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 et al., 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 et al., 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 et al., 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 quadriplegia, 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 et al., 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, Arbee, & 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 &
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, McInnes, 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 (Indredavik, 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 occurred 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 incurred 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, McInnes, 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, & Buzaitis et 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 et 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, Jorn et 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 supratentorial intracranial haemorrhages still does not indicate any specific outcomes (Nassisi, 2008; Mendelow, Gregson & Fernandes, 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% and 75.0% 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; Badria, 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 \%) 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 to speak, write, and understand spoken and written languages (Skolarus, 2014; Taylor,
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).
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.