted regression coefficient
[b]Multiple linear regression (R^2 = 0.52, F=22.7). The model reasonably fitted well. Model assumptionswere met: There was no interaction between the independence variables and no multicollinearity problems.
Reference categories:
[c]male
[d]lobar
[e]no respiratory infection

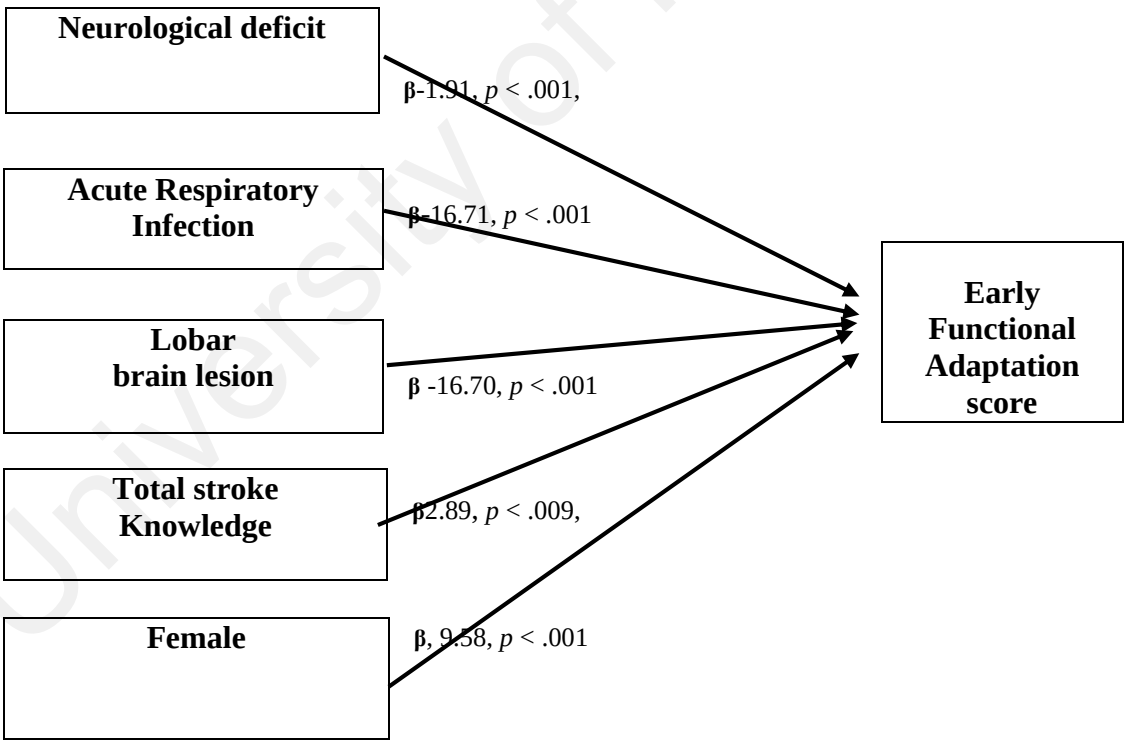


Figure 4.15: Illustration of the predictors affecting Early Functional Adaptation in response to stroke-related disabilities during the recovery phase (n=113).

In summary, female patients, those who developed intra-cerebral bleeding in the non-lobar area of the brain, higher score of neurological deficits, had respiratory complications and lower stroke knowledge at the acute phase, were associated with a lower ability to adapt to functional disabilities in the acute phase post-PICH.

4.13 Predictors of later (3 months) functional adaptations

4.13.1 Association between predictors and later (3 months) adaptations using Simple Linear Regression

Nine variables had a significant unadjusted association with later (3 months) functional adaptation (Table 4.14). Age, family caregiver support, GCS scores, early functional adaptation score, respiratory infection at the acute phase, urinary infection at the acute phase and three-month post-PICH, pressure sores at the acute phase and at three-month post-PICH, depression status at three months, and stroke knowledge had a significant linear relationship with later (3 months) functional adaptations without adjusting the other variables. The analysis also revealed that antibiotic treatment, ICH treatment and length of stay were associated with better later (3 months) functional adaptations toward recovery.

Table 4.14: Factors associated with later (3 month) functional adaptations using Simple Linear Regression (n=113)

Variable	Crude *b*coeff [a]	r^2	t statistic	ρ value	(95% CI) of beta coefficient
Age	-1.081	.133	-.13	**.001**	(-1.600, -.562)
Gender	-9.57	.02	-1.44	.150	(-22.67, 3.52)
Socio-economic status	2.79	.01	.35	.290	(-2.41. 8.00)
Smoking	2.43	.00	.35	.728	(-11.36, 16.21)
Location of brain lesion	1.58	.01	-1.13	.261	(-4.36,1,19)
Family caregiver	23.022	.100	3.508	**.001**	(10.017, 36.026)
GCS	-29.173	.132	-4.111	**.001**	(-43.234, -15.112)
Neurological deficit	-2.252	.176	-4.863	**.001**	(-3.170, -1.335)
Early adaptation	.873	.367	0.873	**.001**	(.527, .873)
Respiratory infection [1]	-36.927	.283	6.62	**.001**	(-47.985, -25.870)
UTI[1]	-26.158	.127	-4.023	**.001**	(-39.044, -13.273)
UTI[2]	-44.684	.134	-4.148	**.001**	(-66.033, -23.336)
Pressure sore[1]	-36.347	.081	-13.271	**.002**	(-59.424, -13.271)
Pressure sore[2]	-37.070	.048	-2.376	.019	(-67.980, -6.160)
Deep vein thrombosis[1]	-20.78	.01	-1.02	.310	(-61.13,19.56)
Deep vein thrombosis[2]	8.42	.00	.34	.736	(40.98,57,81)
Shoulder pain (Acute)	8.83	.01	1.03	.305	(-8.16, 25,83)
Total depression	.40	.01	.73	.469	(-.69,1.50)
Respiratory infection (3 months)	-13,70	.01	-1.07	.285	(-38.98,11,58)
Shoulder pain (3 months)	.399	.00	.06	.954	(-13.15,13.952)
Post-stroke depression[2]	-1.87	.188	-5.064	**.001**	(-2.601, -1.138)
Stroke knowledge	8.79	.235	5.843	**.001**	(5.812, 11.777)
Antibiotics	-17.34	.059	-2.627	**.010**	(-31.34,-4.39)
ICH treatment	37.69	.137	4.177	**.001**	(19.81,55.58)
Length of stay	-.706	.082	-3.140	**.002**	(-1.151,-.260)

[a] Crude Beta coefficient
[b] Simple Linear Regression is significant at .05
[c]SES – Socio-economic status
GCS- Glasgow Coma Scale
[1] – Acute phase
[2]- At 3 months post-PICH
UTI- Urinary tract infection[1]
UTI- Urinary tract infection[2]
DVT- Deep vein thrombosis

4.13.2 Predictors affecting later (3 months) functional adaptation post-PICH

The eleven significant predictors identified by the Simple Linear Regression were included in the model. For the multivariate analysis, the multiple linear regression analysis using the stepwise method was used.

Later, the assumptions of the regression model were assessed for the linearity assumption, normality of residuals, possible two-way interaction, multicollinearity and multivariate outliers.

4.13.2(a) Linearity and equal variance

Figure 4.16 shows the scatter plot for the later (3 months) functional adaptations (residual) and predicted variables (predicted), which suggest that the linearity assumption was met (linear model fitted well).

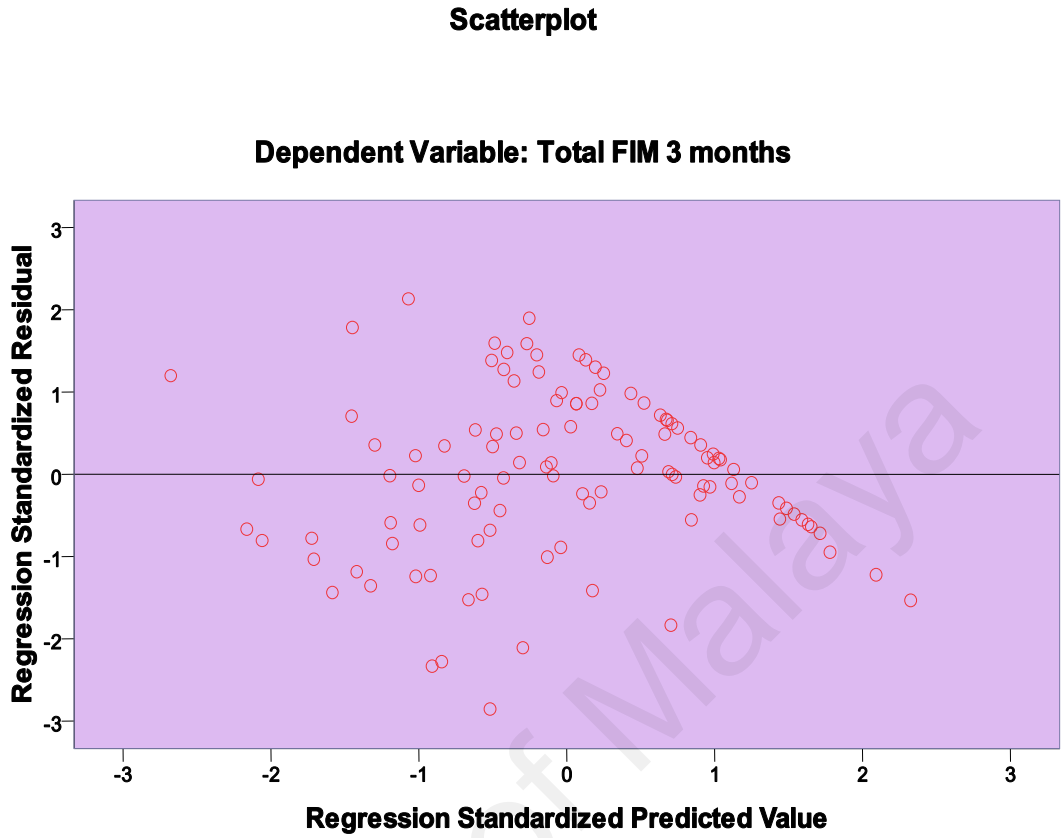


Figure 4.16: Scatter plot of residuals and predicted values

The relationships between the predicted numerical variables (early adaptation, total stroke knowledge, age, and total depression at three months) and the residuals were also evaluated and the relationships were found to be also linear.

4.13.2(b) Normality assumption

The normality assumption was met, as shown in Figure 4.17.

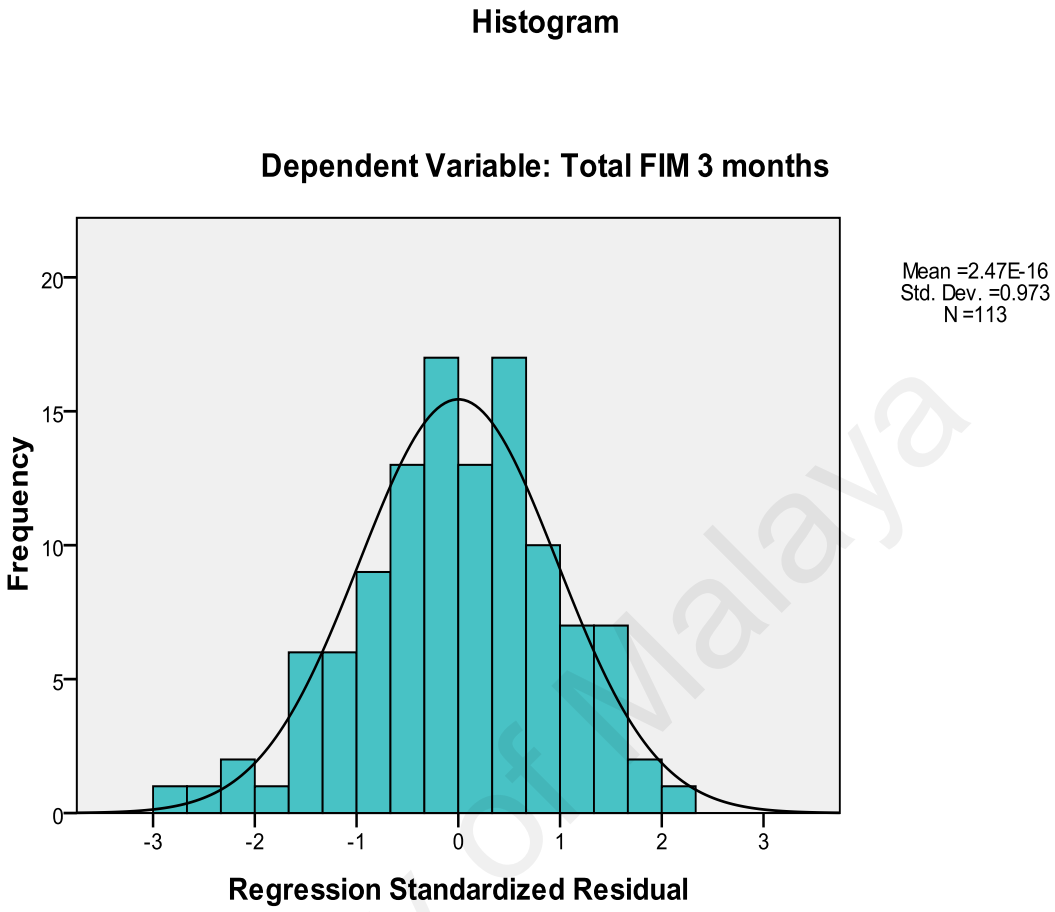


Figure 4.17 Distribution of standardized residuals

4.13.2(c) Checking for interaction

The variables that were included in the check for interactions between the important variables included Early Functional Adaptation and age (p = .073), urinary infection at three months and Early Functional Adaptation (p = .464), urinary infection at three months and ICH treatment (p = .537), and urinary infection at three months and depression at three months (p =.730). The interaction checks revealed that there were no significant interactions between the variables.

4.13.2(d) Checking for multicollinearity

There was no multicollinearity among the predictors. The VIF (variance-inflation factor) values were between 1.07-1.30 (< 10).

4.13.2(e) Checking for multivariate outliers

Multivariate outliers were examined to identify whether there were outliers and influential cases that might have had an impact on the regression solution. The scatterplot of the standardized residual and unstandardized predicted values indicated that there were no multivariate outliers.

4.13.2 (f) The regression analysis of the later (3 months) functional adaptations

The regression analysis revealed that there were nine predictor variables, which significantly affected later (3 months) functional adaptations. The model accounted for R^2=.65, F = 33, p < .05) of the variance that affected later (3 months) functional adaptations (Table 4.15).

An increase of one year of age for PICH patients was associated with a reduction in the later (3 months) functional adaptations score by .82 units, β -.82, p < .001, 95% CI [-1.18, -.46].

The early functional adaptation contributed a positive significant relationship with later (3 months) functional adaptations β .40, p < .001). An increase in one unit of the Early Functional Adaptation score at the acute phase was associated with an increase of .40 units, 95% CI [.25, .55] in later (3 months) functional adaptations outcomes score.

The stroke knowledge of stroke patients and their caregivers demonstrated a positive significant relationship with later (3 months) functional adaptations, β 2.78, p < .001. One

unit of the increase in the positive stroke knowledge (SK) score was related to an increase of 2.7 units, 95% CI [.44, 5.13] in the later (3 months) functional adaptations outcome score.

Urinary infections at three months post-ICH showed a significant negative relationship with the later (3 months) functional adaptations outcome β -29.1, $p < .001$, 95% CI [-43.52, -14.66]. Having urinary infection at three months post-PICH was associated with the decrease of 29 units in later (3 months) functional adaptations outcome score.

There was a significant negative relationship between the total depression at three months post-ICH and later (3 months) functional adaptations (β -.98, $p = < .001$). A unit of increase in the depression score at three months post-ICH or reduction in depression was associated with a decrease of .98 units, 95% CI [-1.52, -.44] in later (3 months) functional adaptations outcome score.

There was a significant relationship between ICH treatment and later (3 months) functional adaptations (β 22.5, $p < .001$**).** Those subjected to surgical and conservative treatments were associated with an increase of 22.5 units, 95% CI [10.4, 34.5] in later (3 months) functional adaptations score.

Table 4.15: The Predictors of later (3 months) functional adaptations outcomes among post-PICH patients using Multiple Linear Regression (n= 113)

Variable	Adjusted β[a]	*p* value	t stat	(95% CI) of β
Age (years)	-.82	.001	-4.52	(-1.18, -0.46)
Early functional adaptation (score)	.40	.001	5.36	(.25, .55)
Total stroke knowledge (score)	2.78	.021	2.35	(.44,5.13)
Urinary infection at 3 months [c]	-29.09	.001	-3.99	(-43.52, -14.66)
Depression score at 3 months	-.98	.001	-3.59	(-1.52,-.44)
ICH treatment	22.50	.001	3.60	(10.42,34.54)

[a]β Adjusted crude regression coefficient
[b] Multiple linear regression (R^2= .65, F=33.0). The model fitted reasonably well. Model assumptions are met: There were no interactions between independence variables and no multicollinearity problems
Categorical variables reference categories: [c]no urinary infection

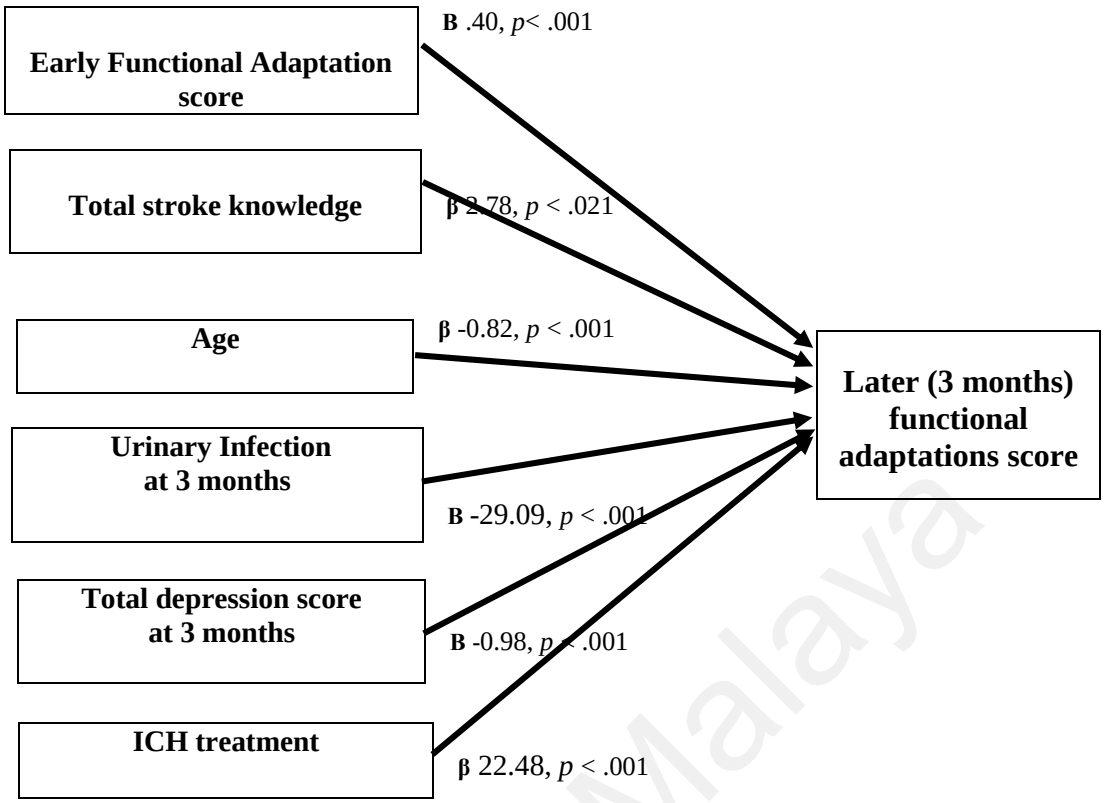


Figure 4.18: Illustration of the predictors affecting later (3 month) functional adaptation post-PICH

Summary

In summary, younger aged patients with a moderate Early Functional Adaptation score, high stroke knowledge, no urinary tract infection at three-month post-ICH, no depression at three-month post-PICH, and supported by ICH treatment were significantly associated with increased in later (3 months) functional adaptations of post-PICH patients.

CHAPTER 5: DISCUSSION

5.1 Introduction

Primary intracerebral haemorrhage is one of the stroke types that affect all domains of a person's life. The first part of the discussion of this study cover on adaptation to stroke-related disability during early phase and later at three months based on four adaptation modes of post intracerebral haemorrhage patients. A person with ICH may experience physical, psychological, and social disability or changes that affect his or her ability to function as a normal human being. The second part of the discussion describes the factors affecting the early and later (3 month) adaptation to stroke-related disability of post intracerebral haemorrhage patients. The last part describes the difference between early and later adaptation and what are the significant recommendations related to the finding of this study.

5.2 Adaptation to stroke-related disabilities

One hundred and thirteen patients with PICH who received acute recovery care at two different hospitals located in the east region of Malaysia participated in this study. The change, loss or impairment of physiological and psychological function's impact from a neurological deficit that resulted from intracerebral haemorrhage was viewed as a stress stimulus for individuals (Davis, 2015; Miller, et al., 2010; Leung, et al., 2010 and Oh &Seo, 2010; Dalvandi et al., 2010*)*. In this study, primary intracerebral haemorrhage is defined as bleeding that occurs directly in the brain parenchyma in the absence of secondary causes, such as vascular malformation, vasculitis, moyamoya disease, aneurysm, cortical vein/sinus thrombosis, neoplasm, trauma, postoperative event,

hyperviscosity syndrome, haemorrhagic diathesis or ischemic stroke (Hill, Silver, Austin, &Tu, 2000).

Adaptation after experiencing PICH is perceived as a process through which patients gain independence in performing functional activities, such as self-care activities, mobility, communication, and social interaction, during the recovery phase. Adaptation based on Roy Adaptation model was determined using Functional Independence Measure (FIM) tools. The first way of adaptation is patient adapting in physiological dysfunction that cover in person's ability in self-care activities, mobility, self-management of bowel and bladder elimination. The second way of adaptation is adapting in self-concept that cover in psychological functions and through the ability to communicate, in remembering and adapting in role function and interdependence mode such as participate in social activities, problem-solving and the ability to make decisions.

Early adaptation is defined as a patient's response to the physiological, psychological, and social disability resulting from PICH stroke, whereas long-term adaptation is the outcome gained by PICH patients' achievement of functional recovery during the rehabilitation phase. The adaptation phase in this study was divided into two phases. The early phase refers to the time of hospitalization after surviving the critical period, whereas the long-term recovery phase occurs at home. Positive adaptation at the early and long-term phases refers to the process by which a patient shows positive recovery outcomes towards stroke disability and regains the ability to perform functional activities with minimal dependence on helpers. Positive adaptation outcomes at three months are perceived as a patient's ability to recover from stroke problems and to function in such activities as self-care, mobility, communication, and social interaction. The finding of this study concurred with suggestions from a previous study, which stated that to achieve positive adaptation to stroke-related disabilities, one has to adjust to physical and

cognitive deficits, overcome limitations to function in activities, and control one's life effectively (Ostwald, et al., 2008).

5.3 Early adaptation

The effect of PICH depends on the severity of the injury and the essential functions that are affected, such as cognition, communication, and physical function. This study revealed that in the acute recovery phase, the majority of PICH patients were in-adaptive in responding to the sudden stroke-related disabilities. Results show that most PICH patients had scores in the lower categories of early adaptation to function in activities of daily living. This demonstrates that more than two-thirds of patients were highly dependent, whereas almost a quarter of them were in the moderately dependent category during the early recovery phase post PICH. In other words, almost 90% of PICH patients exhibited negative early adaptation. This finding indicates that in the early inpatient recovery phase, most of the patients was unable to be independent in performing functional activities and exhibited deteriorated cognitive performance. PICH was reported by several studies to be associated with severe physical, psychological, and social consequences for patients, as their ability to perform their activities, to communicate effectively, to participate in social activities without assistance, as well as causing immobility, changes in emotional status, and inability to cope with the sudden disability (de Palva, Silva, Valadares, Valente, 2012; Jammali, Mclnnes, Markus, Fauk et al., 2011; Toyoda, Steiner, Epple, Kern et al. Oh &Seo, 2010; Miller, 2010; Norman 2014; Rathor et al., 2012; Dalvandi et al., 2010; Leung et al., 2010; NINDS, 2011).

5.3.1 Predictors of early adaptation

The finding of this study found that there are factors positively or negatively affect the ability of PICH patients to adapt with their limitations or disabilities in terms of participating in functional activities. In the early phase post PICH, female patients with higher scores in neurological deficit, bleeding in the intracerebral at non-lobar areas of the brain, lower stroke knowledge and respiratory complications at the acute phase had lower abilities to adapt to functional disabilities in the acute phase post PICH. This result concurred with Jammali, et al. (2011), who found that an increased degree of dependency and reduced physical health status among ICH or haemorrhagic stroke patients were related to the severity of neurological deficits and female gender.

5.3.1.1 Gender (female)

This study found that PICH occurs more often in men (58.4%) than in women (41.6 %), and above half (64.6 %) of the patients were below 60 years of age. Female gender was associated with early adaptation to stroke-related functional disability. This result indicates that being a female was correlated with a lower adaptation score relative to sudden stroke disability compared with being a male. The finding revealed that females reported a score lower in the ability to participate in self-care activities, to manage bowel and bladder effectively, to perform movement and transfer, and to communicate effectively. This finding is consistent with a previous report that patients with PICH tended to be male rather than female. However, female patients reported low survival (Zhou, Zhang & Arima et al., 2014; Al-Khaled et al., 2014; Yesilot, Koyuncu, Coban, Tuncay & Bahar 2011). The reasons for the poorer early adaptation and dependence to function among females in this study are worse clinical status upon admission and less

social support than males. In terms of clinical status, being a female was associated with poor physical health after stroke. Female patients were unable to cope with the disabilities and frequently depended on family caregivers to perform self-care activities, such as eating, toileting, bathing, moving, and transferring.

This study found that women who survive a stroke have less favourable outcomes than their male counterparts. Poorer functional abilities occur because of lower physical function, thinking, language, and energy. For example, Almborg, Ulander, Thulin, and Berg (2010), Carod–Artal and Egido (2009), and Gargano and Reeves (2007) reported that females had less health-related quality of life (HRQoL) than men in terms of physical functioning. Kim, Lee, Roh et al. (2010), in their study on patients with mild neurologic deficits, found that poor outcomes were experienced by more females than males at discharge (Carod-Artal, & Egido (2009). Other studies reported that females were likely to have physical impairments and limitations in their ADL and less likely to be discharged for home than males with the same condition. This is because of the higher proportions of females with severe disability at discharge and at follow-up (Jammali et al., 2011).

Other reasons were weak social support among female stroke patients. Zhou, Zhang, Arima and Zhao (2014) found that women are more likely to be dependent in the early phase and had a higher risk of dependency at three and six months after ICH. The worse outcome in females is attributed to having severe ICH upon admission. According to Jaracz, Fudala, Gorna, and Kzubski (2014), family caregivers play an important role in a loved one's recovery from stroke and are required to provide care, to help in daily living activities, to participate in rehabilitation, to give emotional support, and to motivate the patient in his or her recovery. In this study, the delayed early adaptation among female stroke patients can be attributed to low family caregiver support, especially from their

spouses. In our observation, the stroke patients in this study were not cared for by their spouses. The care responsibilities were given to the children, especially their daughters. This finding is consistent with that by Daniel, Wolfe, Busch, and Mc Kevitt (2009), who noted that many stroke patients experienced family conflict and marital problems after stroke. These problems include separation, deterioration in the spousal relationship, and negative impact on children who are caregivers. Further, Weimar, Ziegler, Konig, and Diener (2009) and Almborg, Ulander, Thulin et al., (2010), found that low adaptation post stroke was among females with less of social support.

5.3.1.2 Physical dysfunction

In relation to the physical domain of adaptation, the majority of patients were not independently able to perform activities on their own and required a helper to perform self-care activities, such as eating, grooming, bathing, dressing the upper and lower body, and cleaning the body by themselves. They also showed an inability to manage their own bladder and bowel and to transfer from one place to another. Dalvandi et al. (2010) and Oh and Seo (2010) stated that the deficits exhibited by PICH patients had a negative impact on their physical, thus affecting their daily roles and self-management. Adaptations to the physical dysfunction post PICH were depended on several variables such as age of the PICH stroke patients, severity of neurological deficits immediately after ICH, location of brain lesion or development of post stroke complications.

5.3.1.2 (a) Severity of motor neurological deficits

Severity of neurological deficits was the strongest factor that affects the ability of patients to adapt in the early phase post PICH, β =1.91, 95% CI [-2.646, -1.189].Severities of

neurological deficit contribute as stimuli to alter the ability of individual function as normal human being. This result indicates that those who have higher NIHSS scores had a decreased ability to adapt to stroke-related disabilities during the acute recovery phase post PICH. Previous studies reported that neurological function, as measured by the NIHSS, is usually scored during acute-care hospitalization and is used as a predictor of discharge (Ostwald, 2008). The disabilities resulting from sudden neurological deficits included facial palsy (77.9 %), motor function of left arms (63.7%) and legs (65.5 %), motor function of right arms (42.5%) and legs (45.1%), and dysarthria (75.2 %). This finding indicates that most patients were diagnosed as having left hemiparesis with facial palsy, dysphagia, aphasia, apraxia, and dysarthria. The finding indicates that right intracerebral haemorrhage or stroke in the brain presents as left-sided hemiplegic or hemiparesis (NINDS, 2008).

The finding is confirmed that the right intracerebral haemorrhage or stroke in the brain indicates left-sided hemiplegic or hemiparesis. Conversely, a person with a left intracerebral haemorrhage or stroke in the brain will show deficits on the right side of the body (NINDS, 2008). This finding is consistent with that of Dalvandi et al. (2010), Aries and Hunter (2015), Skolaruset al. (2015), and Green and King (2010), who reported that hemiplegia, hemiparesis, sensation dysfunction in the limbs, and balance and coordination impairment caused a deficit in mobility and altered self-management, such as ADL, among ICH patients. In fact, a patient experiences haemorrhagic stroke usually has difficulty in participating in functional activities as a result of the diminished motor cortex in the frontal lobes or the lower parts of the brain, such as the cerebellum, which controls balance and coordination (NINDS, 2008).

The physical deficits of post PICH predicted lower physical activities related to daily living, and the majority of patients demonstrated higher dependency on a helper to meet

basic needs in the early phase post PICH. The most difficult tasks reported were self-care activities (grooming, bathing, dressing the upper and lower body, toileting), control of urinary and bowel movement, and transfer and locomotion (i.e., walking or using a wheelchair or climbing the stairs). The findings on physical disabilities resulting from stroke are comparable to many other relevant studies. For example, Almborg, Ulander, Thulin & Berg, (2010) stated that nearly two third of patients who experienced stroke exhibited a higher neurological deficits which translated to diminished motor strength largely associated with physical disability. Another study also found that about half of the stroke patients had walking disability as well as mild to severe inability to perform self-care functions among others, bathing, attending to toilet needs, walking, and climb up or going down stairs, which necessitated considerable or total dependence on others **(**Pandian & Arya, 2013). Moreover, Oh & Seo (2010) reported that functional ability increased at various times after ICH. Comparing with the finding of study done at University of Malaya Medical Centre (UMMC) approximately 50% of patients were detected to have motor deficit, also found that the most common motor deficits for primary ICH were weakness (61.8%) and language disorders were present in 45% of patients. Results of this study were compared with the result of study done by Bahou (2009) that found prevailing clinical manifestations of patients in their study were hemiparesis/plegia, impaired level of consciousness and headache/vomiting (Sia, Tan, Waran, 2007).

The conclusion was also compared to the findings of several studies administered by Aries & Hunter (2015), Skolarus et al. (2015), Green & King (2010), Dalvandi, et al. (2010), Leung et al. (2010), and Oh & Seo (2010). They reported that stroke patients were more likely to be dependent in self-care and mobility activities and in most cases to require help with bathing/showering and dressing. Such patients were said to have lower

physical capacities, as well as limitations in their daily physical activities. The loss or limitations regarding physical activities result from damage to the lower part of the brain, the cerebellum, which affects the body's ability to coordinate movements, further associated with body posture, walking, and balance issues. The negative impact on the physical and cognitive abilities of a person after PICH was compared to the findings of Dalvandi et al. (2010), Mollaoglu, Fertelli and Tuncay (2010), Pandian & Arya (2013), Norman (2014), and Rathor et al. (2012). These researchers reported that hemiplegia, hemiparesis, sensational dysfunction in the limbs, balance, and coordination impairment, which caused mobility deficit and alter the self-management capacity, such as ADL, are all common among ICH patients (NINDS, 2008).

The result of this study shows that those who decreased the ability to adapt with stroke-related disabilities during acute recovery phase post PICH were among those who have increased score of NIHSS. This finding was compared with Glymour, Berkman, Ertel, et al., (2007) that was examined the relationships between physical, cognitive, and social participation outcomes across sub populations of stroke survivors on the basis of cortical involvement and lesion lateralization. The result revealed that physical deficit post stroke predicted physical performance, activities of daily living, and IADL independence.

A better rehabilitative in physical performance ability prognosis and higher neurological score at acute was associated with the mechanisms for neurological deficit that may be caused by brain compression. As the hematoma resolves, neurological functions recover and functional status improves but if hematoma not resolves the neurological functions will not recover and functional status were not improved.

5.3.1.2(b) Location of brain lesion

The second factor affecting physiological domain of adaptation is the location of the brain lesions. As noted earlier, primary intracerebral haemorrhage is defined as bleeding occurring directly into the brain parenchyma (Hill, Silver, Austin & Tu, 2000).

In the present study, the analysis showed that basal ganglia is the most common area (49.5%), followed by bleeding of the thalamus in the non-lobar area (14.1%), in the lobar area (11.5%)of the brain, and reveals that about 65.5% of the bleeding occurs in the right hemisphere of the brain. It indicates that brain lesion in the non-lobar area significantly affects the physiological domain of adaptation, especially the ability to perform functional activities in the early phase of post-PICH. Hypertension was found to be the most important risk factor for spontaneous intracerebral haemorrhage, where's the majority of patients (95.6 %) in this study had a past health history of hypertension. According to Liebeskind and Kulkarni et al. (2011) stated that the usual mechanism of primary intracerebral haemorrhage is the leakage from small intracerebral arteries damaged by chronic hypertension. The result of this study consistent with the previous study that found the most common location of ICH on CT brain in hypertensive patients was in the BG (61%), 32 with and 39 without intra ventricular extension (IVE), the majority (54 out of 61) were related to hypertension. Similar to previous study also found that lobar hematomas in only 24 out of 100 patients (24%) (Lo Presti et al., 2014; Bahou, 2009). In Malayisa, previous study was reported that hypertension was the most common cause of ICH, accounting for 71. 5% to 84.8% of patients, especially in individuals who are non-compliant with antihypertensive medication and those who are smokers (Sia, Tan, & Waran, 2007).

Patients with intracerebral bleeding in the non-lobar area are associated with the lower level of early adaptation. Intracerebral haemorrhage in the non-lobar area significantly contributes to worse quality of life (Christensen, et al., 2009). Compared with many studies previously that have found that the location of the brain lesion is among the factors affecting functional ability (Lo Presti et al., 2014; Patel et al., 2007; Christensen, et al., 2009). However, patients with right-side intracerebral haemorrhage or lesion had poor quality of life compared to those with left-side intracerebral haemorrhage (NINDS, 2008; Haan et al., 1995). Right-sided lesions are additionally associated with neglect, anosognosia, and spatial disorientation, which may have a devastating effect on social functioning and thus on HRQOL. Patients may also have problems with orientation, self-consciousness, physical performance, and prosody. Patients with more severe supra-tentorial strokes, be it infarct or haemorrhage, experience poorer quality of living in all existential domains except psychological distress (NINDS, 2008; Haan et al., 1995). There was an associated with between stroke severity and physical and social participation (Ostwald, Swank, & Khan, 2008).

Many studies have found that the location of the brain lesion is among the factors affecting functional ability (Lo Presti et al., 2014; Patel et al., 2007; Christensen, et al., 2009). The location of the brain lesion not only affects motor functional outcomes such as locomotion, mobility, and self-care but also non–motor ones like sphincter control and social cognition. For example, large cortical or sub cortical lesions cause not just degeneration in the corticospinal tract, but decline in global neuronal activities as well. Such declines in the global neuronal activities following diffuse brain damage could further impair the cognitive function (Lo Presti et al., 2014). The inability to perform self-care activities in daily life is associated with the lesion in the left side of the brain, while people who have speech problems are usually among the patients with right-side

brain lesion. (Oh, 2010; Leung, 2010; Dalvandi, 2010; Miller, 2010). Further, patients with right-side intracerebral haemorrhage or lesion had poor quality of life compared to those with left-side intracerebral haemorrhage (NINDS, 2008; Haan et al., 1995). Poor capacity to adapt with stroke-related disabilities among patients with right-side lesion is due to neurological deficits such as neglect of the left body space, insufficient awareness of the disease, and spatial disorientation. Right-side brain lesion can also cause communication problems. A haemorrhage that occurs in the left hemisphere may cause the patient to move slowly and cautiously, and to experience right-visual-field deficiency. Right-sided lesions are additionally associated with neglect, anosognosia, and spatial disorientation, which may have a devastating effect on social functioning and thus on HRQOL. Patients may also have problems with orientation, self-consciousness, physical performance, and prosody. Patients with more severe supra-tentorial strokes, be it infarct or haemorrhage, experience poorer quality of living in all existential domains except psychological distress (NINDS, 2008; Haan et al., 1995). Christensen et al. (2009) stated that hypertensive people with intracerebral haemorrhages in the lobar area suffer from bad quality of life too.

The most common reason for intracerebral bleeding in the non-lobar area is hypertension. The findings of this study show that hypertension is among the most considerable risk factors for spontaneous intracerebral haemorrhage. Around 95.6% of the patients in this study have hypertension history. The results of this research determined that the most common location of ICH on CT brain is among hypertensive patients - in the BG up to 61%. The vast majority (54 out of 61) cases were related to hypertension. Literature review by Liebeskind, Kulkarni et al. (2011) states that the usual mechanism of primary intracerebral haemorrhage is thought to involve leakage from small intracerebral arteries damaged by chronic hypertension.

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5.3.1.2 (c) Respiratory infection in acute phase

The third predictor contributes as factor affecting physiological domain of adaptation during early phase post PICH is post stroke complications. The most complications which occurred in the first and second weeks after PICH stroke were respiratory

infections (46.9%), urinary infections (33.6%), and shoulder pains (17.7%). Furthermore, respiratory infections significantly inhibited positive early adaptation to sudden stroke disabilities ($p < .001$) with coefficient, $\beta = -16.71$, 95% CI [-26.205, -7.227]. The results indicated that those who experienced respiratory infections during the acute phase had lower levels of early adaptation towards independence in performing daily routine activities. The reason for the respiratory infections during the early recovery phase is related to the severity of neurological deficits such as hemiparesis, facial palsy, dysphagia, or altered state of consciousness. The severity of the admission stroke was identified as the most important risk factor for developing complications, including respiratory problems (Kumar, Selim and Caplan, 2010; Johnson, Svendsen, Ingeman, 2012; Indredavik, Rohweder, Naalsund, Lydersen, 2008). Respiratory infections and pneumonia have been reported to occur frequently during hospitalization and are associated with poor long-term stroke outcomes (Kumar, Selim and Caplan, 2010; Johnson, Svendsen, Ingeman, 2012; Kuptniratsaikul et al., 2009; Stott, 2009; Vermeij et al., 2009). It was also reported that respiratory infection wasthe most complications occurred during the first four days after admission (Indredavik, Rohweder, Naalsund & Lydersen, 2008). In addition to that, the results of previous studies stated that post-stroke problems were associated with the occurrence of pneumonia and poor stroke outcome during the three-month recovery stage on all outcome measures (Kuptniratsaikul et al., 2009; Stott, 2009; Vermeij et al., 2009).

5.3.1.3 Adaptation in the cognitive dysfunction

In the cognitive domain of adaptation, the findings indicated that more than half of patients scored low in terms of the ability to communicate effectively, participate in social activities, solve problems, and make decisions at two-week post ICH. Dalvandi et al.

(2010) and Oh and Seo (2010) stated that the deficits exhibited by PICH patients had a negative impact on their physical and cognitive abilities, thus affecting their daily roles and self-management. The cognitive domain of adaptation of this study is deals with psychic and spiritual integrity, including beliefs and feelings, and deals with interpersonal relationships (Roy, 2009; Ordin, 2012). The assessment of cognitive domain of this study covers in terms of self-concept mode (psychological) of adaptation. According to many researchers, cognitive dysfunction occurs due to the inability to communicate effectively or the loss of ability to think, remember or be involved in problem solving (Skolarus, 2014; Taylor, Todman & Broomfield et al, 2011; Oh, 2010; Leung, 2010; Dalvandi, 2010; Vanhook, 2009).

5.3.1.3(a) Adaptation in self-concept (psychological) mode of adaptation

Deficits experienced by PICH patients in this study had a negative impact on cognitive abilities. This finding is consistent with that of Dalvandi et al. (2010), Aries and Hunter (2015), Skolarus et al. (2015), and Green and King (2010), who reported that physical deficits experienced by PICH patients in this study had a negative impact on cognitive abilities.

In addition to displaying cognitive dysfunction, the result shows that 29.2% of the patients have changed in terms of consciousness state, 42.5% are unable to answer the question, and 38.1 % are unable to respond to the command. A study conducted by Sia, Tan, and Waran (2007) also found that the loss of consciousness is one of the most common clinical characteristics of primary ICH (58.5%) and is associated with reduced ability to adapt to functional cognitive activities. Regarding the state of consciousness and cognitive deficit (language and dysarthria) of PICH patients, Bahou (2009) also discovered an impaired

level of consciousness and suggested that neurological deficits which patients experienced can lead to certain losses or disabilities.

Cognitive dysfunction was found to be associated with the inability to perform self-care activities, to take part in community occupations, and to depend on others for functional activities. Janice (2006) suggests that high priority of focus should be given to patients with limitations or malfunctions in their cognitive abilities in order for improved communication adaptation, social participation, and total functional recovery to occur.

Skolarus et al. (2015) reported that stroke patients also suffered from aphasia or dysarthria and exhibited poorer performance on word recollection. Their clock drawing abilities were impaired as well. Similarly, a local study by Sia, Tan and Waran (2007) also discovered that loss of consciousness was one of the most common clinical features for primary ICH (58.5%) associated with reduced ability to adapt to functional cognitive activities.

5.3.1.3(b) Psychosocial domain of adaptation

In this study, psychosocial domain of adaptation covers the ability of individual with stroke disability performed their role function to performed activities of daily living and able to participate in social activities that cover the ability to interact with others, solving the problems and make a decision making. In this study, the finding revealed that nearly a majority of patients have more difficulties with social interaction, memory and decision making, and show a high dependence on a helper. Psychosocial dysfunction (role function and interdependence mode of adaptation) was found to be associated with the inability to perform self-care activities, to take part in community occupations, and to depend on

others for functional activities. The finding of this study consistent with finding by Bahou (2009), who found that the prevailing clinical manifestations such as impaired level of consciousness and neurological deficits among ICH patients can lead to problems of losses or disability and needs of others to help in functional activities.

In this study, the findings revealed that 75.2% of the patients experienced symptoms of dysarthria and 63% faced language inadequacy. Further, language and dysarthria significantly decreased the total score of neurological status assessed using NIHSS and affect the cognitive domain of adaptation. The dysarthria and language deficit issues caused more than half of the patients to exhibit inferior abilities to communicate effectively, participate in social activities, solve problems, and remember important elements of their everyday. These results are consistent with the ones reached in the studies of Skolarus (2014), Taylor, Todman, Broomfield et al. (2011), Oh (2010), Leung (2010), Dalvandi (2010), and Vanhook (2009), who found that, in terms of cognitive ability, some stroke patients were unable to communicate effectively or lost their ability to think, use their memory, or be involved in problem solving. Cognitive deficit (language and dysarthria) which patients experience can lead to certain losses or disabilities (Gillespie et al., 2015). Skolarus et al. (2015) reported that stroke subjects also suffered from aphasia or dysarthria and exhibited poorer performance on communication.

5.3.2 Summary

The findings revealed that those female patients with the higher score of neurological deficit, bleeding intra cerebral at non lobar area in the brain, lower stroke knowledge and having respiratory complication at acute phase were associated with the lower abilities to adapt with functional disabilities in acute phase post PICH. A better understanding of the

factors that affect the process of adaptation is essential to develop an adequate stroke education program and specific rehabilitation interventions for patients with strokes related to bleeding intra-cerebral before they are discharged.

5.4 Improvement functional adaptation at three month post PICH

In this study, the result indicates that at three-month follow-up, the majority of PICH patients were able to adapt with stroke-related disabilities and showed high independence in performing functional activities. At three months post PICH, patients exhibited high adaptive outcome in physical adaptation, specifically routine self-care activities, control of bladder and bowel, and mobility.

This study found that there was significant difference in terms of early adaptation in response to stroke-related disability during acute recovery phase and at three months adaptation outcome, t (112) = -15.3, $p < .05$ range from 18 to 126. The result indicated that the mean (SD) score improved from 48.1 (30.1) at early phase to 93.2 (34.79) at three months post PICH.

The result obtained shows that in early acute phase after PICH about 64.6% of the subjects suffered with the sudden functional disabilities in a physical and cognitive domain of individual well-being. Compared with of adaptation outcome at three months, the finding shows that among 63.7% of subjects able to adapt with the disability and gain ability to do functional activities in a physical and cognitive domain at three months. However, there were 41 (36.3%) who still did not achieve their ability to do functional activities and still required moderate to full help or assistant from caregivers. This finding was confirmed in the previous finding by Oh & Seo, (2010), reported that the ability to gain

functional activities was significantly increased, the ability to function in activities improved between three and nine months after ICH.

This study found that recovery of physical and cognitive abilities occurred within three-month post PICH. During early phase, rehabilitation was instituted and continued until long term. Thus, this confirmation of rehabilitation helped in their adaptation. Accordingly, a significant improvement of their physical and cognitive functions was demonstrated within three months post PICH compared with previous early adaptation status. Majority of the patients gained adaptation with stroke-related physical disability, and showed minimal dependence on caregivers in performing routine self-care activities, control of bladder and bowel, and relative mobility such as walking. In terms of cognitive domain of adaptation, PICH patients with communication and social disabilities exhibited increased independence and consequently, lower dependence on their caregivers.

The results of this study were compared with previous finding, for example, Macco et al., (2006) and Samsa et al (2007) stated that physical and cognitive dysfunction post ICH significantly improved rapidly in between 3 to 9 month, while Oh & Seo, (2010) found that physical and cognitive dysfunction post ICH significantly had improvement during one to six-month post ICH. The finding of this study confirmed the study that predicted a functional outcome in patients with primary intracerebral hemorrhage using FUNC score (a functional outcome risk stratification scale) that reported, at 90 days post PICH, 162 (26%) patients achieved independence (Rost, et al., 2008).

Another study showed that a similar result from this study by Rost et al., (2008) in predicting functional outcome in patients with primary intracerebral hemorrhage using FUNC score (a functional outcome risk stratification scale) . It was found that at three months, 162 (26%) patients achieved independence (Rost, et al., 2008). The result of this

study also compared with the study done by Leung, Cheng, (2010), showed that there were significant differences between the admission and discharge FIM scores.

This indicates that the patients showed significant functional improvement after the rehabilitation training. Rehabilitation programs were significantly able to improve functional recovery and able to return the stroke survivor to society with the abilities to function in cognition and functional activities (Miller, 2010; World Health Organization [WHO], 2010). Similarly, Rost et al. (2008) using FUNC score that is, a functional outcome risk stratification scale reported that 162 or 26% of patients with primary intra-cerebral haemorrhage achieved independence within three months.

With regards to adaptation in the physical recovery domain, the majority of the patients suffered a high degree of inability to adapt to the sudden disability and were unable to perform routine physical activities and basic functions. By contrast, within three months post PICH, patients exhibited high adaptive outcome in physical adaptation, specifically routine self-care activities, control of bladder and bowel, and mobility. The result reveals that a majority of patients gained adaptation with stroke-related physical disability and, accordingly, showed moderate dependence on caregivers. The findings on physical disabilities resulting from stroke are comparable to many other relevant studies. Study also found that about half of the stroke patients had walking disability as well as mild to severe inability to perform self-care functions among others, bathing, attending to toilet needs, walking, and climb up or going down stairs which necessitated considerable or total dependence on others **(**McNaughton, McPherson, Taylor et al., 2003; Shen, Cordato, Chan et al., 2006). Moreover, Oh & Seo (2010) reported that functional ability increased at various times after ICH.

Moreover, the improved physical abilities resulting from stroke over time were comparable with other studies. Mocco et al. (2006) &Samra et al. (2007) likewise, stated that improvement in functional activities post stroke significantly happens in between one to three months, although his tended to reach the plateau at nine months.

5.5 Predictors of Later Adaptation

In the regression model, six predictors determined significantly as factors affect later (three month) patients ability to gain adaptation in functional activities. The predictors includes age of the PICH patients, total functional ability at baseline (FIM early), total stroke knowledge, urinary tract infection at three months post ICH, total depression at three months post ICH and ICH treatment. The finding was consistent with the previous study found that patients' age, pre-training functional level during early admission at hospital, and cognitive abilities measured at admission successfully predicted functional gain as measured by the FIM scores (Leung, et al., 2010).The finding is compared with the previous finding that reported baseline demographic and clinical characteristics (age, initial neurological deficit, systolic blood pressure, ICH volume, and deep ICH) and neuro worsening during the acute phase of treatment to all be independent predictors of poor HRQOL (Christensen, Mayer, & Ferran, 2009).

5.5.1 Adaptation to physical dysfunction at three month

In the physical domain, the result revealed that PICH patients gained independence to participate in performing self-care activities of daily living (eating, grooming, bathing, dressing upper and lower body and toileting) in bladder and bowel management, in mobility and in locomotion. The mean (SD) value for physical (motor) activities of

Adaptation Outcome was 65.0 (28.0) range from 13 to 91. The result revealed that at three-month majority of subjects were gaining adaptation with stroke physical disability, they showed moderate dependence on caregiver to perform self-care activities of daily living, to control the sphincter of bladder and bowel, to transfer or walk. In comparison to the study by Green (2010) also reported patient perceived to improve their quality of life during long-term recovery phase, particularly in the early recovery period. During this period, they overcome the physical disability by restructuring of daily living routine to decrease the need of assistance from family.

With regards to adaptation in the physical recovery domain, the majority of the patients suffered a high degree of inability to adapt to the sudden disability and were unable to perform routine physical activities and basic functions. By contrast, within three months post PICH, patients exhibited high adaptive outcome in physical adaptation, specifically routine self-care activities, control of bladder and bowel, and mobility. The result reveals that a majority of patients gained adaptation with stroke-related physical disability and, accordingly, showed moderate dependence on caregivers. The findings on physical disabilities resulting from stroke are comparable to many other relevant studies. Study also found that about half of the stroke patients had walking disability as well as mild to severe inability to perform self-care functions among others, bathing, attending to toilet needs, walking, and climb up or going down stairs which necessitated considerable or total dependence on others **(**McNaughton, McPherson, Taylor et al., 2003; Shen, Cordato, Chan et al., 2006).

This finding is consistent with the literature, the better a spouse copes with psychological and physical expectations of a disability related to stroke, the better the outcome the patients will have (Kautz & Horn, 2009). It is because life after having disability resulting from stroke is usually difficult. Lack of physical and cognitive function, limitation in

social interaction, experience of post stroke complication, emotional and stress, stroke patients show high dependency on other to help them, especially spouse. Spouses were expected to provide competent physical care for their loved ones. PICH patients with stroke increasingly depend upon their spouse for this continuing care, particularly when they are experiencing advanced deterioration of health and disability after stroke. Spouse or caregivers must learn to help with activities of daily living (ADLs), such as bathing, dressing, grooming, feeding, and toileting. Many research findings stated one family member who needs inpatient acute recovery care and rehabilitation demand support from all family member especially spouse to help them in participating in performing functional activities in all aspects of life (Kautz & Horn, 2009; Dalvandi et al., (2010); Oswald's (2008).

This result can be used as strategies in promoting carer to involved in providing care for their family member who requires inpatient rehabilitation post PICH. This result will be used as new intervention of involvement family carer of disability patient starting from hospital setting to home and as strategies to help family carer to be able to provide a good care for stroke patient and to ensure carer can cope with change of the patient resulting from PICH. As stated in literature review, it would be necessary to include the patients and caregivers at the team meeting while maintaining the existing time constraints and to establish a baseline to the level of participation that could be achieved. Once the feasibility could be established of having the patient present and able to address these questions, one could begin to increase the degree to which entire approach could be implemented (Ozer 2000). Disability and post stroke complication such as infection and depression resulting from stroke contribute as factors affecting recovery process and also can alter life satisfaction and reduce good family relationship. This finding suggests that it is important to help stroke patients and their family member to adapt with stroke-related

problem and to enable patient with stroke to become reintegrated into their family and the community.

5.5.1.1 Age

In this study, age was also shown to be a significant inverse predictor of adaptation in physical improvement. There was a significant negative relationship between age and later (3 months) adaptation after PICH. It indicates that, younger age was significantly related with better long-term adaptation. The analysis revealed that decrease in one year of age of PICH patients was associated with an increase of FIM score, representing better long-term adaptation. This finding is consistent with previous finding by Denti et al. (2008), stated younger' age patient was a significant predictor of functional improvement. Moreover, age was negatively related to physical functioning where younger patients had better physical function. A higher improvement in adaptation to stroke-related disability will also likely increase social participation.

Individuals who have higher incidence of survival following a stroke were among those who were under 80 years old as compared to those over 80 years of age (Duncan, 1994, Almborg, et al., 2010). In addition, elderly ICH patients showed the poorer outcome, including higher in-hospital mortality and moderate or severe neurological deficit at the hospital discharged, than younger patients with intracerebral haemorrhage. Saloheimo et al. (2006) found the predictors for long-term (> 6 months) recovery after ICH includes age, the level of consciousness, the severity of disability, and hematoma volume and location. In another study, patients' age, pre-training functional level, and cognitive abilities measured at admission successfully predicted functional gain as measured by the FIM scores (Leung, et al., and 2010).

Furthermore, Qureshi, Mendelow, & Hanley (2009) found that prevalence of ICH was significantly higher among young and middle-aged groups. It commonly occurs among the blacks compared with the whites of the same age. The difference was mostly found in the incidence of deep intracerebral haemorrhage, most prominent in young and middle-aged people (Qureshi, Mendelow, & Hanley, 2009).

To summarize, patients aged above 60 years with intracerebral haemorrhage showed the poorer outcome, including higher in-hospital mortality and moderate or severe neurological deficit at the hospital discharged, compared with younger patients with intracerebral haemorrhage.

5.5.1.2 Functional status at early phase

A positive significant relationship was found between early and later (three months) adaptation outcomes. An increase in one unit of the early adaptation in the acute score was associated with the increased later (three month) adaptation outcome score by $\beta = .40$, 95% CI [0.25, 0.55]. The total FIM score at the early phase post-stroke onset was associated with an influence on the improvement in the total FIM score at the long-term rehabilitation phase (Hinkle, 2006). The finding was also compared with one by Fong, Chan, and Au (2001), which described a significant association of motor and cognitive deficits with functional participation among stroke patients during stroke rehabilitation. According to Green et al. (2010), patients reported an improvement in perception of adaptation during the early phase post stroke. An overall improvement was found in the ability to function in physical activities and lack of need for family caregivers.

Better adaptation to participate in performing functional activities (physical and cognitive) during the acute recovery phase was associated with gaining positive achievement in later (three months) adaptation outcomes. According to Petrina (2011), a patient who has neurological deficits, such as physical, psychological and social, resulting from stroke may regain the ability to participate independently in functional activities, even if some degree of residual physical alteration remains through rehabilitation training. The analysis also proved that recovery is related to the severity of neurological deficits and low dependence on caregivers in terms of performing functional activities during the recovery phase immediately after and at three-month post PICH. The result revealed significant negative correlations between later (three months) adaptation outcomes of living with stroke disability at three months and the severity of neurological deficit (NIHSS) (r = -.419, $p < 0.05$). The result indicated that higher adaptation to participation in functional activities at three months post PICH was significantly related to a lower severity of neurological deficit (NIHSS) determined at the early phase. The findings of this study are consistent with those of a previous study that examined the correlation between the severity of neurological deficits (NIHSS) and functional disability using FIM. This previous study revealed that the degree of alteration in body function related to intracerebral haemorrhage has a direct relationship with the ability to participate in functional activities, whether upon admission or discharge (Roth et al., 1998).

However, according to Roth et al. (1998), haemorrhagic stroke patients demonstrated recovery of body dysfunction faster than those with other types of stroke. Haemorrhagic stroke patients who were observed to gain a high level of participation in functional activities at three months are among those who exhibited a lower ability to perform functional activities at the acute phase (r = .606, $p < 0.05$). The result indicated the existence of relationships between a lower score relative to participation in functional activities at the acute phase and the ability to adapt to disability at three-month post

PICH. This finding confirms the result of a previous study, which stated that positive early and later (three month) adaptation is related to the degree of severity of neurological dysfunction after ICH onset (Hinkle, 2006). In other words, the severity of neurological deficits attributed to ICH is related to the prognosis and the ability to function in daily activities.

The reason behind the significant association between early adaptation in response to stroke-related disability and long-term adaptation outcome is the recovery of neurological deficit. Leung et al. (2010) reported that recovery in the first two months post stroke was determined more by spontaneous neurological recovery and less by the impact of therapy. This is particularly applicable to recovery from haemorrhagic strokes. Neurological functioning could be recovered, particularly when the haematoma has resolved and the oedema has subsided (Kwakkel et al., 2004; Schepers et al., 2008). The specific pattern of recovery of haemorrhagic stroke patient can be described as a quick rebound of functions after the haematoma has resolved, thus laying the path for greater functional gain in patients with low FIM scores upon admission (Kelly, et al., 2003). Moreover, ICH patients had significantly greater recovery than cerebral infarction patients with stroke of similar severity.

However, an inverse relationship was found between pre-training functional level and functional gain after training, thus suggesting that haemorrhagic stroke patients who have poor baseline functional levels may indeed be capable of showing progress in rehabilitation training (Leung et al., 2010). On the other hand, low FIM scores upon admission may be associated with more room for improvement and hence allowed more room for observable treatment effects reflected as FIM gain (Leung et al., 2010).

Fong, Chan, and Au (2001) found a significant association of motor and cognitive deficits with functional participation among stroke patients during stroke rehabilitation. The present finding confirms that the assessment of physical function upon admission using FIM, which measures the extent of disability related to self-care, bowel and bladder continence, mobility and ambulation, was independently associated with significant functional disability and caused delayed discharged. However, pre-training functional level has been shown to be a significant predictor of functional improvement (Tan, Chong, Chua, Heng, & Chan, 2010). Another reason for the improvement in the ability to adapt to sudden physical disability and cognitive disability among patients is the early referral to comprehensive rehabilitation care for advanced training. The patient was given an appointment to participate in rehabilitation training. Before being discharged, the patient was also referred to a district rehabilitation centre nearest to his or her home to continue the training and rehabilitation care.

According to Green et al. (2010), patients reported an improvement in perception of adaptation during the early phase post stroke. An overall improvement was found in the ability to function in physical activities and lack of need for family caregivers.

5.5.1.3 Urinary infection at three months post PICH

In relation to post stroke complications, the descriptive analysis showed that during acute inpatient rehabilitation phase post PICH, the common complication was respiratory infection (46.9 %), urinary infection (33.6 %) and shoulder pain (17.7 %). Most complications occurred during the first and second week after PICH stroke. Compared to the development of post stroke complications at three months, the most common of stroke complications was shoulder pain (63.7%) and only 8.8 % of subject experience urinary

infection. However, the percentage of shoulder pain that occurred among the subjects revealed an increase from 17.7 % in acute phase to 63.7 at three-month post stroke. In terms of deep-vein thrombosis and bedsore was rare on post stroke subject, whether during early phase inpatient hospitalization and at three months at home.

The finding is consistent with previous study revealed that the most common complications were pain (23.9%), urinary tract infection (16.0%), chest infections (11.2%), whereas deep venous thrombosis, shoulder pain, and pressure sores were each present in 2.5% of patients and reported that the most complications occurred during the first 4 days after admission (Indredavik, Rohweder, Naalsund & Lydersen, 2008). Longhorne, (2000), also reported the most complications developed within the first 6 weeks after stroke, with an early onset being seen particularly for pressure sores, pain, and infections. While compared with another study regarding post stroke complication that occurred at three months, previous study stated that during the 3-month follow-up, 82.4% experienced at least 1 complication, the most common of which was pain, which occurred in 53.3%, followed by urinarytract infection in 27.9% (Indredavik, Rohweder, Naalsund & Lydersen, 2008). Another finding stated that there also found are relatively low frequencies of the deep-vein thrombosis among stroke patients (Langhorne, Stott, Robertson, 2000).

Regression analysis revealed a significant negative relationship between urinary infections at three months and long-term adaptation. In other words, those with no evidence of urinary infection at three-month post ICH had great positive long-term adaptation outcome scores. The finding highlighted that the improvement in long-term adaptation to stroke-related disability was associated with the absence of UTI during long-term recovery and rehabilitation. As previously mentioned, being prone to UTI before urinary incontinence was reported to be independently associated with poor adaptation after stroke and is a factor of initial stroke severity that is related to long-term

outcomes of quality of life (Kumar, Selim & Caplan, 2010; Patel et al., 2007). Another study by Hamidon et al. (2003) involving patients with acute Ischaemic stroke in UKM Hospital from June 2000 to January 2001 revealed that urinary tract infection served as predictors of negative long-term outcomes. The reasons for UTI during a long-term post stroke include the stroke itself, impaired consciousness, immobility, faecal impaction, or temporary over-distension of the bladder (Doshi et al., 2003).

In preventing risk of UTI, comprehensive CBD care and observation for UTI should be conducted. Knowledge of baseline factors that predict the occurrence of UTI will also assist in the monitoring of patients and the prevention of stroke complications. Thus, comprehensive CBD care and regular observation on conditions leading to UTI are crucial in the prevention of the risk of UTI.

In our hospital setting, strategies used in the prevention of post-stroke UTI and important precautions include the avoidance of unnecessary catheterization. Other ways to prevent catheter-associated UTI include insertion in an aseptic manner, correct positioning of the drainage tubing and collection bag, and maintaining a closed system, which may all help reduces the risks of clinically significant infection. If a urinary catheter is used, the standard guideline on the management of patients with a urinary catheter should be followed and modified catheters coated with antimicrobials should be used to reduce the risk of UTI by implement of early removal. The catheter should only be changed if it begins to crack or deteriorate or if the patient has a UTI. Kumar et al. (2010) also suggested the use of antimicrobial-coated catheters or modified catheters, such as nitrofurazone-coated silicone or silver-coated latex, to minimize catheter-associated UTI.

So, the finding from this study confirmed that the most common complications during the early phase and at three-month post PICH was infections (such as respiratory infection and urinary infection), and deep-vein thrombosis and bedsore are rare occur on post stroke

subject, whether during early phase inpatient hospitalization or at three months at home in community area. The result also found that pressure sores, pain, and infection was commonly developed in between one to six month (Longhorne, 2000). Weimar, Roth Zillessen, Glahn et al, (2002), found, the complications due to prolonged immobilization, such as deep venous thrombosis and pulmonary embolism, were generally rare among post stroke patients.

Previous finding stated that the important risk factors significantly found to have the association with the development of post stroke complications included severity of PICH that determines using GCS, severity of neurological deficit and level of functional disability (Indredavik, Rohweder, Naalsund & Lydersen, 2008). Study found that stroke patient who has a higher risk of infections, falls, pressure sores, pain, anxiety, and depression were significantly associated with those who more dependent patients on a helper (Longhorne, 2000).

5.5.1.4 PICH treatment

Toyoda, Steiner, Epple, and Kern et al. (2013) suggested that all patients with acute ICH should preferably be treated in a stroke unit or in an intensive care unit if the patient condition requires because the stroke care unit reduces mortality and increases the likelihood of good functional outcome of stroke in general. In this study, PICH treatment was associated with long-term adaptation outcomes. PICH patients who received combined surgical and conservative treatments exhibited higher adaptation outcome scores than patients on conservative treatment only. The results indicate that PICH treatment is associated with increased adaptation outcome scores, 95% CI [10.4, 34.5]. This finding means that PICH patients who have gone through combined surgical and

conservative treatment, conservative treatment alone, and neuroscience inpatient rehabilitation care post PICH have shown improvement in their ability to participate in functional activities.

Approximately 13.3% of PICH patients in this study received surgery in combination with conservative treatments. The patients who required surgical intervention are those who were admitted with severe stroke and poor GCS. Surgical management includes craniotomy or burr hole to evacuate the blood clot in the brain parenchyma or in the lobar area or surgery for the insertion of a tracheotomy tube. The study by Wei et al. (2011) revealed that patients with more severe strokes upon presentation, as evidenced by poor GCS scores, were more likely to be surgical candidates. Surgical evacuation of the haematoma, especially for lobar haemorrhage or cerebellar haemorrhage, resulted in improved outcomes (Broderick, 2007; Mendelow, Gregson, Fernandes & Murray et al., 2005). Surgery for brain haemorrhage is an important treatment for an appropriate selection of ICH patients, especially with improved operative techniques, such as minimal invasiveness, safety, and effectiveness of clot evacuation method, such as endoscopic surgery (Nakona, 2005).

Conservative treatment for PICH patients focuses on the regulation and control of blood pressure (Al- Khaled, 2014). More than three-quarters of PICH patients in this study were prescribed a drug for the treatment of hypertension; these drugs include Labetalol (Trandate), Amlodipine, Esmolol (Brevibloc), Nicardipine (Cleviprex), Fenoldopam (Corlopam), sodium nitroprusside, Nitroglycerin (Tridil), and Hydralazine (Apresoline) in combination with other types of drugs, such as those for lowering high cholesterol like Lovastatin. Antibiotics are administered if patients are at risk of respiratory tract infection or UTI and some patients also receive antipyretics, such as Paracetamol. Conservative treatment uses such drugs as anti hypertensive, anti-cholesterol, diabetes mellitus, antibiotic, and analgesic drugs for patients (95.6 %) with high blood pressure upon

admission and with a past health history of hypertension. Other agents used to include osmotic therapy (mannitol, hypotonic saline), anticonvulsion agents (e.g. Diazepam), or antipyretics (e.g. Acetaminophen) that are appropriate for patient conditions and needs (Jauch, Kissels, 2009). All these agents were found to be associated with improving the recovery and ability to adapt to disability.

Another important treatment for patients with PICH is effective neuroscience rehabilitation care. PICH patients often exhibit impaired neurological function immediately after an episode of intracerebral haemorrhage, and this continues for several months. The possibility of patients to gain functional ability at three months is also related to effective rehabilitation training. In our setting, inpatient rehabilitation care is given full attention with the goal of ensuring optimal recovery and adaptation to function in activities of daily living. As stated by Clarke (2013) and Miller (2010), the main focus of PICH stroke rehabilitation is to achieve functional recovery as quickly and as fully as possible to enable patients to adapt to any remaining stroke disability. Thus, patients benefit from early referral to the comprehensive rehabilitation care unit for advanced training during inpatient rehabilitation care. Patient participation in rehabilitation training in a centre nearest to their home should be ensured, and compliance should be warranted.

In the hospital where the study was undertaken, the neuroscience unit is a well-organised setting that offers multidisciplinary services to provide care and treatment for PICH stroke patients. The care includes an early discharge preparation programme and home-based rehabilitation programs. The components of the early discharge preparation programme include the provision of training and support for patients and their caregivers, as well as education for patients and caregivers regarding secondary stroke and post-stroke complication prevention and available resources and funding options. The education

programme for patients and caregivers includes how to change the usual lifestyle, as well as the prevention of stroke complications, depression, and caregivers' burden. This inpatient neuro rehabilitation unit in our setting is consistent with that suggested by Aries and Hunter (2015), Clarke (2013), and Morgenstern et al. (2010), who stated that all patients with ICH should have access to inpatient rehabilitation management that involves multidisciplinary professionals and that rehabilitation should start as early as possible and should be continued in the community in order to reap the maximum benefits. The rehabilitation inpatient unit is a multidisciplinary integration that involves a team of healthcare professionals who will act together to integrate the physical, mental, emotional, and social aspects of a patient's health care needs. Morgenstern et al. (2014) also found that the provision of stroke rehabilitation services gives strong evidence of improvement in survival, recovery, and ability to return home compared with conventional non-dedicated stroke wards.

This early discharge preparation programme for patients with PICH has been shown to be associated with effective early and long-term recovery and adaptation. At the three-month follow up, the number of patients who achieved functional independence increased, which resulted from neuroscience rehabilitation care, as well as physiotherapy and speech pathology services. This finding by Morgenstern et al. (2014) revealed that early supported hospital discharge and home-based rehabilitation programme provide benefits for PICH patients.

In summary, functional recovery and adaptation to achieve the ability to participate in activities of daily living resulted from comprehensive treatment and inpatient PICH stroke rehabilitation care, including appropriate nursing care and training, educational program, as will as physiotherapy, speech, and occupational therapy.

5.5.2 Adaptation in cognitive domain of adaptation

In a cognitive domain, the result revealed that PICH patients show high independency to participate in communication and social activities. The total mean (SD) value cognitive functional activities score of Adaptation Outcome was 28.2 (9.3) and range from 5-35. The result indicates that the ability of PICH patients to adapt with the communication and social disabilities was increased and shows lower dependence on caregivers (Table 4.11).

In adapting with psychosocial domain of adaptation, the total cognitive score result revealed that there are significant difference of subtotal cognitive ability score at acute phase and at three-month post PICH, t = -10.4, (112), $p < .05$). In a cognitive domain (FIM social –cognitive subtotal items) at acute was 18.8(11.3) range from 5-35, and the result revealed that majority of subjects was scored at lower adaptation in ability to communicate effectively, participated in social activities and unable to interaction with another person, to solved problem and memories while compared with adaptation outcome at three months for cognitive adaptive ability (FIM social cognitive) the mean (SD) result was 28.2 (9.3) and the median was 33 (range from 5-35). The result revealed that PICH patients show high independency to participate in communication and social activities. The result indicates that the ability of PICH patients to adapt with the communication and social disabilities was increased and shows lower dependence on caregivers. The cognitive deficit that occurred on PICH subject in this study was comparable with many other relevant studies related to stroke deficit and outcome. ICH patients may experience change in cognitive ability such as alteration in attention, awareness to time and place, communication, memory, problem solving, and judgment (Oh, & Seo, 2010; Mocco et al., 2006; Samra et al., 2007). For example, Oh, & Seo (2010) reported that the improvements in cognitive ability were occurred in between one

to three months. However, in the area of problem-solving and safety and social behaviour recovery at six-month post ICH was lower. It is the difference in the ability in getting attention and communication; it showed improvement at six months.

This result was a comparison with previous studies and found congruent with their findings where half of the patients who have sensory motor deficit, cognitive, or behavioural deficits gained adaptation with stroke-related physical disability, and showed minimal dependence on caregivers in performing routine self-care activities, control of bladder and bowel, and relative mobility such as walking.

Later at three months, the ability of patients with PICH to adapt is individuals with PICH response to disability related to stroke and has undergone recovery phase as well. Stroke disability is a functional limitation that requires supervision to perform activities of daily living (ADLs), or limitation in physical, cognitive, or social activities. The goal of a long-term recovery phase after ICH for a patient having undergone rehabilitation is to be able to function in cognition and functional activities (Clarke, 2013; Miller, 2010). The predictors of later adaptation (three month) of psychological domain of adaptation are post stroke depression and in terms of psychosocial (interdependence), it covers as a social component of adaptation.

5.5.2.1 Depression status at three months post PICH

Depression commonly occurs after a stroke, with an estimated prevalence as high as 30% in the first year after the event (Artal & Egido, 2009). Depression that occurs among stroke patients is related to the inability to accept disabilities and the lack of social support. In this study, depression is one of the independent factors influencing long-term adaptation outcomes. A significant negative relationship was found between total

depression at three-months post PICH with later adaptation outcome. The result revealed that a decrease in one unit of a depression problem among patients at three-month post ICH was associated with a positive increase in later adaptation outcome scores of 0.93 unit. The result indicates that those without depression at three-month post PICH or those with minimal depression symptoms may have a better total score for adaptation outcome at three months. In other words, stroke patients without psychological problems and with no symptom of stress and depression were among those who are able to participate in functional activities of daily living. Hadidi, Treat–Jacobson, and Lindquist (2009) found that post-stroke depression was significantly associated with negative functional adaptation or quality of life of post-stroke survivors. For example, patients with post-stroke depression (PSD) showed far worse recovery from functional impairments compared with non-depressed patients with stroke.

In our local setting, to prevent depression among PICH patients during the early and later (three month) in rehabilitation phases, a routine assessment is performed to identify PICH patients who are at risk of mental stress and depression. The patients diagnosed as having signs and symptoms of depression was referred to a psychiatrist for medication and counseling. Toyoda, Steiner, Epple, and Kern et al. (2013) stated that in the Japanese guidelines, stroke patients should be examined for risk of depression because this condition is a factor that interferes with cognitive and physical function and activities of daily living. They also suggested that drug therapy for a post-stroke depressive state was recommended because it is expected to improve depressive symptoms and physical function. Another finding stated that healthcare providers, such as physicians and nurses, should be experts in the assessment to determine patients with stroke who have stress or depression. They should also be able to suggest specific treatment strategies, such as counseling, cognitive-behavioural therapy, and treatment with anti-depressants to treat depression (Kumar et al., 2010).

The present results confirm that the emotional impairment and depression are common among the PICH stroke patients. Post-stroke depression has been reported in not less than 30% and up to 50% of all stroke survivors (Robinson, 2003; Department of Health, 2007a, Pfeil, Gray, Lindsay 2009). The symptoms of depression that majority of subject experienced were they had little interest or pleasure in doing things, feeling down, depressed, or hopeless. They also reported experience having trouble in sleep pattern such as suddenly falling asleep or always sleepy and always tired or feel no energy.

The result of this study found that majority of the patients is prone to have depression, whether during acute rehabilitation phase or long term, living with disability post PICH. In comparing the findings for depression at acute and depression at three months, the result revealed a significant difference which the, t (112) = -3.169, $p < .001$. The result of this study found that about 70 % had experienced depression from mild to severe level of depression during acute phase and similarly at three months post PICH revealed about 72.0 % the subject had experience of mild to severe depression. However, the analysis showed that the percentage of subject having moderately severe to severe increased from 12.3 % at an acute phase increase to 34.5 % at a three-month poststroke. The result indicated that one-third of subjects having the serious problems of depression in living with disability at three months, and the subjects required help and treatment.

The finding of this study is consistent with previous result of study stated that the frequency of depression experienced by stroke patients during acute recovery until three month in rehabilitation phase post stroke estimated about 10% to more than 50% of stroke patients (Johnson, Minarik, Nyström, Bautista &. Gorman, 2006). Buchanan, Elias & Goplen (2000), found among haemorrhagic stroke patients, many of them experience change to negative neurobahavioral even though they achieved good physical recovery

outcome and this change gives negative impact to patients itself and also to their family, for example, experience of a psychological stress.

Among stroke patients, the strongest predictors of post stroke depression were a history of depression, an increased severity of stroke, and post stroke physical or cognitive impairment (Johnson, Minarik, Nyström, Bautista &. Gorman, 2006).

5.2.2.2 Patient and family caregiver stroke knowledge

The last domain of adaptation is an interdependence mode which is represented as a social component of adaptation. The regression analysis of this study found that there was a positive significant relationship between total stroke knowledge and later adaptation outcome ($\beta = 2.78$, $p < .001$). The result indicates that 50 % of PICH subjects those who have high stroke knowledge score is related to increase total adaptation outcome score by 2.9, 95% CI [1.097, 6.011]. Based on this finding, researcher conclude that in order to ensure the positive long term adaptation outcome post PICH, the patients and their caregivers should have knowledge of risk factors contribute to stroke illness of stroke to stroke illness, lifestyle such as exercise, smoking, diet, weight, alcohol, stress management, is essential to prevention risk of recurrent stroke, post stroke complication and post stroke depression.

In adapting with psychosocial domain of adaptation, the total cognitive score result revealed that there are significant difference of subtotal cognitive ability score at acute phase and at three-month post PICH, t = -10.4, $p < 0.05$. In a cognitive domain (FIM social –cognitive subtotal items) at acute was 18.8(11.3) range from 5-35, and the result revealed that majority of subjects was scored at lower adaptation in ability to

communicate effectively, participated in social activities and unable to interaction with another person, to solved problem and memories while compared with adaptation outcome at three months for cognitive adaptive ability (FIM social cognitive) the mean (SD) result was 28.2 (9.3) and the median was 33 (range from 5-35). The result revealed that PICH patients show high independency to participate in communication and social activities. The result indicates that the ability of PICH patients to adapt with the communication and social disabilities was increased and shows lower dependence on caregivers. The cognitive deficit that occurred on PICH subject in this study was comparable with many other relevant studies related to stroke deficit and outcome. ICH patients may experience change in cognitive ability such as alteration in attention, awareness to time and place, communication, memory, problem solving, and judgment (Oh, & Seo, 2010).

A significant positive relationship exists between total stroke knowledge and later (three month) adaptation. Those who have a unit of higher stroke knowledge score exhibited improved total adaptation outcomes. The result revealed that half of the patients in this study exhibited improved later (three month) adaptation in terms of involvement in functional activities. The improved three-month adaptation in terms of functional activities is associated with the level of stroke knowledge. This result indicates that patients with PICH who received general stroke education and rehabilitation before discharge from the hospital setting showed an improvement in stroke knowledge. The finding also showed that good recovery and the associated later (three month) adaptation depends on family caregiver support, as well as patient motivation and ability to learn.

The result of this study was compared with previous study, for example, Ostwald, Davis, Hersch, Kelley, & Goodwin, (2008), suggested in stroke education guidelines that in the prevention strategies, to reduce stroke risk, prevention of recurrent stroke, prevention

stroke complication and stress management should be taught before discharge (Byers, Lamanna, & Rosenberg, 2010). The finding confirms of the previous results of study that suggests the patient and family should be given information regarding stroke illness, stroke risks factors, stroke management and prevention post stroke complications such as depression, post stroke medical complication and recurrent stroke and they should be encouraged to involve in the rehabilitation program suggested properly in order to improve physical and cognitive disability before discharge (Rodgers et al. 1999). The other studies identified information service focus directly on individualized information can lead to better quality of life (Croquelois & Bogousslavsky, 2006; Rodger et al, 2001).

Therefore, to prevent recurrent stroke, post-stroke complications, and depression among stroke patients and their family caregivers, stroke education is provided in our setting to achieve positive early and long-term adaptation outcomes. Stroke education guidelines refer to the prevention strategies aimed at reducing the occurrence of recurrent stroke, stroke complications and stress management, which should be taught before a patient is discharged (Byers, Lamanna, & Rosenberg, 2010). In this study, healthcare professionals and clinicians provide specific stroke education for PICH patients before discharge with a focus on the prevention of risk factors in association with early adaptation to enhance long-term adaptation outcomes associated with stroke-related disability. Rodger (2001) stated that we should be aware that stroke patients have unmet needs on information about their illness. Thus, different kinds of care and treatment must be provided, and professionals must help patients evaluate their alternatives to facilitate decision-making (Rodger et al., 2001).

A better understanding of the factors that affect the process of acute and long-term adaptation is essential in developing an adequate stroke education programme and specific rehabilitation interventions for patients with stroke related to intracerebral

bleeding before being discharged. Some patients and caregivers felt that they were discharged with inadequate information, and this lack of education persisted even two to three years after the stroke (Wachters Kaufmann, Schuling, The & Meyboom, 2005).

The proper stroke educational programme given before discharge during the inpatient recovery phase that focuses on stroke illness, stroke risk factors, stroke management and prevention of post-stroke complications, such as depression, post-stroke medical complication, and recurrent stroke, contribute to improve long-term physical and cognitive disability (Rodgers et al., 1999).

The lack of physical and cognitive function, limitations in social interaction, experience of post-stroke complications, as well as emotional stress cause stroke patients to show high dependency on others to help them, especially on their spouses and significant others. Spouses are expected to provide competent physical care for their loved ones. PICH patients with stroke increasingly depend upon their spouse for continuing care, particularly when they are experiencing advanced deterioration of health and disability after stroke. Spouses or caregivers must learn to help with activities of daily living (ADLs). Many research findings stated that a family member who needs inpatient acute recovery care and rehabilitation requires support from all family members, especially spouses, in terms of helping them perform functional activities in all aspects of life (Kautz& Horn, 2009; Dalvandi et al., 2010; Oswald, 2008). Other studies found that information services focused directly on individualized information could lead to a better quality of life (Rodger et al., (2001).

In order to ensure positive long-term adaptation, PICH patients should have knowledge of risk factors contributing to stroke illness. Essentially, a healthy lifestyle that shows a balanced mix of exercise, good diet, weight control, stress management, and particularly

non-smoking and non-alcoholic habits, is essential to prevention of the risk of recurrent stroke, post-stroke complication, and post-stroke depression (Croquelois & Bogousslavsky, 2006). These prevention strategies are part of stroke education guidelines that should be taught before discharge of patients (Byers, Lamanna, & Rosenberg, 2010)

In this study, those PICH patients who have support and care from their spouse have improved their ability to participate in functional activities and reported able to be independence very past. This finding is consistent with the literature, the better a spouse copes with psychological and physical expectations of a disability related to stroke, the better the outcome the patients will have (Kautz & Horn, 2009). It is because life after having disability resulting from stroke is usually difficult. Lack of physical and cognitive function, limitation in social interaction, experience of post stroke complication, emotional and stress, stroke patients show high dependency on other to help them, especially spouse. Spouses were expected to provide competent physical care for their loved ones and should have adequate stroke information. PICH patients with stroke increasingly depend upon their spouse for this continuing care, particularly when they are experiencing advanced deterioration of health and disability after stroke. Spouse or caregivers must learn to help with activities of daily living (ADLs), such as bathing, dressing, grooming, feeding, and toileting. Many research findings stated one family member who needs inpatient acute recovery care and rehabilitation demand support from all family members, especially spouse to help them in participating in performing functional activities in all aspects of life (Kautz & horn, 2009; Dalvandi et al., 2010; Oswald, 2008).

It means that those PICH patients who have support and care from their spouse have improved their ability to participate in functional activities and reported able to be independence very past. This finding is consistent with the literature, the better a spouse

copes with psychological and physical expectations of a disability related to stroke, the better the outcome the patients will have (Kautz & Horn, 2009).

This result can be used as strategies to promoting carer in have involved in providing care for their family member who requires inpatient rehabilitation post PICH. This result will be used as new intervention of involvement family carer of disability patient starting from hospital setting to home and as strategies to help family carer to be able to provide a good care for stroke patient and to ensure carer can cope with change of the patient resulting from PICH. As stated in literature review, it would be necessary to include the patients and caregivers at the team meeting while maintaining the existing time constraints and to establish a baseline to the level of participation that could be achieved. Once the feasibility could be established of having the patient present and able to address these questions, one could begin to increase the degree to which entire approach could be implemented (Ozer 2000). The finding indicates that those PICH patients who have support and care from their spouse have improved their adaptation with stroke disability and reported able to be independence very past. It is because stroke illness is not only giving negative impact to the person but continues to affect their families, health care setting and community. Disability and post stroke complication such as infection and depression resulting from stroke contribute as factors affecting recovery process and also can alter life satisfaction and reduce good family relationship. This finding suggests that it is important to help stroke patients and their family member to adapt with stroke-related problem and to enable patient with stroke to become reintegrated into their family and the community.

5.6 Conclusion

For PICH patients with disabilities, the predictors of adaptation during the inpatient recovery phase of this group of patients include severity of PICH, unrecovered neurological deficit, risk for post stroke complications, and limited stroke knowledge. For the positive later (three month) adaptation outcomes, contributing factors include age, gender, severity of neurological deficit, location of brain lesion, stroke knowledge, functional ability in the early phase, and respiratory infection in the acute phase, UTI at three months, depression at three months, and spousal support during the rehabilitation phase at home. The results and findings of this study will be used as an evidence base related to factors that affect early adaptation and later (three month) adaptation outcomes of post intracerebral haemorrhage patients and the importance of stroke education among stroke patients and family caregivers.