

**RECOVERY OF FUNCTIONAL ABILITIES AFTER
TREATMENT FOR 3 MONTHS IN STROKE PATIENTS WHO
DID NOT RECEIVE RECOMBINANT TISSUE PLASMINOGEN
ACTIVATOR THERAPY: THE COMPARISON BETWEEN
PATIENTS WHO ARRIVED AT A HOSPITAL WITHIN 4.5
HOURS AND THOSE WHO ARRIVED AFTER 4.5 HOURS
OF SYMPTOM ONSET**

SUJITTRA DUANGJIT

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Sujittra Duangjit

RECOVERY OF FUNCTIONAL ABILITIES AFTER TREATMENT FOR 3 MONTHS IN STROKE PATIENTS WHO DID NOT RECEIVE RECOMBINANT TISSUE PLASMINOGEN ACTIVATOR THERAPY : THE COMPARISON BETWEEN PATIENTS WHO ARRIVED AT A HOSPITAL WITHIN 4.5 HOURS AND THOSE WHO ARRIVED AFTER 4.5 HOURS OF SYMPTOM ONSET

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ABSTRACT

This study is a prospective cohort study design, to study the recovery of functional abilities of stroke patients who did not receive recombinant tissue plasminogen activator (rtPA) therapy after treatment for 3 months, comparing patients who arrived at a hospital within 4.5 hours and those who arrived after 4.5 hours of symptom onset. The sample was 194 stroke patients, selected by the purposive sampling method of inclusion and exclusion criteria, who were admitted in Saraburi hospital. Data were collected by interviewing the patients and caregivers twice. The first time was when they were admitted at an inpatient ward. The second interview was after 3 months of stroke onset by telephone interview. The study instrument was a case record form mRS, Barthel Index, NIHSS, GCS, and WHOQOL-Bref-Thai. Statistical analysis were done by SPSS for Windows version 19 software.

Only 173 stroke patients were able to complete the second time of questionnaires or interview at 3 months after treatment (88 patients who arrived at a hospital early and 85 patients who arrived late after symptom onset). The results showed that on day 1 of admission, the NIHSS scores differed significantly in both groups ($p=0.003$). Patients who arrived at a hospital early were more severe as classified by the NIHSS score ≥ 15 than those who arrived at a hospital late. At 3 months after treatment, the recovery of stroke patients assessed by mRS, Barthel Index, and WHOQOL-Bref-Thai in both groups did not differ ($p>0.05$). We found that 4 significant predictors of improved mRS at 3 months after treatment were age, pre-morbid self care (basic activities of daily living), severity of disease measured by the NIHSS, and the mRS score on day 1 of admission at the hospital. These variables were associated with the recovery of stroke patients significantly ($p<0.05$).

The results may be used to predict the recovery of functional abilities of stroke patients who did not receive rtPA.

KEY WORDS: STROKE / RECOVERY / FUNCTIONAL ABILITIES

117 pages

การฟื้นตัวด้านความสามารถในการประกอบกิจวัตรประจำวันของผู้ป่วยโรคหลอดเลือดสมองที่ไม่ได้รับยาละลายลิ่มเลือดหลังได้รับการรักษา 3 เดือน : เปรียบเทียบระหว่างผู้ป่วยที่มาโรงพยาบาลเร็วภายใน 4.5 ชั่วโมงและมาช้ามากกว่า 4.5 ชั่วโมงหลังเกิดอาการ

RECOVERY OF FUNCTIONAL ABILITIES AFTER TREATMENT FOR 3 MONTHS IN STROKE PATIENTS WHO DID NOT RECEIVE RECOMBINANT TISSUE PLASMINOGEN ACTIVATOR THERAPY : THE COMPARISON BETWEEN PATIENTS WHO ARRIVED AT A HOSPITAL WITHIN 4.5 HOURS AND THOSE WHO ARRIVED AFTER 4.5 HOURS OF SYMPTOM ONSET

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บทคัดย่อ

การศึกษานี้เป็นการวิจัยแบบติดตามไปข้างหน้า เพื่อศึกษาการฟื้นตัวด้านความสามารถในการประกอบกิจวัตรประจำวันของผู้ป่วยโรคหลอดเลือดสมองที่ไม่ได้รับยาละลายลิ่มเลือดหลังได้รับการรักษา 3 เดือน : เปรียบเทียบระหว่างผู้ป่วยที่มาโรงพยาบาลเร็วภายใน 4.5 ชั่วโมงและมาช้ามากกว่า 4.5 ชั่วโมงหลังเกิดอาการ เลือกลุ่มตัวอย่างแบบเจาะจงตามคุณสมบัติเกณฑ์คัดเข้า-คัดออกที่กำหนด จำนวน 194 ราย เป็นผู้ป่วยที่เข้าพักรักษาตัวในโรงพยาบาลสระบุรี เก็บข้อมูลโดยการสัมภาษณ์ผู้ป่วยและ/หรือญาติ 2 ครั้ง ครั้งแรกในวันแรกที่ผู้ป่วยเข้ารับการรักษา และครั้งที่ 2 จะสัมภาษณ์หลังจากนี้ 3 เดือนทางโทรศัพท์ เครื่องมือที่ใช้ในการเก็บรวบรวมข้อมูลคือแบบบันทึกสำหรับการทำวิจัย ได้แก่ แบบประเมิน mRS, Barthel Index, NIHSS, GCS, และ WHOQOL-Bref-Thai วิเคราะห์ข้อมูลโดยใช้โปรแกรมคอมพิวเตอร์สำเร็จรูป SPSS เวอร์ชัน 19

ผู้ป่วยจำนวน 173 รายที่ได้รับการสัมภาษณ์ครบหลังได้รับการรักษา 3 เดือน (88 รายเป็นผู้ป่วยที่มาโรงพยาบาลเร็วและ 85 รายเป็นผู้ป่วยที่มาโรงพยาบาลช้า) ผลการศึกษาพบว่าในวันแรกที่ผู้ป่วยเข้ารับการรักษา ความรุนแรงของโรค (คะแนน NIHSS ตั้งแต่ 15 ขึ้นไป) ของผู้ป่วยทั้ง 2 กลุ่มมีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ ($p=0.003$) โดยผู้ป่วยที่มาโรงพยาบาลเร็วจะมีความรุนแรงของโรคมากกว่าผู้ป่วยที่มาโรงพยาบาลช้า และที่ 3 เดือนหลังได้รับการรักษา การฟื้นตัวโดยใช้แบบประเมิน mRS, Barthel Index และ WHOQOL-Bref-Thai ของผู้ป่วยทั้ง 2 กลุ่มไม่แตกต่างกัน ($p>0.05$) เมื่อวิเคราะห์ถึงปัจจัยที่สามารถทำนายการฟื้นตัวด้านความสามารถในการประกอบกิจวัตรประจำวันของผู้ป่วยโรคหลอดเลือดสมองที่ไม่ได้รับยาละลายลิ่มเลือดที่มีระดับคะแนนความสามารถในการช่วยเหลือตนเองดีขึ้นหลังได้รับการรักษา 3 เดือน พบว่า อายุ ความสามารถในการประกอบกิจวัตรประจำวันก่อนเกิดโรค คะแนนความรุนแรงของโรค และความสามารถในการช่วยเหลือตนเองของการประเมินในวันแรกที่ผู้ป่วยเข้ารับการรักษาในโรงพยาบาล เป็นตัวแปรที่ส่งผลต่อการฟื้นตัวของผู้ป่วยโรคหลอดเลือดสมองอย่างมีนัยสำคัญทางสถิติ ($p<0.05$)

ข้อมูลจากการวิจัยนี้อาจนำไปใช้ในการทำนายการฟื้นตัวด้านความสามารถในการประกอบกิจวัตรประจำวันของผู้ป่วยโรคหลอดเลือดสมองที่ไม่ได้รับยาละลายลิ่มเลือด

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CHAPTER I

INTRODUCTION

1.1 Rationale and Justification

Stroke is a common disease and is a major public health problem. It is a leading cause of death and disability of the population. A number of stroke survivors remain suffering from paralysis. Stroke has an impact on patients themselves, family members, communities and societies. Not only causes the loss in physical function of the patients themselves, but stroke also causes the loss and burden in economics and socially of the patients, family and society.

World Health Organization (WHO) have reported in 2005 that stroke was the third leading cause of death worldwide affecting people of nearly 6 million persons per year. This proportion was 10% of all death with the average death of 11 cases per minute.¹ Thailand was the 1 in 23 of countries in the world that mortality rate have highest of stroke.^{2,3} World Stroke Organization (WSO) reported in 2006 that stroke caused the death worldwide approximately 5.7 million persons per year and estimated the death attributed to stroke worldwide will rise to 6.7 million persons in 2015.⁴ The National Stroke Association of America reported that the incidence of stroke patients was approx 750,000 cases annually and stroke was the third leading cause of death and the first leading cause of disability in American.⁵

In Thailand, the studies of the prevalence of stroke was conducted for the first time in 1983 and showed the prevalence of 690 per 100,000 population.⁶ In 1998 study showed the prevalence of 1,120 per 100,000 population⁷ and a later study showed the prevalence of 1,880 per 100,000 population in 2004-2006.⁸ Since 2002 until present, stroke was the third leading cause of death and disability for males after AIDS and traffic accident, and was the second cause for females after AIDS.⁹ During the period of 10 years between 1997 and 2007, the admission rate of stroke in hospitals under the Ministry of Public Health increase 2.75 times. The death of stroke was projected to increase 17% in 2015.⁹ The recent study in 2008, stroke was the

fourth leading cause of death in Thai population.¹⁰ The mortality rate of stroke was 20.8 per 100,000 population with the average death of 36 persons per day or 1.5 persons per hour.¹¹ In Thailand, the Disability-Adjusted Life Years (DALYs) Loss in 2004 was reported that, by gender, stroke was the first leading cause of disease burden for females and was the fourth for men.¹² Stratified by region, the prevalence of stroke patients admitted in hospitals in 1999-2007 trends to increase every region especially in central region excluding Bangkok which showed the highest burden of stroke followed by Northern, Southern and Northeastern regions, respectively.¹³

In 2003-2009, stroke was the third leading cause of death in Saraburi Province and was the second in Thailand. The prevalence trends to rise overall in Thailand.¹⁴ From data of Saraburi hospital in 2005-2010, the number of stroke patients admitted in the hospital trended to rise. In October 2009 – June 2010, the number of stroke patients was the fourth leading cause of admission in the hospital, the first leading cause of admission in division of medicine, the third leading cause of death in the hospital and the first leading cause of death in division of medicine.¹⁵

Stroke causes the impairment of functional ability in many aspects, i.e. the motor system, sensory system, co-ordination, cognition, psychiatric problems, language and swallowing. These impairments lead to the loss in the abilities to perform activities in daily life such as communication, ambulation and self-care.¹⁶ In the present day, stroke patients can survive more than in the past because of the improvement in medical care. However, surviving from critical period does not mean the complete recovery. Stroke patients usually suffer from residual disability which affects patients' physical, psychological and social functions.¹⁷ These disabilities cause the dependency of the patients which leads to the burden to themselves, their family members and the society. The previous guideline recommended the use of recombinant tissue plasminogen activator (rtPA, altephase) to treat acute ischemic stroke within 3 hours of symptom onset which showed the treatment benefit.¹⁸ The new study extended the time period of thrombolysis with rtPA to 3 to 4.5 hours after the onset of stroke. This extension of the treatment still showed that the treatment with rtPA was effective for acute ischemic stroke and this extension increased the chance of acute stroke patients to be eligible for the treatment.¹⁹ However, less than 5% of stroke patients in Thailand²⁰ and less than 10% of stroke patients in foreign²¹ are eligible with

the inclusion criteria for the treatment with rtPA, even in developed countries which have good healthcare support. From the data of the Thai Ministry of Public Health, only 1.96% of acute stroke patients are eligible for the rtPA treatment leading to the high mortality and disability rates.²² Moreover, the majority of patients including those receiving rtPA still suffer from the disabilities from stroke. Stroke patients can have better symptoms or functional abilities by 2 mechanisms.²³ The first is a mechanism of neurologic recovery and usually occurs in the first 6 months.²⁴ The second mechanism is from rehabilitation. The majority of the patients improve within 3-6 months and the speed of recovery is faster in the first 1-3 months.^{24,25}

The study to examine the nature of the stroke recovery is important and necessary for implementation of the knowledge to clinical practice to help patients suffering from stroke having as less residual disabilities as possible. The researcher found that there have been few studies about the stroke recovery especially in Thailand. Hence, the researcher aims to study the recovery of functional abilities after treatment for 3 months in stroke patients who did not receive recombinant tissue plasminogen activator therapy. The researcher wants to investigate the difference in recovery between patients who arrived at a hospital within 4.5 hours and those who arrived after 4.5 hours of symptom onset.

1.2 Research Objectives

1.2.1 Major Objective

To study the recovery of functional abilities of stroke patients who did not receive recombinant tissue plasminogen activator therapy after treatment for 3 months comparing patients who arrived at a hospital within 4.5 hours and those who arrived after 4.5 hours of symptom onset.

1.2.2 General Objectives

1. To study factors affecting the recovery of functional abilities of stroke patients as follows.

- a. Age
 - b. Pre-morbid functional status
 - c. Severity of stroke
 - d. Type of stroke
 - e. Site of stroke lesions or hemiplegic
 - f. Knowledge, awareness to risk factors and treatment with stroke
 - g. Caregiver
2. To study quality of life in stroke patients who did not receive recombinant tissue plasminogen activator therapy.
 3. To predict recovery of functional abilities in stroke patients who did not receive recombinant tissue plasminogen activator therapy.

1.3 Research Question

Do stroke patients who did not receive recombinant tissue plasminogen activator therapy who arrived at a hospital within 4.5 hours and those who arrived after 4.5 hours of symptom onset have difference in functional recovery at 3 months?

1.4 Hypotheses

Stroke patients who did not receive recombinant tissue plasminogen activator therapy who arrived at a hospital within 4.5 hours and those who arrived after 4.5 hours of symptom onset have no difference in recovery of functional abilities at 3 months.

1.5 Operational Definitions

Stroke or cerebrovascular disease (WHO): Rapidly developed clinical signs of focal (global) disturbance of cerebral function lasting more than 24 hours or leading to death, with no apparent cause other than a vascular origin.²⁶

Stroke patients: Patients who received the diagnosis confirmed by a doctor as ischemic stroke or hemorrhagic stroke.

Stroke patients who did not receive thrombolysis: Stroke patients who did not receive recombinant tissue plasminogen activator therapy.

Recovery: A patient returns to normal of functional abilities or the best outcome, or might have residual disabilities caused by stroke.

Activities of daily living: Daily self-care activities within an individual's place of residence, in outdoor environments, or both.

Functional abilities of stroke patient: Abilities of a stroke patient to perform daily activities within an individual's place of residence, in outdoor environments, or both.

Caregiver: A person who takes care of a stroke patient in a hospital and at home.

Hormone contraceptives use: Stroke patient who used pill contraceptives or injectable contraceptives.

Obesity: Stroke patient have body mass index (BMI) ≥ 30 .

Current Smoking: At the interview, stroke patient was smoking or stop smoked ≤ 6 months.

Ever smoked (current stop smoking): At the interview, stroke patient stop smoking ≥ 6 months.

Current alcohol consumption: At the interview, stroke patient was alcohol consumption or stop drinking alcohol ≤ 6 months.

Ever drank alcohol (current stop drinking alcohol): At the interview, stroke patient stop drinking alcohol ≥ 6 months.

Previous knowledge about risk factors of stroke: Stroke patient can answers correctly is 2 in 3 questions about risk factors of stroke which deemed to have knowledge about it i.e. hypertension, atrial fibrillation, heart disease / acute myocardial infarction, abnormality of carotid artery, smoking, diabetes mellitus, hyperlipidemia, obesity, hormone contraceptive use, alcohol consumption, and family history of stroke, etc.

Previous knowledge about the care for stroke: Stroke patient can answers correctly is 2 in 3 questions about the care for stroke which deemed to have

knowledge about it i.e. stroke patients arrived at a hospital within 4.5 hours of symptoms onset, meeting the doctor that quickly after symptom onset, using of thrombolytic therapy that treatment efficacy, brain surgeon, control and reduce risk factors, etc.

Arriving at a hospital early: Stroke patients who arrived at a hospital within 4.5 hours of symptom onset.

Arriving at a hospital late: Stroke patients who arrived at a hospital after 4.5 hours of symptom onset.

Modified Rankin Scale (mRS): A commonly used scale for measuring the degree of disability or dependence in the daily activities of people who have suffered a stroke. The scale is divided into 6 levels of functional abilities.

The Barthel Index (BI): The 10 items that measure a person's daily functioning specifically the activities of daily living and mobility. The items include grooming, bathing, dressing, feeding, continence of bowels and bladder, transferring to and from a toilet, moving from wheelchair to bed and return, walking on level surface, going up and down stairs. The assessment can be used to determine a baseline level of functioning and can be used to monitor improvement in activities of daily living over time. The items are weighted according to a scheme developed by the authors. The person receives a score based on whether they have received help while doing the task. The scores for each of the items are summed to create a total score. The higher the score the more "independent" the person. Independence means that the person needs no assistance at any part of the task. If a person does about 50% independently then the "middle" score would apply. The possible maximum score is 100 with the higher score representing the more independence of the patient.

The National Institutes of Health Stroke Scale (NIHSS): A standardized method used by physicians and other health care professionals to measure the level of impairment caused by a stroke. The NIH stroke scale measures several aspects of brain function, including consciousness, vision, sensation, movement, speech, and language. A certain number of points are given for each impairment uncovered during a focused neurological examination. A maximal score of 42 represents the most severe and devastating stroke. Current guidelines as of 2008 allow strokes with scores greater than 4 points to be treated with rtPA.

Glasgow Coma Scale (GCS): A neurological scale that aims to give a reliable, objective way of recording the conscious state of a person for initial as well as subsequent assessment. A patient is assessed against the criteria of the scale, and the resulting points give a patient score between 3 (indicating deep unconsciousness) and either 14 (original scale) or 15 (the more widely used modified or revised scale). The assessment covers the eye opening, verbal response and motor response.

The World Health Organization Quality of Life (WHOQOL)–Bref–Thai: An international cross-culturally comparable quality of life assessment instrument. It assesses the individual's perceptions in the context of their culture and value systems, and their personal goals, standards and concerns. The WHOQOL instruments were developed collaboratively in a number of centers worldwide, and have been widely field-tested. It comprises 26 items, which measure the following broad domains: physical health, psychological health, social relationships, and environment. The WHOQOL-Bref is a shorter version of the original instrument that may be more convenient for use in large research studies or clinical trials.

The improvement of the Modified Rankin Scale (mRS) at 3 months after treatment: Measuring the degree of disability or dependence in the daily activities of stroke patient at 3 months after treatment which changed of mRS score improved 1 level of functional abilities or more.

The stability of the Modified Rankin Scale (mRS) at 3 months after treatment: Measuring the degree of disability or dependence in the daily activities of stroke patient at 3 months after treatment which have not changed of mRS score.

The worse of the Modified Rankin Scale (mRS) at 3 months after treatment: Measuring the degree of disability or dependence in the daily activities of stroke patient at 3 months after treatment which changed of mRS score worse 1 level of functional abilities or more.

1.6 Research Utilizations

1. To help stroke patients know and understand the risk factors and disease including the recovery of stroke.

2. To shape the clinical guideline for the care of stroke patients for health professionals.

3. To find a guideline for patients and caregivers to care the dependent stroke patients to make them more independent and to make them.

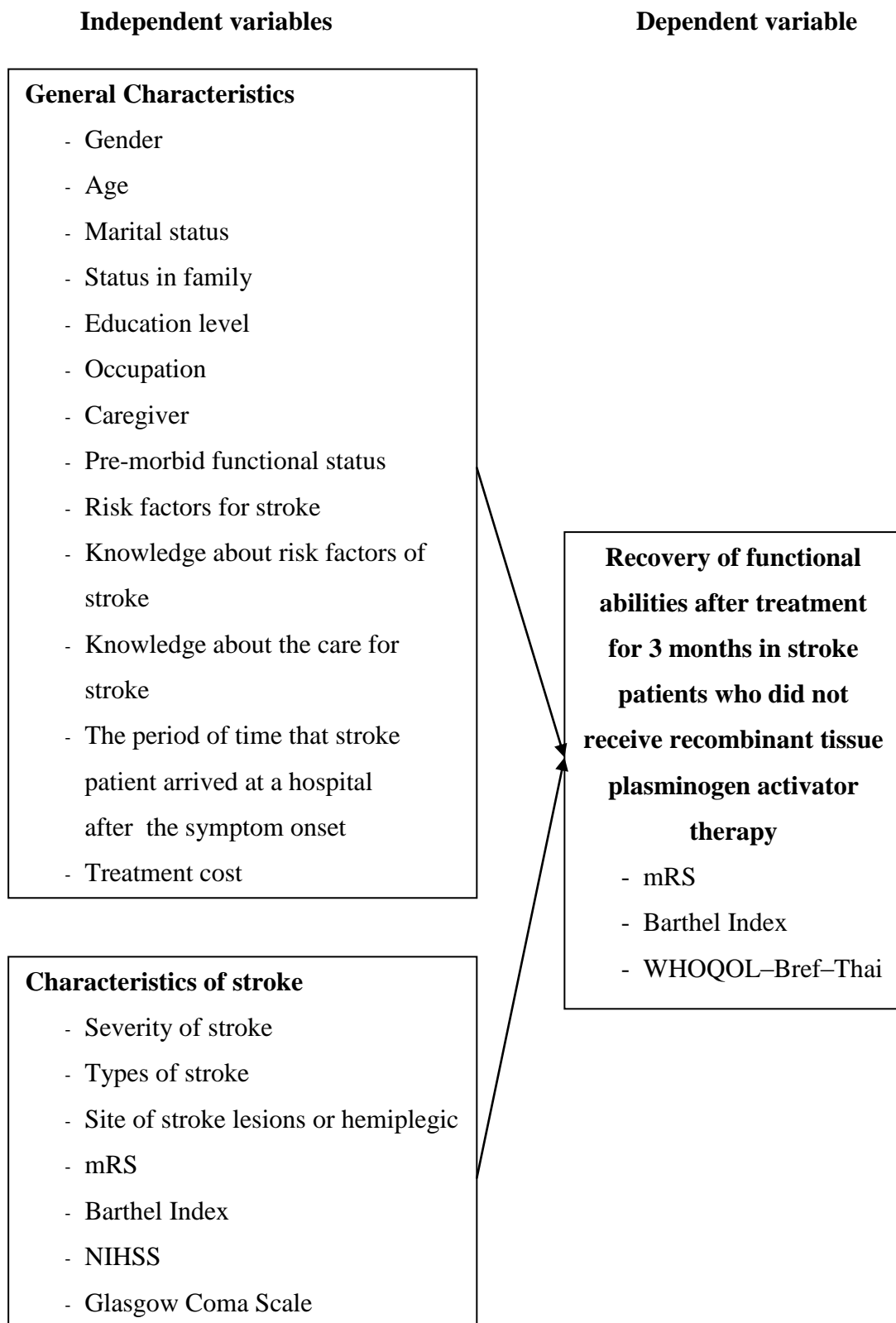


Figure 1.1 Conceptual Framework

CHAPTER II

LITERATURE REVIEW

This research was designed to study the recovery of functional abilities after treatment for 3 months in stroke patients who did not receive recombinant tissue plasminogen activator therapy. The researcher compared the recovery between patients who arrived at a hospital within 4.5 hours and those who arrived after 4.5 hours of symptom onset. The researcher has studied textbooks, documents, articles and related research to adopt an approach to this research as follows.

2.1 Stroke

- 2.1.1 Definition of stroke
- 2.1.2 Types of stroke
- 2.1.3 Symptoms of stroke
- 2.1.4 Risk factors for stroke
- 2.1.5 Diagnosis of stroke
- 2.1.6 Treatment of stroke
- 2.1.7 The nature of stroke recovery
- 2.1.8 Factor that affecting to the recovery of stroke
- 2.1.9 Prognosis
- 2.1.10 Complications of stroke
- 2.1.11 Impact of stroke on patients and a families

2.2 Assessment tools for functional abilities of stroke patients

- 2.2.1 Modified Rankin Scale (mRS)
- 2.2.2 The Barthel Index (BI)
- 2.2.3 The National Institutes of Health Stroke Scale (NIHSS)
- 2.2.4 Glasgow Coma Scale (GCS)
- 2.2.5 The World Health Organization Quality of Life –Bref– Thai

2.3 Relevant research

2.1 Stroke

Stroke is sometimes called cerebrovascular disease (CVD) or cerebrovascular accident (CVA). Generally, the term CVA is not recommended for the use as it may be misunderstood that it is related to an accident. It is frequently called “paralysis” in Thai. If it is not a complete weakness or the symptoms occur only temporarily, Thai people call it paresis.²⁷

2.1.1 Definition of stroke

World Health Organization defined stroke as rapidly developed clinical signs of focal (global) disturbance of cerebral function lasting more than 24 hours or leading to death, with no apparent cause other than a vascular origin.²⁶

The definition of the World Health Organization does not cover transient ischemic attack (TIA) which the signs and symptoms occur and disappear within 24 hours.

2.1.2 Type of stroke is classified in 3 groups.²⁷

2.1.2.1 Classification of stroke by the character of pathophysiology

Ischemic Stroke

Ischemic stroke is accounted for 85 per cent of all strokes. It is caused by a blood clot occluding a large artery in 40 per cent of the cases. Twenty per cent is caused by the obstruction of small blood vessels and 20 per cent is from of the blood clot detached from other vessels and a cardiac source such as a wall of the heart or heart valves. The remaining 5 per cent are from other causes such as arteriosclerosis and inflammation.²⁸ The occlusion of blood vessels of both large and small vessels is associated with atherosclerosis and long term high blood pressure. They are also found to be associated with pathological changes of the perforating vessels which lead to the obstruction and infarction of brain tissue in a small area known as a lacunar infarction. Generally, a blood clot is gradually formed along a blood vessel wall containing an atherosclerotic plaque. Patients develop symptoms

and signs of cerebral infarction within an hour or a day and often do not have headache or vomiting. The neurological signs and symptoms depend on the location of the obstruction, the duration of ischemia, rate of ischemia and the collateral circulation from nearby blood vessels.

Hemorrhagic Stroke

Intracerebral hemorrhage is accounted for 10 per cent of all stroke patients.²⁸ The major cause is the uncontrolled hypertension leading to the weakening of the blood vessel wall. Eventually the vessel wall develops microaneurism of the 300-900 microns in size. If there is a rapid acceleration of increasing blood pressure such as in emotional stress, the microaneurism will break down which cause the blood clot occurring in the brain tissue. This process will make the brain tissue inflammation and death. As in the case of cerebral infraction, the surrounding brain tissue will be swollen compressing the brain tissue.

Subarachnoid hemorrhage (SAH) constitutes 5 per cent of all strokes.²⁸ It is usually caused by the rupture of blood vessels with the aneurysm. Subarachnoid bleeding causes sudden severe headache, vomiting and changes in consciousness. When compared with stroke from other causes, patients with SAH are likely to be younger and have no underlying diseases such as hypertension. Physical examination revealed neck stiffness and meningeal irritation signs such as Kerning's and Brudzinski's signs. The vasospasm following the rupture of blood vessel wall causes the cerebral infarction leading to the disability.

2.1.2.2 Classification of stroke by the locations of the blood vessel with pathology

a. Symptom groups occurring from the pathology of carotid artery

Anterior cerebral artery

The anterior cerebral artery (ACA) supplies blood to inter-hemispheric cortical surface of the frontal and parietal lobe. The obstruction of this

artery causes the weakness of the opposite arm and leg, is the weakness confines to the leg more than arm. Also, the shoulder, foot and lower leg are weaker than forearm, hand and thigh. Patients usually have numbness in the affected area. Some patients cannot move voluntarily but can move instinctively. This is because of the ischemia of the anterior corpus callosum of the brain leading to the disconnection between the prefrontal area of the brain in the non-dominant hemisphere with language centre in the dominant hemisphere.

Middle cerebral artery

The middle cerebral artery (MCA) supplies blood to the wide area of the cerebral cortex. The obstruction of the MCA just distal to the circle of Willis is usually from a blood clot from the extracranial sources. If there is no collateral circulation from the anterior and posterior cerebral arteries to help supply the area of the brain, patients will have major neurological deficit i.e. unilateral facial palsy and hemiplegic of the arm and leg because the posterior limb of the internal capsule lacks of blood supply. Patients may have the hemi-anesthesia but the symptom is usually not severe because to the affected part is only the lower part of the sensory cortex only. Patients may have visual dysfunction in homonymous hemianopia pattern. The symptoms of numbness, weakness, and disorders of vision occur on the opposite site of brain lesion. In addition, patients may have difficulty in swallowing, and incontinence. If the abnormality occurs at the dominant hemisphere, patients may have global aphasia. However, the abnormality occurs at the non-dominant hemisphere, some patients may have language problems as well because there is a problem in the emotional tone, facial expression and gesture called “aprosody” and patients can not recognize mood of the other people. Patients may not perceive physical conditions of the limbs and the environment of the opposite site and can not distinguish the position of an object.

If a blood clot occludes a distal branch of the MCA, the signs and symptoms are similar to those with the obstruction of the proximal part of the MCA, except that the face and arm will be weaker than the leg. It is because the inferolateral aspect of the motor cortex is an ischemia. If the problem is at the dominant hemisphere, patients will have Broca's (motor) aphasia. If the abnormality

occurs at the non-dominant hemisphere, patients can not express their emotion. If the occlusion is at the lower branch of the MCA, patients will have problems in communication and vision which is contralateral hemianopia. If the problem is at the dominant hemisphere, patients will have Wernicke's (sensory) aphasia. If the abnormality occurs at the non-dominant hemisphere, patients will have difficulty recognizing the emotions of other people.

b. Symptoms group that is occur from pathology of vertebrobasilar artery

Vertebrobasilar artery

The vertebrobasilar artery is a branch of the subclavian artery which supplies the brain stem, medulla and pons. The vertebral arteries on both sides join together to be the basilar artery. Both the branches of the vertebral arteries and the basilar artery supply the brain stem and cerebellum. The principal branches are the posterior inferior cerebellar artery (PICA) which is a final branch of the vertebral artery and the anterior inferior cerebellar artery (AICA) which is a branch of the basilar artery at the pons level. Both branches supply the inferior lobe of the cerebellum. The superior cerebellar artery (SCA) originates from the basilar artery at the midbrain level to supply the superior lobe of the cerebellum. However, since the brain stem has a complex structure, Brain stem lesion on one side might make bilateral suffering to patients. Patients may present with “cross-syndrome” where the cranial neuropathy is on one side (affected side) and the extremities are affected on the other side.

Posterior cerebral artery

The posterior cerebral artery (PCA) originates from the basilar artery. It supplies the thalamus, lateral geniculate, temporal and occipital lobes. When it is occluded, patients often have abnormalities in the perception of the hemisphere which can be feeling less or abnormal feeling such as hyperesthesia or dysesthesia. Patients may have abnormal vision which can be visual loss or inability to distinguish colors. In cases of the brain damage at the occipital cortex and corpus callosum of

dominant hemisphere, there will be the disconnection between the unaffected visual cortex of the non-dominant hemisphere and the primary language area of the dominant hemisphere leading to the visual field defect opposite to the lesional hemisphere. Patients will lose the ability to read but they can still write. In addition, the obstruction of the PCA may result in infarction of the temporal lobe and hippocampus which results in memory impairment.

2.1.2.3 Classification of stroke by the duration of progression

i.) Transient ischemic attack (TIA) is the phenomenon of stroke that signs and symptoms occur and disappear within 24 hours. It is often found in patients with carotid artery atherosclerosis.

ii.) Reversible ischemic neurological deficit (RIND) is not common. The signs and symptoms occur and last for more than 24 hours but disappear within 2 weeks. It is believed to be caused by brain ischemia only in a small area.

iii.) Progressive stroke (stroke in evolution) is a stroke which signs and symptoms become worse. It is often caused by an expanding blood clot in an artery leading to the progressive occlusion of the blood flow.

iv.) Complete stroke is used when signs and symptoms of patient are fully occurred and no further progression is observed fully.

2.1.3 Symptoms of stroke²⁹

Stroke patients have symptoms depending on the type and the affected area of the brain. The symptoms are developed quickly over a few minutes. The severity of stroke may be divided into three levels, as follows.

a. Mild symptoms

The mild symptoms are developed in small vessel stroke. The brain area lacks of blood supply temporarily but there is no permanent infarction. In some cases, there is permanent brain damage but the affected area is small and not a pathway of major neural control. Cerebral ischemia occurs in a short period of time.

Patients may have weakness of the extremities, slow movement, facial asymmetry, drooling, dysarthria and temporary memory loss.

b. Moderate symptoms

Patients may have paresis. The neurons are partially destroyed. After receiving treatment, the symptoms will gradually improve. Most symptoms occur suddenly. There are muscle weakness, loss of balance, hemianopia or monocular visual loss, loss of memory and calculation, decision making, and emotional symptoms in some cases such as depression or irritability.

c. Severe symptoms

Patients may have paralysis. The neurons are destroyed permanently. Patients have arm and leg weakness, loss of balance, inability to speak or pronounce words, facial weakness, gaze palsy, difficulties swallowing, slow reaction time and memory loss.

2.1.4 Risk factors for stroke; categorized into 3 types²⁷

2.1.4.1 Non-modifiable risk factors

Table 2.1 Non-modifiable risk factors for stroke

Factors	Incidence / Risk
Age ³⁰	In people aged 45 years or more, the incidence increases 2-fold in every 10 years of the increasing age.
Sex ^{30,31}	Male risk is 1.5 times that of females.
Ethnic ³²	In people aged 45 years or more, Blacks: The incidence is 1,283 per 100,000 population Hispanic: The incidence is 667 per 100,000 population Whites: The incidence is 712 per 100,000 population
Genetics ³³	Paternal stroke increases the risk of 2.4 times (95% CI: 1-6) Maternal stroke increases the risk of 1.4 times (95% CI: 0.6-3.2)

2.1.4.2 Well-documented and modifiable risk factors

Table 2.2 Well-documented and modifiable risk factors for stroke

Factors	Relative Risk	Risk / Risk ratio, after treatment
Hypertension	4-6 times ³⁶	Systolic blood pressure reduction of an Average of 10 mmHg. Risk for stroke decreases 34 per cent (95% CI: 20-48) Diastolic blood pressure reduction with an average of 5 mmHg. Risk for stroke decreases 28 per cent (95% CI: 12-44) ³⁵
Atrial fibrillation	5 times ³⁶	Adjusted-dose warfarin: Risk for stroke decreases 62 per cent (95% CI: 48-72) ³⁷ Aspirin ; Risk for stroke decreases 22 per cent (95% CI: 2-38) ³⁸
Heart disease / Acute myocardial infarction	2 times ³⁴	Patients receiving antiplatelet therapy had the decrease in the recurrence of heart disease or death from stroke in 38 per 1,000 patients (95% CI: 28-48) ³⁴
The abnormality of carotid artery	2 times ⁴⁰	Within 3 years after surgical, the surgery reduces the risk of recurrent stroke more than antiplatelet drugs 2 per cent ⁴¹
Smoking	1.5 times ^{42,43}	After stop smoking for 5 years, risk for stroke decreases to be equal to those who have never smoked cigarettes ^{43,44}
Diabetes mellitus	2 times ⁴⁵	Controlling blood sugar helps prevent microvascular complications ⁴⁶
Hyperlipidemia	No direct relationship ⁴⁷	Statins reduce the risk of stroke 29 per cent (95% CI: 14-41) ⁴⁸

Table 2.2 Well-documented and modifiable risk factors for stroke (continued)

Factors	Relative Risk	Risk / Risk ratio, after treatment
Prior stroke	5 times after a stroke are the first 5 years ⁴⁹	Antiplatelet drugs reduce the risk of recurrence stroke over 25 per cent (95%CI: 10-35) ³⁹

2.1.4.3 Less well-documented or potentially modifiable risk factors

- Obesity
- Physical inactivity
- Poor diet intake
- Alcohol abuse
- Drug abuse
- Oral contraceptive pill
- Other risk factors that are less well-documented or potentially modifiable, for example, antiphospholipid syndrome (APS), hormone replacement therapy and vasculitis.

2.1.5 Diagnosis of stroke types⁵⁰

Stroke is categorized by pathology into 2 groups which are ischemic stroke and hemorrhagic stroke.

Ischemic Stroke

Ischemic stroke is caused by vascular obstruction of both large and small vessels in the brain and is classified into 3 subtypes.

i.) Small arterial occlusion. The occlusion occurs at a vessel of a diameter of 1-2 mm. This small vessel is a branch of an artery penetrating into the brain or brain stem tissue. The cause of the occlusion is often from hypertension and diabetes mellitus that deteriorate the walls of blood vessels leading to stenosis of the

lumen and complete occlusion. This process is called lipohyalinosis. As a result of this process, surrounding brain volume of 10-20 cc. lacks of blood supply and develops lacunar infarction. Because of the small area of infarction, patients do not lose consciousness. As lacunar infarction is small, sometimes it does not cause any recognized symptoms and sign. If this happens in an important area such as brain stem or internal capsule, it causes more disability.

ii.) Large arterial occlusion. It starts from the tear of the vessel wall with atherosclerotic plaque leading to leak of the plaque substance into the local circulation. Then, it stimulates platelets to aggregate and induces coagulation cascade to finally develop the blood clot to occlude the blood vessel. Large arterial occlusion causes the large area of infarction result in the major neurological deficit and sometimes loss of consciousness from brain swelling. In addition, sometimes the swollen brains progresses and compress the brain stem from herniation.

iii.) The occlusion of the blood vessel from a blood clot or other tissues such as tumor tissue. It flows with the circulation and lodges to obstruct the blood vessel causing the embolic stroke. The occlusion is usually at a large blood vessel. However, it can also occur at a small vessel.

Hemorrhagic Stroke

The common causes of hemorrhagic stroke include the following.

i.) High blood pressure usually causes bleeding in the brain. The common positions are at basal ganglion, thalamus, cerebellum and brainstem.

ii.) Abnormal cerebral blood vessels such as arteriovenous malformations and amyloid angiopathy.

iii.) Overdose of anticoagulant drug use such as warfarin and heparin.

iv.) An accident.

The classification of hemorrhagic stroke according to the position of bleeding into 3 groups as follows.

- a.) Intracerebral hemorrhage
- b.) Intraventricular hemorrhage (IVH); divided into the following.
 - b.i) Pure intraventricular hemorrhage called primary IVH.
 - b.ii) Intracerebral hemorrhage and then rupture into ventricle called secondary IVH.
- c.) Subarachnoid hemorrhage (SAH) divided into the following.
 - c.i) Primary SAH; caused by the rupture of blood vessels with the underlying pathology.
 - c.ii) Secondary SAH; caused by the rupture of blood vessels due to high blood pressure or an accident.

The differentiation of ischemic stroke or hemorrhagic stroke

In case of the hemorrhagic stroke, the sudden bleeding increases the intracranial pressure causing headache, nausea, and vomiting. Sometimes patient's loss consciousness. The symptoms are usually related to the high blood pressure. If the bleeding is not much, there might not increase the intracranial pressure. Relying on the blood pressure may not be accurate as it is also high in patients with ischemic stroke.

Currently, there are special tools and others such as computerized tomography of the brain (Cranial CT scan) to help to diagnose more accurately and quickly. It is usually performed in everyone with suspected of acute stroke. Magnetic resonance imaging (MRI) will detect the abnormalities more accurately than the CT scan, but it takes longer time and costs much higher than the CT scan. Hence, it is used in cases of necessity. Ultrasound is used to examine the carotid artery at the neck to detect the atherosclerosis of the artery at this area.

2.1.6 Treatment of stroke

At present, stroke can be treated by medication or surgery. It is important that patients should seek medical advice immediately as possible after symptoms onset. If they come to visit a doctor within 3-6 hours, there will be the opportunity to receive the effective treatment. The critical period of stroke during 3-7 days of illness leading to death. Hence, patients need to be treated in a hospital or under the supervision of a doctor closely. This treatment is intended to help patients to relieve from the symptoms with the least disability and to prevent the recurrence of stroke.

1. Treatment of ischemic stroke

There is no treatment to recover the dead brain tissue to normal. In case of the temporary lack of the blood supply, the ischemic brain could resume to normal function. Hence, the treatment strategy is to increase the cerebral blood flow to the ischemic area as much as possible. The treatment strategies can be as follows.

1.1) Maintain adequate blood pressure. Do not reduce diastolic blood pressure reduction below 90-100 mmHg because the cerebral autoregulation will be impaired. If the blood pressure is too low, the blood circulation to the brain will be reduced leading to the expansion of the cerebral ischemic area and the progression of the ischemia in the territory which has existing occlusion. This will increase the ischemic area.

1.2) Antiplatelets drug. This is found to reduce the incidence rate of dead brain tissue from the temporary lack of blood to the brain and reduce the recurrent rate in patients who have existing dead brain tissue.

1.3) Anticoagulant drug. This is used in patients who has the temporary lack of blood to the brain and who has an embolism from other organs.

1.4) The drugs for reducing the brain swelling. The hyperosmolar agent such as mannitol is used to reduce the brain swelling.

2. Treatment of hemorrhagic stroke

The treatment aims to prevent the increasing bleeding or rebleeding and to reduce the intracranial pressure. The treatment emphasizes on a supportive therapy. Common drugs used are as follows.

2.1) Antihypertensives drugs for hemorrhagic stroke from high blood pressure. It must be used with caution because it can reduce the cerebral blood flow.

2.2) Surgical evacuation of patients with a hematoma which compresses the brain.

2.3) Surgery to drain the cerebrospinal fluid from the ventricular system to other body spaces in patients with IVH.

In conclusion, the treatment of stroke patients aims to reduce the symptoms and disabilities, and to prevent the recurrence of the disorder. In ischemic stroke patients, the treatment is to increase the cerebral blood flow as much as possible. This is by control the blood pressure to the proper level, antiplatelet drugs, anticoagulants and hyperosmolar agents in an appropriate case. In hemorrhagic stroke patients, the treatment is the best supportive care, prevent rebleeding, and reduce the intracranial pressure with medications or surgical intervention.

2.1.7 The nature of the recovery of stroke¹⁶

Stroke patient can have better symptoms or functional abilities by 2 mechanisms.²³ The first one is a mechanism of neurologic recovery such as the decrease in brain edema, and the improvement of cerebral blood flow. This reduces the neurological deficits and usually occurs in the first 6 months.²⁴ The improvement may be the increase in muscle strength or speech ability. The second mechanism is from rehabilitation. This is the improvement of the ability despite the remaining physical disability.⁵¹⁻⁵⁴ The ability of rehabilitation depends on personality, mental status, motivation, the assistance from the social, families and relatives. The majority of the patients improve within 3-6 months and the speed of recovery is faster in the first 1-3 months.^{24,25}

Generally, the recovery of the patient usually takes time. In patients with potential recovery, the recovery usually getting better within 2-3 weeks and will gradually recover until they are independent or nearly complete recovery. If the symptoms do not improve at the 6th months, patients usually have permanent disability which is dependent on the severity of the disease and the physical status of the patients.⁵⁵

2.1.7.1 Neurological recovery⁵⁶

Neurological recovery after stroke is different among patients. It can be different both in the degree and duration of recovery depending on the size, position and severity of the lesions. Some patients can recover up to 80-90% within 1-2 months. These is a majority of the recovery occurs within 3 months of stroke. After 6 months, the recovery is slow.²⁵

Recovery of stroke is divided into 2 stages.

1. Acute stage; patients will have the neurological recovery naturally if they are treated promptly and properly to improve the cerebral circulation, reduce brain edema, and decrease intracranial pressure. This shows by the increase ability to move limbs better, improving motor control, improving ability to speak or understand the language, and better primary neurological function. Natural recovery usually occurs within 1 month after the disease.²⁴

2. After acute stage; patients will recover in their functional abilities and well-being by the natural recovery. This recovery is from the patients' adaptation or being trained to use the other parts of the body to compensate or replace the dysfunction organs. This recovery needs a lot of knowledge and skill in rehabilitation.^{51,57}

a. Mechanism of neurological recovery

The mechanism of neurological recovery after stroke is divided into 2 processes.

1. Natural spontaneous recovery; resulting from the improvement of the pathology of the brain around the ischemia called the ischemic penumbra. This process involves the increase blood flow to the neurons, reduction of the brain swelling as well as intracranial pressure, and decreasing the bleeding. This takes times around 1-2 weeks.⁵⁸

2. Recovery from neural plasticity recovery; the unaffected neurons modify themselves such as branching of dendrites, unmasking, and disachisis. This plasticity results in modification of the structure and function of neurons. It is a learning process and time consuming in practicing. Currently, there are

certain drugs and various techniques to stimulate the modification of neuronal network faster and more efficiently.⁵⁹⁻⁶¹ Rehabilitation has a huge role in the process of neural plasticity of the brain such as the attempt to use the weak arm and leg in order to neural network by the constraint-induced movement therapy and treadmill training with body weight support.⁶²⁻⁶⁴

b. Recovery of Motor Function

Most patients will have a similar pattern of recovery as follows.⁶⁵

The arm has the characteristic of prominent flexor synergy.

Scapula	:	retraction, depression
Shoulder	:	internal rotation, depression
Elbow	:	flexion, pronation
Wrist, Finger	:	flexion

The leg has the characteristic of prominent extensor synergy.

Pelvis	:	retraction, elevation
Hip	:	adduction, internal rotation
Knee	:	extension
Ankle	:	plantar flexion
Foot	:	inversion

In ischemic stroke at the middle cerebral artery territory, legs are usually recovered faster than arms and hands. Proximal muscles often recover before the distal muscles. However, the recovery of motor function may be stopped at any time and the recovery usually occurs substantially within 3 months after stroke.

Patients with a poor prognosis for the recovery of motor function to the arms and hands are those with the following characteristics.^{66,67}

1. Complete arms paralysis at the beginning
2. Can not move arms and hands within 3 weeks
3. The movement in the second part does not follow the first part within 1 week
4. Can not measure to the hand grip strength within 4 weeks

c. Recovery of Language and Perception

Recovery of language and perception occurs at a slower rate and require a longer period than motor function. It usually occurs within 3-6 months after stroke depending on the type and severity. Patients with fluent aphasia recover better than patients with nonfluent aphasia. Comprehension recovers faster and more than expression. Patients with anomia or word finding difficulty have the best prognosis while patients with global aphasia have the worst prognosis and take the longest to recover.²⁵

2.1.7.2 Stroke Rehabilitation¹⁶

Rehabilitation is a process that takes time and is divided into intervals with a different goal and approach as follows.

1.) Rehabilitation in the acute period

The rehabilitation should be started immediately once the diagnosis is made and patients are free from life-threatening conditions. It is recommended that evaluation of rehabilitation potential within 24-48 hours after hospitalization to determine the clinical symptoms, cause, position, and severity of stroke. The role of rehabilitation in this stage is to prevent important complications such as deconditioning state. Then, the assessment of social and environmental aspects should be done to help treatment and discharge planning. Patients should be encouraged to move when the clinical status is stable for 24-48 hours. For those who have SAH, the movement should be delayed for 10-14 days to stabilize the symptoms because the rebleeding is common at the beginning.

2.) Specific rehabilitation

This type of rehabilitation aims to improve the functional abilities of stroke patients suitable for the individual. The patient must be evaluated in terms of physical function, mental status, emotional status, communication ability, readiness to learn and practice, and motivation. This is to realize the potential of that patient and to organize the appropriate program. The rehabilitation in this period can be varied depending on the patients and their family. It can be done at home or meeting medical personnel for consultation sporadically or practicing in a hospital as an outpatient or inpatient cases. The training center could be a hospital or a

rehabilitation center. Patients who have many medical problems should be taken care and received the training in a hospital.

3.) Life time rehabilitation

The discharge from a hospital or the end of the rehabilitation training program at the health service is not the end of the specific rehabilitation but it is the start of a new life of a stroke patient. Patients return to outside world with the same or change of the social role. They need to adapt themselves and might find more problems in living in their real world. Hence, the health care professionals should make an appointment for patients to come back for reassess or recounselling periodically especially in the first year. This is to help patients to maintain the ability level they have got from the rehabilitation and even to improve their capacity. It is reported that the rehabilitation can be helpful even if it is an old a stroke occurring several years ago. In the assessment, the assessors should be focus on the physical condition, recognition, emotion, role and their social adaptation.

2.1.8 Factors affecting the recovery from stroke²⁰

1.) Pathological factors; it is found that the location of the pathology is critical to the recovery of muscles as follows.⁶⁸

a. The possibility of recovery of arm muscles reduce consecutively in the following order of lesions: lesions of the motor cortex, corona radiata and posterior limb of internal capsule (PLIC). The PLIC is the conjunction of corticospinal tracts from the primary motor area (M1).

b. Patients with the lesions at the premotor area will have the recovery of arm muscles less than those without such lesions.

2.) Clinical factors affecting the recovery of muscle power, for example, the severity of the disease in early stages.^{69,70} Besides, other clinical factors include a history of stroke in the past, diabetes mellitus and peripheral artery disease.⁶⁷ Some studies found that age, heart disease and prior history of vascular dementia had a major impact on mortality and recurrence of stroke after 1 year.⁷¹ Besides, it was found that it took time at least 6 months in recurrence stroke to recover to an independency state which was longer than that for the first stroke about 3 months.⁷² Recurrent stroke is also an important factor to predict poor outcomes in the long term

(5 years), for example, the loss of performance, the need to be taken care of in a nursing home or even death.⁷³

3.) Therapeutic factors; The rapid and proper treatment suitable for the pathophysiology of the changes in each period of stroke is important to the recovery of muscle power. The use of recombinant tissue plasminogen activator therapy as indicated, providing adequate and appropriate food and fluid as well as the appropriate treatment of high blood pressure⁷⁴ and prevention of the potential complications, early rehabilitation⁷⁵ all affect the recovery of muscle power.

2.1.9 Prognosis of stroke²⁰

The prognosis of stroke is good if there is blood supply to the ischemic area, less compression of the brain by the hematoma, and reduction of the brain swelling. Therefore, the prognosis depends on the following factors.

1. Age; a younger patient predicts better outcome than an older patient
2. Cause of the disease; hemorrhagic stroke patients who receive the prompt treatment have better recovery than ischemic stroke patients. If there is only little obstruction, the prognosis is better than those with massive obstruction. The occlusion of the extracranial artery has the better prognosis than the intracranial arterial occlusion.
3. The size of the lesion; if the lesion are large, the opportunity to recover is small.
4. The location of the lesion; if the lesion is at the cortex, the prognosis is worse than that at the brain stem because the lesion in the cortex destroys a part that helps optimizing the brain function. The lesion on the non-dominant hemisphere usually have a worse prognosis than the lesion on the dominant hemisphere because the non-dominant hemispheric lesion often causes patients to be disoriented to time, place and person and to neglect the opposite body and limbs. This is an obstacle for the rehabilitation and performing self-care.

In conclusion, the prognosis of stroke depends on age of the patient, cause of the disease, size and location of the lesions.

2.1.10 Complications of stroke

Patients who have chronic illness and lack of availability of care by caregivers can lead to various complications. The common complications are as the following.

1. Pressure ulcer; the major cause of pressure ulcer is the pressure, especially the tissue between bony prominence and the compressing surface. It can also be from the friction. Other factors that promote pressure ulcers are the restricted movement, loss of sensation, blood flow reduction, malnutrition, swelling, and infection, etc. The most common site of pressure ulcers is the weight-bearing area of the body, such as, coccyx, elbow, scapula, occiput, ear pinna, hip, knee, heel, and ankle.

2. Joint contracture; as there is no movement of the joint, some changes develop such as the fascia and tendon near the joint being stiff and contracted reduction of the synovial fluid or calcium deposition at the joint.

3. Pneumonia; due to the aspiration or regurgitation of food from swallowing disorders, the weakness of accessory respiratory muscles and diaphragm or bronchial secretion, the patients might develop pneumonia.

4. Urinary tract infection (UTI); it is caused by the urinary retention, the position of urine bag being higher than urinary bladder level in patients with urinary catheter, the dried blood or mucous at the exit of line, or from the irritation of urinary bladder from the movement of urinary catheter.

5. Other complications; for example, constipation, urinary incontinence, enuresis, urinary stone, foot and leg deformity, osteoporosis and fragile bone.

2.1.11 Effect of stroke on the patient and families

Morbidity of stroke patients occurs from the pathology of brain which causes the changes to body systems. This change depends on the severity and associated risk factors which cause the effect, as follows.

1. Physical impact; when there is brain ischemia, the affected brain lose its functions. The duration of this functional loss and recovery depends on the duration of cerebral ischemia and location of brain lesion. Stroke patients with the left

hemispheric lesion have right limb weakness or paralysis, disorders of speech, aphasia, dysarthria, inability to read and write, cognitive and memory impairment. Stroke patients with right hemispheric lesion have left limb weakness or paralysis, memory impairment, behavior, emotion, perception of body position, neglect and inattention, and impairment in estimating distance. These impairments usually causes movement problems, perception of sensory modalities, loss of self control leading to the inability of patients to take care themselves, to carry out daily activities, inability to sit and stand, speech problem, chewing and swallowing problems, and bowel and bladder control problems. As a result, patients lack the potential to live by themselves, loss of independence, depend on others for activities of daily living.⁷⁶ Also, the ability to perform everyday activities decreases in both short and long terms.^{77,78}

2. Psychosocial impact; when there are physical impact to patients, they loss of self esteem and the self-confidence. This could lead to depression. Mental and emotional impacts are most common to the patient.^{79,80} The symptoms are social withdrawal, desperate, angry, aggression, and irritability.⁸¹

3. The impact on the family; when a family member suffers from stroke and their families have been affected. Family members of patients often have reduced quality of life⁸² and there is more stress.⁸³ Long-term care for patients will lead to reduce quality of life of caregivers.⁸⁴ However, family need to change the roles and life style to take care the patients. Family is important social support in rehabilitation and returning to patients' society. Family has to help patients return to their original state as much as possible including physical function, self esteem and social role of the patients.

2.2 Assessment of the functional abilities of stroke patients

2.2.1 The Modified Rankin Scale (mRS): It was created by John Rankin⁸⁵⁻⁸⁷ and translated into Thai by Prasat Neurological Institute, Department of Medicine, Ministry of Public Health.⁸⁸ It is common tool used to measure abilities after stroke and is accepted worldwide.⁸⁹ Clinical trial use of the mRS is global and often used by research nurses and professions allied to medicine.⁹⁰ A systematic

review of modified Rankin Scale reliability studies, which also found reliability of mRS was 0.95. Overall reliability of mRS was 0.90 in traditional mRS and 0.87 in structured interview.⁹¹ The scoring 0-6 is based on the level in the loss of abilities as follows.

- 0 = No symptoms at all
- 1 = No significant disability despite symptoms; able to carry out all usual duties and activities
- 2 = Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance
- 3 = Moderate disability; requiring some help, but able to walk without assistance
- 4 = Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance
- 5 = Severe disability; bedridden, incontinent and requiring constant nursing care and attention
- 6 = Dead

2.2.2 The Barthel Index (BI): It was developed by Mahoney FI and Barthel D⁹² and translated into Thai by Prasat Neurological Institute, Department of Medicine, Ministry of Public Health.⁸⁸ It is a measurement tool for stroke patients which is worldwide accepted.⁹³ Evidence suggests that the BI is a valid measure of activities of daily living. The sensitivity to change is limited at extremes of disability (floor and ceiling effects), and reliability of the standard BI assessment is acceptable.⁹⁴ For BI, internal consistency has been described as good ($\alpha=0.80-0.89$)^{95,96} to excellent ($\alpha=0.93$).⁹⁷ Barthel index is graded according to level of self-care activities by observing and asking the patient to assess progression in self-care and mobility of stroke patients. It consists of 10 activities including, grooming, bathing, dressing, feeding, bladder, bowels, toilet use, transfers (bed to chair and back), mobility (on level surfaces), and stairs. The possible scores range from 0-100. Patients who have a lower score indicate that they need to the help in daily life more than those who have a higher score. It is categorized by functional ability to different levels as follows.

0-20	mean	Very severity disabled
25-45	mean	Severity disabled
50-70	mean	Moderately disabled
75-95	mean	Mildly disabled
100	mean	Physically independent but not normal or social independent

1. Grooming

0	=	needs to help with personal care
5	=	independent face/hair/teeth/shaving (implements provided)

2. Bathing

0	=	dependent
5	=	independent (or in shower)

3. Dressing

0	=	dependent
5	=	needs help but can do about half unaided
10	=	independent (including buttons, zips, laces, etc.)

4. Feeding

0	=	unable
5	=	needs help cutting, spreading butter, etc., or requires modified diet
10	=	independent

5. Bladder

0	=	incontinent, or catheterized and unable to manage alone
5	=	occasional accident
10	=	continent

6. Bowels

0	=	incontinent (or needs to be given enemas)
5	=	occasional accident
10	=	continent

7. Toilet use

0	=	dependent
5	=	needs some help, but can do something alone

10 = independent (on and off, dressing, wiping)

8. Transfers (bed to chair and back)

0 = unable, no sitting balance

5 = major help (one or two people, physical), can sit

10 = minor help (verbal or physical)

15 = independent

9. Mobility (on level surfaces)

0 = immobile or ambulate < 50 yards

5 = wheelchair dependent, including corners, > 50 yards

10 = walks with help of one person (verbal or physical) > 50 yards

15 = independent (but may use any aid; for example, stick) > 50 yards

10. Stairs

0 = unable

5 = needs help (verbal, physical, carrying aid)

10 = independent

2.2.3 The National Institutes of Health Stroke Scale (NIHSS) for stroke patient. It was created by Thomas G. Brott⁹⁸ and was translated into Thai by Yongchai Nilanont Et al.⁹⁹ This tool is used to measure the neurological deficits which has been accepted as a good predictor for long term clinical outcomes.^{100,101} It was found that the deficit levels as measured by the NIHSS within 24 hours after stroke can predict exactly the place for treatment after the acute stage.⁸⁹ Additionally, the NIHSS evaluation is useful in assessing the severity of symptoms, assist in monitoring the treatment and can predict the clinical outcome. Patients with higher scores have more severe deficit than patients with lower scores. The Thai version of NIHSS is valid for assessing acute stroke severity. Spearman rank correlation coefficients between the initial NIHSS-T score versus initial MRI lesion volume and mRS at 3 months were 0.53 and 0.69 with a p-value of 0.002 and <0.001 respectively. Intra-observer reliability demonstrated high correlation of 0.98, 0.98, 0.96, 0.98, 0.90 and 0.98 for 2 stroke fellows, 2 internists and 2 stroke nurses respectively. Inter-observer reliability between 6 raters was excellent of 0.99, 0.98 and 0.99 respectively.

The scale is used to assess acute stroke severity when administered in a Thai-speaking setting by trained healthcare professionals.⁹⁹ The NIHSS assessment is used to assess various domains, a total of 11 domains, including level of consciousness, best gaze, vision, facial palsy, motor function of the arm, motor function of the leg, limb ataxia, sensation, best language, dysarthria, extinction and inattention, etc.¹⁰² A total of 42 scores by the scoring is as follows.

0	mean	No stroke
1-4	mean	Minor stroke
5-14	mean	Moderate stroke
15-20	mean	Moderate / severe stroke
21-42	mean	Severe stroke

1a. Level of consciousness

0	=	Alert; keenly responsive
1	=	Not alert; but arousable by minor stimulation to obey, answer, or respond
2	=	Not alert; requires repeated stimulation to attend or is obtunded
3	=	Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and areflexic

1b. LOC Questions

0	=	Answers both questions correctly
1	=	Answers one question correctly
2	=	Answers neither question correctly

1c. LOC Commands

0	=	Performs both tasks correctly
1	=	Performs one task correctly
2	=	Performs neither task correctly

2. Best gaze

0	=	Normal
1	=	Partial gaze palsy
2	=	Forced deviation, or total gaze paresis not overcome by the oculoccephalic maneuver

3. Visual

- 0 = Normal
- 1 = Partial hemianopia
- 2 = Complete hemianopia
- 3 = Bilateral hemianopia (blind including cortical blindness)

4. Facial palsy

- 0 = Normal symmetrical movements
- 1 = Minor paralysis (flattened nasolabial fold, asymmetry on smiling)
- 2 = Partial paralysis (total or near-total paralysis of lower face)
- 3 = Complete paralysis of one or both sides

5a. Left motor arm

- 0 = No drift; limb holds 90 (or 45) degrees for full 10 seconds
- 1 = Drift; limb holds 90 (or 45) degrees, but drifts down before full 10 seconds
- 2 = Some effort against gravity
- 3 = No effort against gravity; limb falls
- 4 = No movement
- UN = Amputation or joint fusion

5b. Right motor arm

- 0 = No drift; limb holds 90 (or 45) degrees for full 10 seconds
- 1 = Drift; limb holds 90 (or 45) degrees, but drifts down before full 10 seconds
- 2 = Some effort against gravity
- 3 = No effort against gravity; limb falls
- 4 = No movement
- UN = Amputation or joint fusion

6a. Left motor leg

- 0 = No drift; leg holds 30-degree position for full 5 seconds
- 1 = Drift; leg falls by the end of the 5-second period but does not hit bed
- 2 = Some effort against gravity

3 = No effort against gravity; leg falls to bed immediately

4 = No movement

UN = Amputation or joint fusion

6b. Right motor leg

0 = No drift; leg holds 30-degree position for full 5 seconds

1 = Drift; leg falls by the end of the 5-second period but does not hit bed

2 = Some effort against gravity

3 = No effort against gravity; leg falls to bed immediately

4 = No movement

UN = Amputation or joint fusion

7. Limb Ataxia

0 = Absent

1 = Present in one limb

2 = Present in two limb

8. Sensory

0 = Normal

1 = Mild-to-moderate sensory loss

2 = Severe to total sensory loss

9. Best Language

0 = No aphasia; normal

1 = Mild-to-moderate aphasia

2 = Severe aphasia

3 = Mute, global aphasia; no usable speech or auditory comprehension

10. Dysarthria

0 = Normal

1 = Mild-to-moderate dysarthria

2 = Severe dysarthria

UN = Intubated or other physical barrier

11. Extinction and Inattention

0 = No abnormality

- 1 = inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities
- 2 = Profound hemi-inattention or extinction to more than one modality

2.2.4 Glasgow Coma Scale (GCS): created by Graham Teasdale and Bryan J. Jennett.^{103,104} It was translated into Thai by Preecha Siritongtaworn and Somsak Pongprasert.¹⁰⁵ The GCS was used accurately by experienced and highly trained users. The reported reliability was 98.6 - 100% among experienced nurses, 94.3 - 96.2% among new graduates and 77.3 - 100% among groups of student nurses.¹⁰⁶ The interrater reliability for the GCS was good ($k_w=0.738$). The GCS are able to predict in-hospital morbidity and poor outcome at the end of hospitalization.¹⁰⁷ It is used to assess the level of consciousness by evaluating the best reaction to 3 forms of a stimuli i.e. eye opening, verbal response, and motor response. The scoring of the level of response to stimuli in the possible maximum score of 15 is as follows.

- 3-8 mean Severe; response to stimuli in the possible minor
- 9-12 mean Moderate; response to stimuli in the possible moderate
- 13-15 mean Mild; response to stimuli in the possible high

Eye opening (E)

- 1 = None; Even to supra-orbital pressure
- 2 = To pain; Pain from sternum/limb/supra-orbital pressure
- 3 = To speech; Non-specific response, not necessarily to command
- 4 = Spontaneous; Eyes open, not necessarily aware

Verbal response (V)

- 1 = None; No verbalization of any type
- 2 = Incomprehensible; Moans/groans, no speech
- 3 = Inappropriate; Intelligible, no sustained sentences
- 4 = Confused; Converses but confused, disoriented
- 5 = Oriented; Converses and oriented

Motor response (M)

- 1 = None; To any pain; limbs remain flaccid
- 2 = Extension; Shoulder adducted and shoulder and forearm

- internally rotated
- 3 = Flexor response; Withdrawal response or assumption of hemiplegic posture
 - 4 = Withdrawal; Arm withdraws to pain, shoulder abducts
 - 5 = Localizes pain; Arm attempts to remove supra-orbital/chest pressure
 - 6 = Obeys commands; Follows simple commands

2.2.5 The World Health Organization Quality of Life (WHOQOL)–Bref–Thai:

created by the World Health Organization.¹⁰⁸ It was translated into Thai by Suwat Mahatnirunkul, et al.¹⁰⁹ The assessment tool was developed from the World Health Organization Quality of Life-100 to evaluate a mental habit which is rooted in cultural, social and environment; by focusing on the perceived quality of life of stroke patients. WHOQOL-Bref-Thai reliability was 0.8406 and validity was 0.6515 which are comparable to the WHOQOL-100 in Thai language and it is officially recognized by the WHO.¹⁰⁹ It consists of 4 components i.e. physical health, psychological, social relations and environmental domains It includes 26 questions with a possible scores of 26-130.

To rate of the WHOQOL–Bref–Thai–26 score; all questions have a positive meaning in 23 items and a negative meaning in 3 items which are the 2nd, 9th and 11th items. Each item has the estimated 5 level scale.

Group 1; 3 questions have a negative meaning and each question has the scoring as follows

Never	5	score
Little	4	score
Moderate	3	score
Very	2	score
Most	1	score

Group 2; 23 questions have a positive meaning and each question has the scoring as follows

Never	1	score
Little	2	score

Moderate	3	score
Very	4	score
Most	5	score

Interpretation WHOQOL–Bref–Thai, the total scores range of 26–130 points. When the total score of all respondents can be compared with normal criteria.

26 – 60 scores	mean	poor quality of life
61 – 95 scores	mean	moderate quality of life
96 – 130 scores	mean	good quality of life

Table 2.3 The quality of life scores are separated into domains

Domains	Poor quality of life	Moderate quality of life	Good quality of life
1. Physical domain	7-16	17-26	27-35
2. Psychological domain	6-14	15-22	23-30
3. Social relationships domain	3-7	8-11	12-15
4. Environment domain	8-18	19-29	30-40
Quality of life scores	26-60	61-95	96-130

Physical domain: items 2,3,4,10,11,12,24

Psychological domain: items 5,6,7,8,9,23

Social relationships domain: items 13,14,25

Environment domain: items 15,16,17,18,19,20,21,22

3. Relevant research

The study regarding factors affecting level of functional abilities after stroke reveal the following findings.¹¹⁰⁻¹¹²

Age; the elderly stroke patients usually have lower level of functional abilities than younger patients since there are many underlying diseases and physical defects from those diseases.

The severity of disease; it is found that bilateral hemispheric lesions or severe disease leading to cognitive impairment, urinary and fecal incontinence longer than 3-4 weeks, flaccid paralysis longer than 2 months, impaired sitting balance, low level of functional abilities, or previous stroke are all associated with poor rehabilitation results.

Some associated neurological deficits are the hindrance for patients to learn to the self-care skills. These deficits are the impairment of the perception, hemi-neglect of the body and environment, severe aphasia, and major depression.

Some underlying diseases are the risk factors for recurrent stroke and affect the mortality rate. These underlying diseases are myocardial infarction and other heart diseases, diabetes mellitus, hypertension, and hyperlipidemia.

Stroke, once develop, results in neurological symptoms. Patients often have symptoms immediately but it takes quite a long time to recover. If they received appropriate care since the beginning, the mortality rate and disability will be substantially reduced and sometimes can return to normal life.¹¹³ The recovery is usually gradual depending on the size, position, type and severity of lesions.¹¹⁴ In addition, it also depends on age of patients, areas of brain tissue death and treatment of other diseases that causes stroke.¹¹⁵

The study found that, in the first month, 85 per cent of ischemic stroke patients survived while survival rate for hemorrhage stroke patients was 20-52 per cent.^{116,117} Patients who are unconscious at the beginning have poor prognosis because there are likely to have bleeding in the brain or large ischemic brain lesions associated with cerebral edema. Patients who have a small area of brain ischemia called a lacunar infarct or the motor function deficit only¹¹⁸ usually have the neurological recovery within 2-3 days to normal or nearly normal within a week. However, in patients who have a large lesion, the recovery of the neurological function may be a little or none despite full rehabilitation.¹¹⁴ This finding is consistent with the study that patients with the NIHSS on admission less than 10 will have a good prognosis in 60-70 per cent on follow-up at 1 year. On the contrary, patients with the NIHSS

greater than 20 indicating severe symptoms will have a good prognosis only in 4-16 per cent.¹¹⁹

A study which follow 5,017 stroke patients for a period of 3 months found that stroke patients have a mortality rate of 9.4 per cent. In addition, 33 per cent of patients had moderate or severe disability and needed help in carrying out daily routine activities. The remaining 57 per cent had mild disability or complete recovery.¹²⁰ The study at Chulalongkorn hospital on follow-up stroke patients for 1 year found that stroke patients had a mortality rate of 10 per cent, 32 per cent of patients had severe disability and 58 per cent of patients had mild disability or complete recovery.¹²¹

The study found that, 48-58 per cent of stroke patients can return to their independency in self-care.¹²² At the end of the first week, 17 per cent of patients have no residual muscle weakness and 31 per cent of patients have weakness of the limbs. On follow-up at 6 months, the ratio of those who have no weakness increases to 47 per cent while 9 per cent of the patients remain substantially weak. Patients who have weakness of the limbs at the end of three weeks have no recovery to normal after 6 months.¹²³

Moreover, the study also showed that only 9 per cent of the patients with complete paraplegia at the beginning will recover in hand function. If patients still can not move their arm and hand, or can move some parts of the arm but can not move the other parts, they are unlikely to recover. However, if the patients partially recover in the hand function, 70 per cent of them will have good recovery. Patients with a good recovery in hand function usually recover within 3 months after stroke.^{66,124} Approximately 75-85 per cent of stroke patients can recover and are able to walk with or without a cane or a walker.¹²⁵ This is consistent with the findings that 54-80 per cent of patients can walk within 3 months after stroke.¹²⁶

The study also found that stroke patients often have better quality of life within 18 months.¹²⁷ Men had quality of life, both in physical domain and psychological domain better than women.¹²⁸ Patients who had anxiety and depression had quality of life lower than patients without these conditions. Women had more anxiety than men.¹²⁹ The psychological domain of the quality of life of stroke patients living in rural and urban areas of the Northeastern region of Thailand is not

different.¹³⁰ This was similar to the study showed the quality of life of stroke patients increase at 1 month and 3 month after stroke, except for the social relationship domain and psychological domain are not different.¹³¹

The study found that stroke patients were often married, completed primary education, and had children as primary caregivers. Stroke patients have abilities to perform daily routine activities and care of themselves very well. As a result, they have a chance to recover from the disease better.¹³²

In term of the Barthel index, the score at 3 months after onset had a higher mean than that at 2 weeks after onset which reflected the functional recovery.¹³³

Moreover, a number of studies also showed that stroke patients who had high Glasgow Coma Scale indicating the almost normal function of the brain had a better recovery from stroke in the activities of daily routine than those have moderate to low Glasgow Coma Scale.¹³³ This was similar to other studies, which also showed that the conscious change of patients on admission assessed by Glasgow Coma Scale correlated with the ability to perform daily routine activities at 3 months after onset¹⁰³ and able to predict the prognosis or identify the factors that caused the disease.¹³⁴

CHAPTER III

MATERIALS AND METHODS

This chapter describes the research methodology used in this study. It includes research design, study population, sample size, research instrument, data collection and data analysis.

3.1 Research design

This study is a prospective cohort study design.

3.2 Study population and setting

The population used in this study is stroke patients who received a diagnosis confirmed by a doctor and were admitted in Saraburi hospital since December 23, 2010 to August 31, 2011.

Inclusion criteria:

1. Patients aged 18 years and over.
2. Patients received diagnosis of ischemic stroke or hemorrhagic stroke confirmed by a doctor.
3. In case of patients with disorders of consciousness or communication caused by stroke, there must be caregivers who were able to be interviewed. In case of patients and caregivers having trouble reading and writing, the researcher read or complete the record.
4. Patients voluntarily participate in this study.

Exclusion criteria:

1. Patients received diagnosis head injuries, tumors, central nervous system infections and transient ischemic attack (TIA).
2. Stroke patients who received recombinant tissue plasminogen activator (rtPA) therapy.
3. Prior stroke.
4. Patients with underlying psychotic disorders and mental disorders.
5. Patients who cannot follow-up the illness either by phone or interview the history while they are receiving treatment in a hospital and after discharge from the hospital.
6. Patients have an in-hospital stroke

3.3 Sample size

Estimated sample size was calculated from the formula to compare two proportions (sample size of each group).

$$n = \frac{\{u\sqrt{[\pi_1(1 - \pi_1) + \pi_0(1 - \pi_0)]} + v\sqrt{[2\bar{\pi}(1 - \bar{\pi})]}\}^2}{(\pi_1 - \pi_0)^2}$$

Where

$$\bar{\pi} = \frac{\pi_1 + \pi_0}{2}$$

n = sample size

π_1 = proportion of stroke patient who did not receive recombinant tissue plasminogen activator therapy and arrived at a hospital within 4.5 hours of symptom onset, with the mRS 0,1 in discharge at Saraburi hospital, equal to 0.35¹⁵

π_0 = proportion of stroke patient who did not receive recombinant tissue plasminogen activator therapy and arrived at a hospital after 4.5 hours of symptom onset, with the mRS 0,1 in discharge at Saraburi hospital, equal to 0.15¹⁵

- u = one-sided percentage point of the normal distribution corresponding to 100% - the power e.g. if power = 80%,
u = 0.84
- v = percentage point of the normal distribution corresponding to the (two-sided) significance level e.g. significance level = 5%,
v = 1.96

$$n = \frac{0.84\sqrt{[0.35(1 - 0.35) + 0.15(1 - 0.15)]} + 1.96\sqrt{[2(0.2)(1 - 0.2)]}}{(0.35 - 0.15)^2}$$

Where

$$\bar{\pi} = \frac{0.35 + 0.15}{2}$$

$$n = 73$$

The estimated sample size of each group required for this study was 73 cases.

This study expected that the studied participants might drop out of about 25% at 3 months and the data would not be complete. Hence, the researcher increased a number of estimated sample size 25% from the calculation to the actual sample size of 97 cases per group.

3.4 Sampling method.

This study used the purposive sampling method. Patients who received a diagnosis of stroke confirmed by a doctor and were admitted in Saraburi hospital with characteristics eligible to inclusion and exclusion criteria were invited to participate this study. Only 19.1% of stroke patients who receive rtPA were excluded during the data collection.¹⁵ The participants was divided into 2 groups according to the period of time that stroke patients arrived at a hospital after symptom onset. There were 97 cases in each group. The purposive sampling was used to recruit stroke participants who did not receive rtPA.

1. There were 97 stroke patients did not receive rtPA who arrived at a hospital within 4.5 hours of symptom onset.

2. There were 97 stroke patients did not receive rtPA who arrived at a hospital after 4.5 hours of symptom onset.

All eligible subjects gave their informed consent, and the study was approved by Siriraj Institutional Review Board.

3.5 Research instrument

The study instrument is a case record form consisting of seven-part questionnaire.

Part I The patients' general characteristics comprised 10 items, including sex, age, marital status, status in family, education level, occupation, caregiver, functional ability before stroke, effect of stroke on work, and cost of treatment. The patient or caregiver recorded the questionnaires by themselves.

Part II Characteristics of stroke and risk factors comprised 7 items, including severity of stroke, type of stroke, location of stroke lesion or hemiplegic, risk factors of stroke, knowledge about risk factors for stroke, knowledge about the care and treatment of stroke patients, and the period of time when stroke patients arrived at a hospital after the symptom onset. This part was filled in by the researcher.

Part III Modified Rankin Scale (mRS) is an instrument for ability assessment in performing daily activities. It is divided into 6 levels according to the functional loss. This part was filled in by the researcher.

Part IV The Barthes Index (BI) is an instrument for the assessment of self-care abilities and the mobility of stroke patients comprising 10 items of activities, for example, grooming, bathing, dressing, feeding, bladder, bowels, toilet use, transfers (bed to chair and back), mobility (on level surfaces) and stairs, with a possible total of 100. This part was filled in by the researcher.

- Part V** The National Institutes of Health Stroke Scale (NIHSS) is an instrument for the assessment of neurological signs of stroke patient which is composed of 11 the items, for example, level of consciousness, best gaze, visual, facial palsy, motor arm, motor leg, limb ataxia, sensory, best language, dysarthria, extinction and inattention, etc. The maximal possible score is 42. This part was filled in by the researcher.
- Part VI** Glasgow Coma Scale (GCS) is an instrument for the assessment of conscious change in stroke patients, for example, eye opening, verbal response and motor response. It is scored according to level of best response to stimuli. The possible scores range between 3-15. This part was filled in by the researcher.
- Part VII** The World Health Organization Quality of Life (WHOQOL)–Bref–Thai consists of 4 components which are physical domain, psychological domain, social relationship domain, and environmental domain. It consists of 26 questions and has a possible scores of 26-130. This part was filled in by the researcher.

3.6 Data collection

The study period used in data collection were from December 23, 2010 to August 31, 2011. The questionnaire was filled in by the patients or caregivers. The researcher filled in the data from medical records. The patients and caregivers were interviewed twice. The first time was when they were admitted at an inpatient ward of Saraburi hospital after receiving a diagnosis of stroke confirmed by a doctor. The second interview was after 3 months of stroke onset by 15-minutes telephone interview. In case of being not able to contact the patients by telephone, the questionnaire was sent out to their contact address. The second time interview included only specific information in the part III, IV and VII. They comprised modified rankin scale (mRS), the Barthel index (BI) and the World Health Organization Quality of Life (WHOQOL)–bref–Thai. The questionnaire on the first and the second time were the same.

3.7 Data analysis

Primary Outcome	Variable	Statistics
Characteristics description of data	Categorical Data	Frequencies, Percentage
	Numerical Data	Mean, Standard Deviation, Median, Interquartile Range
mRS	Categorical Data 2 groups	Chi-square test
Barthel index	Categorical Data 2 groups	Chi-square test
NHISS	Categorical Data 2 groups	Chi-square test
Glasgow Coma scale	Categorical Data 2 groups	Chi-square test
Predicting recovery	Numerical Data	Multivariate Regression Analysis

Secondary Outcome	Variable	Statistics
WHOQOL Bref-Thai	Categorical Data 2 groups	Chi-square test

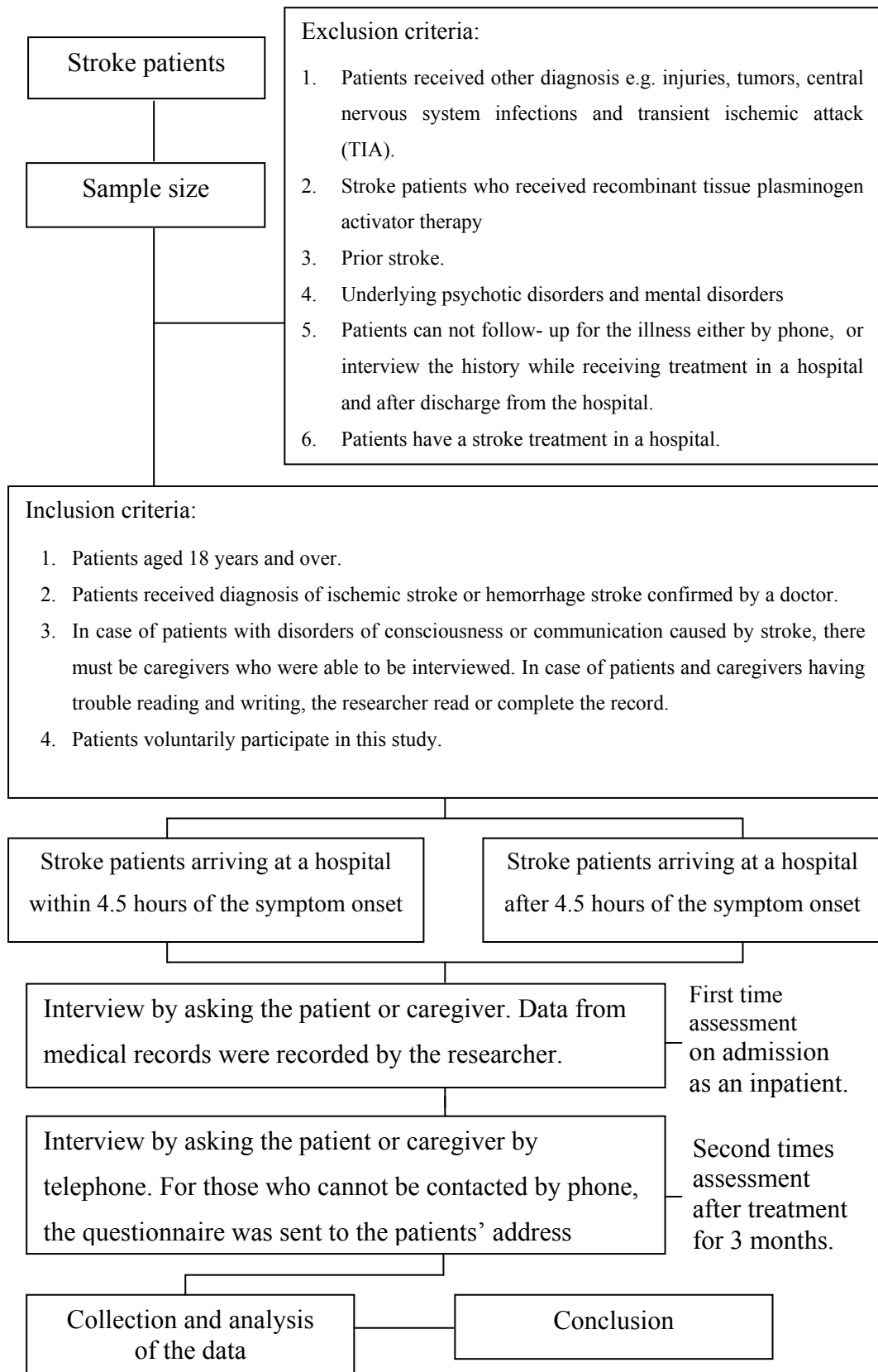


Figure 3.1 Flow Chart of stroke patients in study

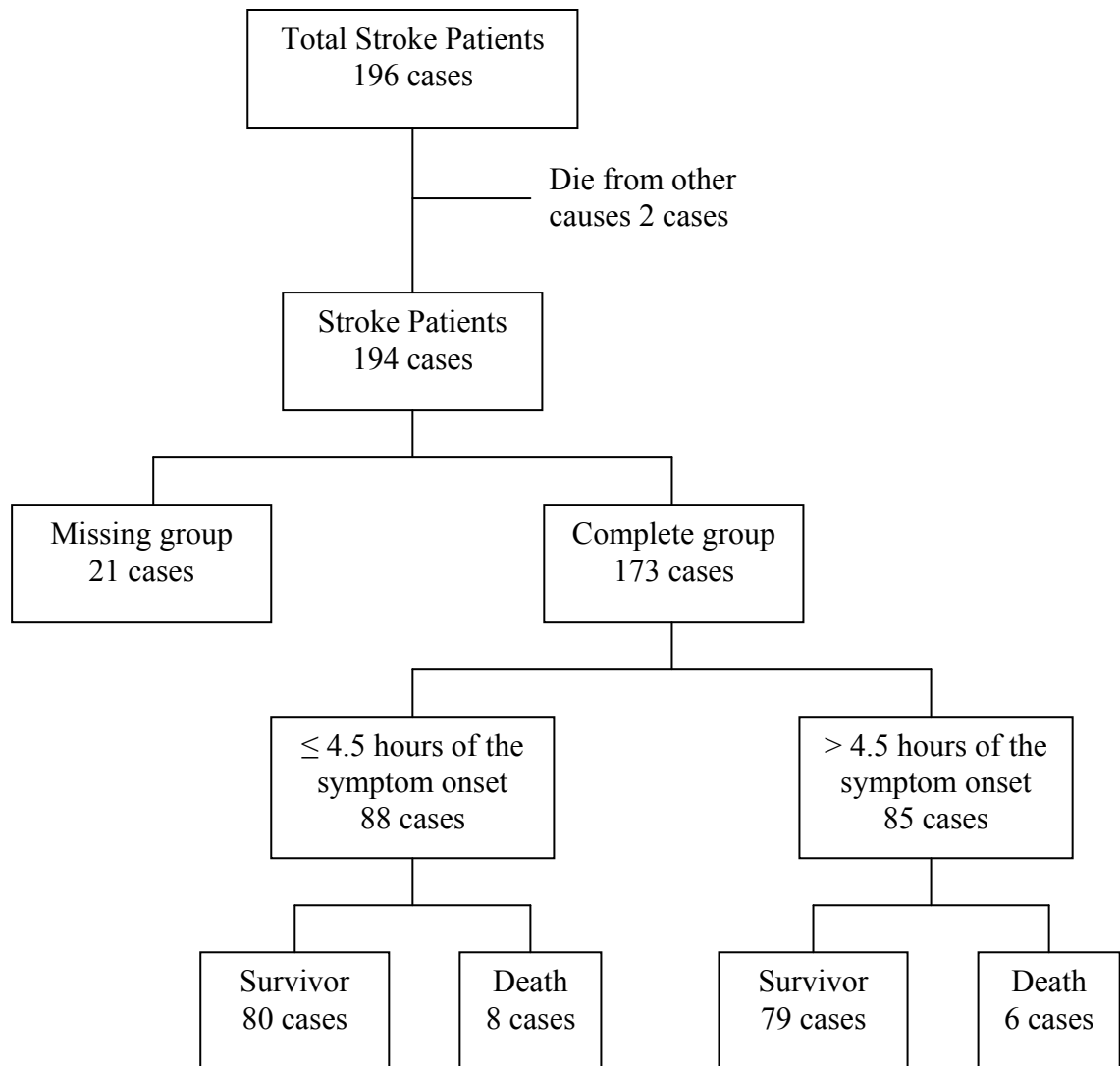


Figure 3.2 Diagram of stroke patients in study

CHAPTER IV

RESULTS

The results are described in the following topics: baseline characteristics of stroke patients, characteristics of factors, functional abilities, QOL score and predictor of recovery of functional abilities after treatment for 3 months.

4.1 Baseline characteristics of stroke patients

4.1.1 Baseline characteristics of study subjects comparing patient with complete follow-up and missing groups

A total of 196 patients met the inclusion criteria were recruited between December 23, 2010 and August 31, 2011. There were 2 patients died from other causes during the study period. However, 173 patients were able to complete the questionnaires or interviewed at 3 months after treatment and 21 patients were dropped from the study because of incorrect address and telephone number. The characteristics of subjects are shown in Table 4.1

Table 4.1 Baseline characteristics of study subjects

Characteristics	Complete follow-up group (N = 173)	Missing Group (N = 21)	p-value
Female Sex (N, %)	53 (30.6)	9 (42.9)	.322
Mean age (yr) \pm SD	61.5 \pm 13.3	60.9 \pm 17.1	.840
Range	27-90	30- 83	

Table 4.1 Baseline characteristics of study subjects (continued)

Characteristics	Complete follow-up group (N = 173)	Missing Group (N = 21)	p-value
Marital status (N, %)			.995
Single	8 (4.6)	1 (4.8)	
Married	120 (69.4)	14 (66.7)	
Widow	30 (17.3)	4 (19.0)	
Divorce/Separated	15 (8.7)	2 (9.5)	
Status in family (N, %)			.440
Head of family	114 (65.9)	11 (52.4)	
Member of family	27 (15.6)	4 (19.0)	
Residents	32 (18.5)	6 (28.6)	
Living status alone (N, %)			.078
Yes	12 (6.9)	4 (19.0)	
No	161 (93.1)	17 (81.0)	
Education level (N, %)			.322
No study	14 (8.1)	2 (9.5)	
Primary school	122 (70.5)	12 (57.1)	
Secondary school	24 (13.9)	6 (28.6)	
Diploma	4 (2.3)	1 (4.8)	
Bachelor degree	9 (5.2)	0	
Occupation (N, %)			.286
Farmer	17 (9.8)	2 (9.5)	
Labor	41 (23.7)	3 (14.3)	
Government officer	6 (3.5)	0	
Retired	5 (2.9)	0	
State enterprises	1 (0.6)	0	
Private organization	8 (4.6)	3 (14.3)	
Business	22 (12.7)	0	

Table 4.1 Baseline characteristics of study subjects (continued)

Characteristics	Complete follow-up group (N = 173)	Missing Group (N = 21)	p-value
Priest	4 (2.3)	1 (4.8)	
Unemployed	69 (39.9)	12 (57.1)	
Pre-morbid functional status (Basic activities of daily living) (N, %)			1.00
Independent	169 (97.7)	21 (100.0)	
Need help for self care	4 (2.3)	0	
Severity of disease by NIHSS (Median, IQR)	4 (2, 12)	8 (3, 16)	.460
Mean NIHSS score \pm SD	7.05 \pm 7.24	8.71 \pm 6.49	.284
Range	0-32	0-21	
Type (N, %)			.575
Ischemic stroke	135 (78.0)	18 (85.7)	
Hemorrhagic stroke	38 (22.0)	3 (14.3)	
Pathology of the brain (N, %)			
Right hemisphere	63 (32.8)	11 (44.0)	.163
Left hemisphere	76 (39.6)	5 (20.0)	.101
Brain stem and cerebellum	12 (6.3)	1 (4.0)	1.00
No detectable abnormality	29 (15.1)	6 (24.0)	.226
Others	12 (6.3)	2 (8.0)	.652
Paralysis (N, %)			.164
Right side	90 (52.0)	7 (33.3)	
Left side	83 (48.0)	14 (66.7)	
Risk factors (N, %)			
Hypertension	111 (64.2)	15 (71.4)	.631
Atrial fibrillation	2 (1.2)	0	1.00
Heart disease / Acute MI	16 (9.2)	1 (4.8)	.700

Table 4.1 Baseline characteristics of study subjects (continued)

Characteristics	Complete follow-up group (N = 173)	Missing Group (N = 21)	p-value
The abnormality of carotid artery	1 (0.6)	0	1.00
Smoking			.371
Current smoking	70 (40.5)	6 (28.6)	
Ever smoked	24 (13.9)	2 (9.5)	
Diabetes mellitus	29 (16.8)	6 (28.6)	.226
Hyperlipidemia	36 (20.8)	2 (9.5)	.380
Obesity	11 (6.4)	2 (9.5)	.637
Hormone contraceptive use	5 (2.9)	0	1.00
Alcoholic drinking			.308
Current drinking	50 (28.9)	5 (23.8)	
Ever drunk	26 (15.0)	1 (4.8)	
Family history of stroke	24 (13.9)	1 (4.8)	.322
Others	34 (19.7)	5 (23.8)	.773
Previous knowledge about risk factor of stroke (N, %)			.481
Yes	23 (13.3)	1 (4.8)	
No	150 (86.7)	20 (95.2)	
Previous knowledge about the care of stroke patients (N, %)			.369
Yes	12 (6.9)	0	
No	161 (93.1)	21 (100.0)	
The period of arrival time after stroke onset (N, %)			.065
≤ 4.5 hours	88 (50.9)	6 (28.6)	
> 4.5 hours	85 (49.1)	15 (71.4)	

Table 4.1 Baseline characteristics of study subjects (continued)

Characteristics	Complete follow-up group (N = 173)	Missing Group (N = 21)	p-value
Arrival time at a hospital after stroke onset (Median, IQR)	4 (2, 20.5)	7 (4, 22.5)	.134

The majority of stroke patients in both groups were male, were married, were head of family, had the education level of primary school and were unemployed. Comparing the two groups, the mean age was not difference. Patients in missing group lived alone and were unemployed more than patients in complete follow-up group. In patients with employed jobs, patients in missing group tended to work as complete follow-up group labor and private organization followed by farmers, respectively. Patients in the complete follow-up group tended to work as labors followed by business and farmers, respectively. Patients in the two groups had the good pre-morbid functional abilities or could carry out basic activities of daily living by themselves before aving stroke.

In terms of the severity of disease as measured by the NIHSS score, patients in the missing group had the median NIHSS score higher than that of the complete follow-up group. These 2 groups of patients were affected with ischemic stroke more than hemorrhagic stroke. Patients in the missing group tended to have the proportion of ischemic stroke, stroke location on the right hemisphere and left sided weakness more than the complete follow-up group. Patients in the complete follow-up group trended to have the stroke lesion on the left hemisphere and some brain areas such as brainstem and cerebellum more than the missing group. In terms of risk factors, the majority of patients in both groups had hypertension followed by smoking and drinking alcohol, respectively. The missing group tended to have hypertension as the commonest risk factor followed by diabetes mellitus, smoking, and drinking alcohol, respectively. Patients in the complete follow-up group tended to have hypertension, smoking, alcoholic drinking and dyslipidemia, respectively. Most

patients in both group had not be aware of the risk factors and treatment of stroke, but patients in the complete follow-up group tended to have realized about the risk factors and treatment of stroke more than patients in the missing group. It was also found that patients in the missing group tended to arrive at a hospital after 4.5 hours of symptom onset and the median duration of arrival time at a hospital was higher than that the complete follow-up group. Table 4.1 shows the baseline characteristics of patients in both complete follow-up and missing groups.

Table 4.2 Outcomes of study subjects

Characteristics	Complete follow-up group (N = 173)	Missing Group (N = 21)	p-value
Treatment cost (Median, IQR)	11066 (8157.5, 21379.5)	11044 (8991.5, 16974.5)	.426
Need of caregiver (N, %)			
None	2 (0.9)	3 (11.5)	.010
Spouse	112 (52.1)	13 (50.0)	.812
Children	77 (35.8)	9 (34.6)	1.00
Son/Daughter-in-law	1 (0.5)	0	1.00
Cousins	23 (10.7)	1 (3.8)	.481
Effect to work after stroke (N, %)			
Normal	49 (28.3)	NA*	
Less flexible	18 (10.4)	NA*	
Change work	2 (1.2)	NA*	
Cannot return to work	22 (12.7)	NA*	
Unemployed	68 (39.3)	NA*	
Death	14 (8.1)	NA*	

* Not Available

After stroke, the 2 groups of patients had the cost of medical treatment on admission at a hospital similarly. The majority of caregivers were patients' spouse

followed by children. The effect to work after stroke assessed at 3 months found that most patients in the complete follow-up group were unemployed followed by returning to their prior jobs, and unable to return to work, respectively. The mortality rate was equal to 8.1 per cent. Patients in the missing group could not be follow-up the effect of stroke on work as shown in Table 4.2

4.1.2 Baseline characteristics of stroke patients who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset

Only 173 stroke patients were able to complete the second time of questionnaires or interview at 3 months after treatment. These patients were 88 patients who arrived at a hospital within 4.5 hours and 85 patients who arrived after 4.5 hours of symptom onset.

Comparing stroke patients in 2 groups, the majority were male with the similar mean age. However, there was higher proportion of male patients arriving late. Patients in both groups were similar in terms of marital status, the status as a head of family, the proportion of living status. Most graduated a primary school and unemployed. However, for those who were employed the main occupation were labor followed by business and farmer, respectively. Regarding the pre-morbid functional status (basic activities of daily living), 2 groups of patients had good pre-morbid self-care and independent. The data were summarized in Table 4.3

Table 4.3 Baseline characteristics of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset

Characteristics	≤ 4.5 hours (N = 88)	> 4.5 hours (N = 85)	p-value
Female Sex (N, %)	37 (42.0)	16 (18.8)	.001
Mean age (yr) ± SD	59.9 ± 13.1	63.3 ± 13.4	.095
Range	35-90	27-85	
Marital status (N, %)			.379
Single	5 (5.7)	3 (3.5)	

Table 4.3 Baseline characteristics of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset (continued)

Characteristics	≤ 4.5 hours (N = 88)	> 4.5 hours (N = 85)	p-value
Married	65 (73.9)	55 (64.7)	
Widow	12 (13.6)	18 (21.2)	
Divorce/Separated	6 (6.8)	9 (10.6)	
Status in family (N, %)			.069
Head of family	51 (58.0)	63 (74.1)	
Member of family	18 (20.4)	9 (10.6)	
Residents	19 (21.6)	13 (15.3)	
Living status alone (N, %)			.562
Yes	5 (5.7)	7 (8.2)	
No	83 (94.3)	78 (91.8)	
Education level (N, %)			.177
No study	11 (12.5)	3 (3.5)	
Primary school	59 (67.0)	63 (74.1)	
Secondary school	10 (11.4)	14 (16.5)	
Diploma	2 (2.3)	2 (2.4)	
Bachelor degree	6 (6.8)	3 (3.5)	
Occupation (N, %)			.777
Farmer	9(10.2)	8 (9.4)	
Labor	24 (27.3)	17 (20.0)	
Government officer	4 (4.5)	2 (2.4)	
Retired	2 (2.3)	3 (3.5)	
State enterprises	1 (1.1)	0	
Private organization	4 (4.5)	4 (4.7)	
Business	9 (10.2)	13 (15.3)	
Priest	1 (1.1)	3 (3.5)	

Table 4.3 Baseline characteristics of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset (continued)

Characteristics	≤ 4.5 hours (N = 88)	> 4.5 hours (N = 85)	p-value
Unemployed	34 (38.6)	35 (41.2)	
Pre-morbid functional status (Basic activities of daily living) (N, %)			1.00
Independent	86 (97.7)	83 (97.6)	
Need help for self care	2 (2.3)	2 (2.4)	

4.1.3 Characteristics of factors of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset

In terms of the severity of disease as measured by NIHSS score, patients who arrived at the hospital after 4.5 hours had the median NIHSS score higher than those who arrived at the hospital within 4.5 hours of symptom onset. The majority of stroke in the 2 groups were ischemic stroke more than hemorrhagic stroke. Patients who arrived at the hospital after 4.5 hours tended to have ischemic stroke more than those who arrived at the hospital within 4.5 hours. Patients arriving early had pathology in left hemisphere and right-sided weakness more common than those arriving late. Patients arriving late had the pathology in some locations such as brainstem and cerebellum and also had left-sided weakness more common than those arriving early. In terms of risk factors, patients in both groups had similar risk factors. The most common risk factor was hypertension followed by smoking, alcoholic drinking and hyperlipidemia, respectively. There were similar proportion of patients who had the awareness about risk factors and knowledge about the treatment of stroke. The majority of them had never known about the risk factors and treatment of stroke. It also found that patients arriving early and late had the median duration of arriving time at 2 hours and 24 hours, respectively. Their characteristics are shown in Table 4.4

Table 4.4 Characteristics of factors of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset

Characteristics	≤ 4.5 hours (N = 88)	> 4.5 hours (N = 85)	p-value
Severity of disease by NIHSS			
(Median, IQR)	3.5 (2, 15)	5 (1.5, 8.5)	.109
Mean NIHSS score ± SD	8.09 ± 8.28	5.98 ± 5.85	.055
Range	0-32	0-28	
Type (N, %)			<.001
Ischemic stroke	59 (67.0)	76 (89.4)	
Hemorrhagic stroke	29 (33.0)	9 (10.6)	
Pathology of the brain (N, %)			
Right hemisphere	32 (33.0)	31 (32.6)	1.00
Left hemisphere	44 (45.4)	32 (33.7)	.126
Brain stem and cerebellum	1 (1.0)	11 (11.6)	.002
No detectable abnormality	15 (15.5)	14 (14.7)	1.00
Others	5 (5.2)	7 (7.4)	.562
Paralysis (N, %)			.068
Right side	52 (59.1)	38 (44.7)	
Left side	36 (40.9)	47 (55.3)	
Risk factors (N, %)			
Hypertension	55 (62.5)	56 (65.9)	.751
Atrial fibrillation	2 (2.3)	0	.497
Heart disease / Acute MI	13 (14.8)	3 (3.5)	.016
The abnormality of carotid artery	1 (1.1)	0	1.00
Smoking			.442
Current smoking	33 (37.5)	37 (43.5)	
Ever smoked	5 (5.7)	19 (22.4)	
Diabetes mellitus	14 (15.9)	15 (17.6)	.840
Hyperlipidemia	18 (20.5)	18 (21.2)	1.00

Table 4.4 Characteristics of factors of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset (continued)

Characteristics	≤ 4.5 hours (N = 88)	> 4.5 hours (N = 85)	p-value
Obesity	9 (10.2)	2 (2.4)	.058
Hormone contraceptive use	4 (4.5)	1 (1.2)	.368
Alcoholic drinking			.738
Current drinking	24 (27.3)	26 (30.6)	
Ever drunk	8 (9.1)	18 (21.2)	
Family history of stroke	10 (11.4)	14 (16.5)	.383
Others	17 (19.3)	17 (20.0)	1.00
Previous knowledge about risk factor of stroke (N, %)			.825
Yes	11 (12.5)	12 (14.1)	
No	77 (87.5)	73 (85.9)	
Previous knowledge about the care of stroke patients (N, %)			.562
Yes	5 (5.7)	7 (8.2)	
No	83 (94.3)	78 (91.8)	
Arrival time at a hospital after stroke onset (Median, IQR)			<.001
	2 (1, 3)	24 (7, 48)	

After stroke, the patients arriving early had the cost of medical treatment on hospitalization higher than those arriving late. The main caregiver was spouse in both groups of patients, followed by children. Regarding the effect to work after stroke assessed at 3 months, patients who arrived at a hospital within 4.5 hours of symptom onset were likely to return to their work normally, but patients who arrived at a hospital after 4.5 hours of symptom onset were likely to be unemployed. Furthermore, the 2 groups of patients had similar mortality rates. The patients who arrived at a

hospital within 4.5 hours and after 4.5 hours of symptom onset had the mortality rate of 9.1 and 7.1, respectively. The data are presented in Table 4.5

Table 4.5 Comparison of the outcomes of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset

Characteristics	≤ 4.5 hours (N = 88)	> 4.5 hours (N = 85)	p-value
Treatment cost (Median, IQR)	11326.5 (8611.7, 22820.5)	10599.0 (7998.5, 19599.5)	.464
Need of caregiver (N, %)			
None	1 (0.9)	1 (1.0)	1.00
Spouse	58 (52.7)	54 (51.4)	.753
Children	37 (33.6)	40 (38.1)	.543
Son/Daughter-in-law	0	1 (1.0)	.491
Cousins	14 (12.7)	9 (8.6)	.373
Effect to work after stroke (N, %)			.398
Normal	29 (33.0)	20 (23.5)	
Less flexible	6 (6.8)	12 (14.1)	
Change work	1 (1.1)	1 (1.2)	
Cannot return to work	13 (14.8)	9 (10.6)	
Unemployed	31 (35.2)	37 (43.5)	
Death	8 (9.1)	6 (7.1)	

4.2 The comparison of the functional abilities of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed on day 1 of admission

The assessment of the functional abilities of stroke patients on day 1 of admission at a hospital is shown in Table 4.6

The BI score and NIHSS score in stroke patients in both groups were significantly different with p-value of less than 0.05. Patients arriving at a hospital within 4.5 hours of symptom onset had more proportion with the BI score 0-20 which means they were more dependent on self-care. Also, the proportion of the NIHSS score ≥ 15 in patients arriving early were higher than those arriving later which means they had more severe stroke. The mRS and GCS score of patients in both groups were not statistically different ($p > 0.05$).

Table 4.6 The comparison of the functional abilities of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed on day 1 of admission using Chi-square test

Functional abilities	≤ 4.5 hours (N = 88)	> 4.5 hours (N = 85)	P-value
mRS score (N, %)			.396
0 (no symptom at all)	3 (3.4)	4 (4.7)	
1 (no disability despite symptom)	31 (35.2)	36 (42.4)	
2 (slight disability)	14 (15.9)	14 (16.5)	
3 (moderate disability)	10 (11.4)	8 (9.4)	
4 (moderate severe disability)	13 (14.8)	16 (18.8)	
5 (severe disability)	17 (19.3)	7 (8.2)	
6 (death)	0	0	
BI score (N, %)			.020
0-20 (very severely disabled)	29 (33.0)	14 (16.5)	
25-45 (severely disabled)	10 (11.4)	22 (25.9)	
50-70 (moderately disabled)	17 (19.3)	13 (15.3)	
75-95 (mildly disabled)	10 (11.4)	16 (18.8)	
100 (physical independent)	22 (25.0)	20 (23.5)	
Median , IQR	55 (10,98.75)	60 (30,92.5)	
Range	0 - 100	0 - 100	

Table 4.6 The comparison of the functional abilities of stroke patients between those who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed on day 1 of admission using Chi-square test (continued)

Functional abilities	≤ 4.5 hours (N = 88)	> 4.5 hours (N = 85)	P-value
NIHSS score (%)			.003
0 (no stroke)	10 (11.4)	12 (14.1)	
1-4 (minor stroke)	38 (43.2)	30 (35.3)	
5-14 (moderate stroke)	16 (18.2)	35 (41.2)	
15-20 (moderate / severe stroke)	16 (18.2)	5 (5.9)	
21-42 (severe stroke)	8 (9.1)	3 (3.5)	
Median, IQR	3.5 (2,15)	5 (1.5,8.5)	
Range	0 – 32	0 – 28	
GCS score (%)			.152
3-8 (severe)	3 (3.4)	1 (1.2)	
9-12 (moderate)	13 (14.8)	6 (7.1)	
13-15 (mild)	72 (81.8)	78 (91.8)	
Median, IQR	15 (13.25,15)	15 (15,15)	
Range	3 - 15	7 - 15	

The NIHSS score in both groups were different significantly in both groups ($p < 0.05$). Patients who arrived at a hospital within 4.5 hours of symptom onset were more severe classified by the NIHSS score ≥ 15 than who arrived at a hospital after 4.5 hours of the symptom onset. The BI score, mRS score, and GCS score of patients in both groups were not statistically different ($p > 0.05$) as shown in Table 4.7

Table 4.7 The comparison of functional abilities of stroke patients between those arriving at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed on day 1 of admission and categorized into subgroups using Chi-square test

Functional abilities	≤ 4.5hours (N = 88)	> 4.5hours (N = 85)	P-value
mRS score (N, %)			.285*
mRS 0-1 (no symptom - no disability)	34 (38.6)	40 (47.1)	
mRS 2-5 (slight - severe disability)	54 (61.4)	45 (52.9)	
BI score (N, %)			.861*
0-95 (very severely - mildly disabled)	66 (75.0)	65 (76.5)	
100 (physical independent)	22 (25.0)	20 (23.5)	
NIHSS score (%)			.003*
0-14 (no stroke - moderate stroke)	64 (72.7)	77 (90.6)	
15-42 (moderate/severe - severe stroke)	24 (27.3)	8 (9.4)	
GCS score (N, %)			.073*
3 -12 (severe - moderate)	16 (18.2)	7 (8.2)	
13-15 (mild)	72 (81.8)	78 (91.8)	

* mRS, BI, NIHSS, GCS score on day 1 of admission by Fisher's Exact Test

4.3 Functional abilities of stroke patients between those arriving at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed at 3 months after treatment

Stroke patients in both groups did not differ ($p > 0.05$) in terms of the mRS score, BI score, and WHOQOL-Bref-Thai score when the functional abilities were assessed at 3 months after treatment as shown in Table 4.8

Table 4.8 The comparison of functional abilities of stroke patients between those who arriving at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed at 3 months after treatment using Chi-square test

Functional abilities	≤ 4.5 hours (N = 80)	> 4.5 hours (N = 79)	P-value
mRS score (N, %)			.664
0 (no symptom at all)	38/88 (43.2)	38/85 (44.7)	
1 (no disability despite symptom)	20/88 (22.7)	22/85 (25.9)	
2 (slight disability)	9/88 (10.2)	10/85 (11.8)	
3 (moderate disability)	3/88 (3.4)	4/85 (4.7)	
4 (moderate severe disability)	6/88 (6.8)	1/85 (1.2)	
5 (severe disability)	4/88 (4.5)	4/85 (4.7)	
6 (death)	8/88 (9.1)	6/85 (7.1)	
BI score (N, %)			.907
0-20 (very severely disabled)	3/80 (3.4)	2/79 (2.4)	
25-45 (severely disabled)	3/80 (3.4)	3/79 (3.5)	
50-70 (moderately disabled)	6/80 (6.8)	8/79 (9.4)	
75-95 (mildly disabled)	10/80 (11.4)	7/79 (8.2)	
100 (physical independent)	58/80 (65.9)	59/79 (69.4)	
Death	8/88 (9.1)	6/85 (7.1)	
Median , IQR	100 (90,100)	100 (95,100)	
Range	0 – 100	20 – 100	
WHOQOL-Bref-Thai score (N, %)			1.00*
26-60 (poor QOL)	0	0	
61-95 (moderate QOL)	11/80 (12.5)	11/79 (12.9)	
96-130 (good QOL)	69/80 (78.4)	68/79 (80.0)	
Death	8/88 (9.1)	6/85 (7.1)	
Median , IQR	111 (102,117)	111 (101,117)	
Range	65 - 125	68 - 126	

* QOL score at 3 months after treatment by Fisher's Exact Test

Stroke patients 2 groups did not differ statistically ($p>0.05$) in terms of the mRS score, BI score, and WHOQOL-Bref-Thai score when the functional abilities were assessed at 3 months after treatment as shown in Table 4.9

Table 4.9 The comparison of functional abilities of stroke patients between those who arriving at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed at 3 months after treatment and categorized by subgroup using Chi-square test

Functional abilities	≤ 4.5hours (N = 80)	> 4.5hours (N = 79)	P-value
mRS score (N, %)			.784
mRS 0-1 (no symptom - no disability)	58/80 (65.9)	60/79 (70.6)	
mRS 2-5 (slight - severe disability)	22/80 (25.0)	19/79 (22.4)	
mRS 6 (death)	8/88 (9.1)	6/85 (7.1)	
BI score (N, %)			.858*
0-95 (very severely - mildly disabled)	22/80 (25.0)	20/79 (23.5)	
100 (physical independent)	58/80 (65.9)	59/79 (69.4)	
Death	8/88 (9.1)	6/85 (7.1)	
WHOQOL-Bref-Thai score (N, %)			1.00*
61-95 (moderate QOL)	11/80 (12.5)	11/79 (12.9)	
96-130 (good QOL)	69/80 (78.4)	68/79 (80.0)	

* BI and QOL score at 3 months after treatment by Fisher's Exact Test

4.4 Distribution of domain WHOQOL-Bref-Thai scores of stroke patients between those arriving at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed at 3 months after treatment

When follow up patients for 3 months after treatment, the mean score in each domain of WHOQOL-Bref-Thai was similar between 2 groups of patients as shown in Table 4.10

Table 4.10 Distribution of domain QOL scores of stroke patients between those who arriving at a hospital within 4.5 hours and after 4.5 hours of symptom onset assessed at 3 months after treatment

Domain	≤ 4.5 hour (N = 80)				> 4.5 hour (N = 79)			
	Mean	SD	Median	Range	Mean	SD	Median	Range
Physical	28.4	5.2	29	13-35	29.3	4.0	31	15-35
Psychological	26.9	3.3	28	14-30	27.4	2.7	28	15-30
Social relationship	12.5	1.5	13	4-14	12.6	1.0	13	8-15
Environment	32.5	3.3	33	22-38	32.0	3.5	32	25-39

4.5 The comparison of the proportion of mRS score of stroke patients between those arriving at the hospital within 4.5 hours and after 4.5 hours of symptom onset, and between the assessment on day 1 of admission and at 3 months after treatment

The mRS 0 (no symptom at all), 1 (no significant disability despite symptom: able to carry out all usual duties and activities), 2 (slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance), 3 (moderate disability; requiring some help, but able to walk without assistance), and 6 (death) of stroke patients 2 groups were similar when comparing the mRS between day 1 of admission and at 3 months after treatment. There was the difference in the recovery measuring the mRS 4 and 5. The patients who arrived at a hospital within 4.5 hours of symptom onset was less likely to have the mRS 4 (moderate severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance) and more likely to have the mRS 5 (severe disability; bedridden, incontinent and requiring constant nursing care and attention)

than those who arrived at a hospital after 4.5 hours of symptoms onset as shown in Table 4.11

Table 4.11 The comparison of the proportion of mRS scores of stroke patients between those who arriving at the hospital within 4.5 hours and after 4.5 hours of symptom onset, and between the assessment on day 1 of admission and at 3 months after treatment

mRS score	≤ 4.5 hour (N=88)		> 4.5 hour (N=85)	
	On day 1 of admission	At 3 months	On day 1 of admission	At 3 months
mRS score (N, %)				
0 (no symptom at all)	3 (3.4)	38 (43.2)	4 (4.7)	38 (44.7)
1 (no disability despite symptom)	31 (35.2)	20 (22.7)	36 (42.4)	22 (25.9)
2 (slight disability)	14 (15.9)	9 (10.2)	14 (16.5)	10 (11.8)
3 (moderate disability)	10 (11.4)	3 (3.4)	8 (9.4)	4 (4.7)
4 (moderate severe disability)	13 (14.8)	6 (6.8)	16 (18.8)	1 (1.2)
5 (severe disability)	17 (19.3)	4 (4.5)	7 (8.2)	4 (4.7)
6 (death)	0	8 (9.1)	0	6 (7.1)

4.6 Change of mRS scores of stroke patients

Considering the mRS score of stroke patients in both groups, most patients had the good functional ability score. Patients who arrived at a hospital within 4.5 hours of symptom onset were likely to improve in the symptoms than those who arrived at a hospital after 4.5 hours of symptom onset. While patients who arrived at the hospital after 4.5 hours of symptoms onset remained stable or worse in the symptoms than patients who arrived at the hospital after 4.5 hours of symptom onset. The mortality rate of patients in both groups was nearly the same as shown in Table 4.12

Table 4.12 Change of mRS scores of stroke patients comparing between the assessment on day 1 of admission and at 3 months after treatment

mRS score	Total Subject (N = 173)	≤ 4.5 hours (N = 88)	> 4.5 hours (N = 85)	p-value
mRS score (N, %)				.358
Improved	131/173 (75.7)	69/88 (78.4)	62/85 (72.9)	
Stable	26/173 (15.0)	11/88 (12.5)	15/85 (17.6)	
Worse	2/173 (1.2)	0	2/85 (2.4)	
Death	14/173 (8.1)	8/88 (9.1)	6/85 (7.1)	

4.7 Comparison of the BI score of stroke patients who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed on day 1 of admission and at 3 months after treatment

In terms of the BI scores of recovery, the BI score 100 (physical independent), BI score 75-95 (mildly disabled), and BI score 50-70 (moderately disabled) of stroke patients in both groups were similar comparing the BI score between day 1 of admission and 3 months after treatment. The difference of recovery BI score was in the BI score 0-20 and 25-45. Patients who arrived at the hospital within 4.5 hours of symptom onset of recovery were more likely to have the BI score 0-20 (very severely disabled), and less likely to have the BI score 25-45 (severely disabled) than those who arrived at the hospital after 4.5 hours of symptom onset as shown in Table 4.13

Table 4.13 Change in the BI score between stroke patients who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset assessed on day 1 of admission and at 3 months after treatment

BI score	≤ 4.5 hour		> 4.5 hour	
	On day 1 of admission	At 3 months	On day 1 of admission	At 3 months
BI score (N, %)				
0-20 (very severely disabled)	29 (33.0)	3/80 (3.4)	14 (16.5)	2/79 (2.4)
25-45 (severely disabled)	10 (11.4)	3/80 (3.4)	22 (25.9)	3/79 (3.5)
50-70 (moderately disabled)	17 (19.3)	6/80 (6.8)	13 (15.3)	8/79 (9.4)
75-95 (mildly disabled)	10 (11.4)	10/80 (11.4)	16 (18.8)	7/79 (8.2)
100 (physical independent)	22 (25.0)	58/80 (65.9)	20 (23.5)	59/79 (69.4)
Death		8/88 (9.1)		6/85 (7.1)
Median , IQR	55(10,98.75)	100 (90,100)	60 (30,92.5)	100 (95,100)
Range	0 - 100	0 - 100	0 -100	20 - 100

4.8 Change in the BI score of stroke patients assessed on day 1 of admission and at 3 months after treatment using paired simple T-test analysis

Comparing the BI scores of stroke patients between on day 1 of admission and 3 months after treatment were different significantly in each groups ($p < 0.05$). Patients who arrived at a hospital within 4.5 hours of symptom onset tended to have the BI score higher than those who arrived at a hospital after 4.5 hours of symptom onset. At 3 months after treatment, stroke patients in both groups did not differ ($p > 0.05$) in terms of change BI score as shown in Table 4.14

Table 4.14 Change in the BI score of stroke patients between the assessment on day 1 of admission and at 3 months after treatment

BI score	Mean ± SD		Change	p-value of change	p-value
	On day 1 of admission	At 3 months	Mean (SD)		
≤ 4.5 hour (N = 80)	57.3±37.4	89.7±22.2	+ 32.4(29.5)	<.001	.620
> 4.5 hour (N = 79)	62.4± 1.2	90.4±20.7	+ 28.0(25.7)	<.001	

4.9 Predictors of the recovery of functional abilities as assessed by the mRS (improved mRS) at 3 months after treatment using multivariate logistic regression analysis

In multivariate logistic regression analysis, 6 independent variables were simultaneously entered in the model of the mRS to predict the improvement at 3 months after treatment. These variables included age, pre-morbid functional status (basic activities of daily living), type of stroke, severity of disease measured by the NIHSS, paralysis, and the mRS score on day 1 of admission at the hospital. After adjusted for all other variables in the model, we found that 4 significant predictors of improved mRS at 3 months after treatment were age, severity of disease measured by the NIHSS, pre-morbid functional status (basic activities of daily living), and the mRS score on day 1 of admission at the hospital. These variables were associated with the recovery of stroke patients significantly as shown in Table 4.15

Table 4.15 Predictors of recovery of functional abilities as assessed by the mRS (improved mRS) at 3 months after treatment using multivariate logistic regression analysis

Variable	Subject	Percent	OR	95%CI	P-value
Age (yr)					.025
≤ 60 years	84	48.6	2.50	1.12-5.57	
> 60 years	8	51.4	1.00		
Pre-morbid functional status (Basic ADLS)					.046
Independent	169	97.7	12.56	1.05-150.51	
Dependent	4	2.3	1.00		
Type of stroke					.453
Ischemic stroke	135	78.0	1.42	0.57-3.54	
Hemorrhagic stroke	38	22.0	1.00		
Severity of disease by NIHSS					.001
≤ 14 score	141	81.5	6.56	2.23-19.32	
> 14 score	32	18.5	1.00		
Paralysis					.351
Right side	90	52.0	1.44	0.67-3.09	
Left side	83	48.0	1.00		
mRS score (on day 1 of admission)					.036
mRS 0-1	74	42.8	0.35	0.13-0.93	
mRS 2-5	99	57.2	1.00		

Age; stroke survivors aged ≤ 60 years old got recovery of functional abilities (improved mRS) at 3 months after treatment 2.5 times (adjusted OR=2.50, 95% CI: 1.12-5.75) more likely than those aged > 60 years old.

In terms of the pre-morbid functional status (basic activities of daily living), stroke survivors with independent pre-morbid functional status got recovery of functional abilities (improved mRS) at 3 months after treatment 12.6 times (adjusted

OR=12.56, 95% CI: 1.05-150.51) more likely than those who were dependent in pre-morbid functional status to have need self care.

The severity of disease as measured by the NIHSS; stroke survivors with NIHSS \leq 14 score got 6.6 times (adjusted OR=6.56, 95% CI: 2.23-19.32) more likely than those with the NIHSS $>$ 14 score to have recovery functional abilities (improved mRS) at 3 months after treatment.

Considering the mRS score on day 1 of admission at a hospital, stroke survivors with the initial mRS 0-1 had the recovery of functional abilities for stroke (improved mRS) at 3 months after treatment 0.3 times (adjusted OR=0.35, 95% CI: 0.13-0.93) more likely than those with the initial mRS 2-5.

CHAPTER V

DISCUSSION

This chapter presents the discussion of research findings

5.1 Subject characteristics

A total of 194 stroke patients who did not receive recombinant tissue plasminogen activator (rtPA) therapy participated in this study. The majority are males. Mean age was 61.5 ± 13.7 years. The majority of the participants were married, were head of the family and had a large family, had an educational level of at least a primary school and were unemployed. In participants who still worked, the main occupations were labors followed by business and farmers, respectively. They were independent in their pre-morbid functional status. The majority of patients had ischemic stroke more than hemorrhagic stroke. The pathology of the brain and the site of the paralyzed extremities were equally in the right and left hemisphere. Patients often had symptoms after awakening that could not specify when the symptom onset was. Most patients did not know the risk factors of stroke and treatment. Therefore, they did not know what symptoms were the warning signs of stroke. Some patients did not aware of having stroke when the symptoms were mild and they did not know the importance of seeing medical attention immediately. Some patients were at home alone or were working in a farm-garden alone while developing stroke. When the symptoms occurred, no one could give help to take them to the hospital. The pathology of the brain reported in this study was from the result of a CT brain report, not from a clinical diagnosis. Therefore, mis-interpretation could happen because patients arriving at the hospital within 4-5 hours might not have any abnormality detected in the CT scan. Also, the lacunar infarction might not be seen in the CT scan and lesions in the posterior cranial fossa area might be obscured by the bony artifact. The infarction in the CT scan might be an old a symptomatic lesion. In addition, the

CT brain was read by radiologists who might not realize the medical examination and relate the clinical examination with the CT findings. Sometimes a clinician did not locate the lesions precisely and simply gave a diagnosis of hemorrhagic stroke, ischemic stroke, stroke, etc. It did not specify the location of lesions and symptoms related to the radiologist. Regarding risk factors, most patients had hypertension followed by smoking and alcoholic drinking, respectively. Patients who arrived at the hospital within 4.5 hours and those who arrived after 4.5 hours of symptom onset had similar risk factors. After stroke, the patients had the treatment cost more than 10,000 baht. The main caregivers were spouse and children. This was similar to the studies of Dewey HM, et al.¹³⁷, Dorsey MK and Vaca KJ¹³⁸ which also found 68-74% of stroke patients require care from family members. The study of Bakas T.¹³⁹ found that 58% of stroke patients were spouses as primary caregivers, followed by children. This is different from studies of Chantawatchai A.¹³³, Suwanno J.¹³⁵ and Tirapaiwong P.¹³⁶ which found that stroke patients had their children as primary caregivers. Regarding the effect to work at 3 months after stroke, the majority of patients did not return to work, and some were able to work the same job as previously.

When compare of stroke patients who did not receive rtPA between the complete follow-up group (patients who were interviewed by a telephone or a letter by post at day 1 admission and 3 months after treatment) and the missing group (patients whom could not be interviewed by a phone or mail both times because the address and telephone number were unclear), patients in both groups had similar demographic characteristics. There was significant difference in the proportion of having caregivers that the complete follow-up group tended to have caregiver more than the missing group. This might be from 1) the higher probability of the presence of caregivers to answer the interview in the complete follow-up group, 2) the higher proportion of having caregivers in the complete follow-up group in the beginning of the study.

The comparison of stroke patients who did not receive rtPA between the patients who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset showed that both groups had similar demographic characteristics, but there were significantly different in baseline characteristics between the 2 groups in these characteristics: sex, type of stroke, pathology of the brain, and the median time of

arrival at the hospital after stroke. Patients who arrived at the hospital after 4.5 hours of symptom onset had higher proportion of male sex, tended to have ischemic stroke, had higher proportion of lesions at brainstem and cerebellum, and had longer median time of arrival than those who arrived at the hospital within 4.5 hours of symptom onset.

A systematic review revealed that male was at higher risk of stroke than female.¹⁴⁰ This study found that most of the patients in both groups were male. Patients who arrived at the hospital after 4.5 hours of symptom onset had higher proportion of the male sex than those who arrived at the hospital within 4.5 hours of symptom onset. This might be because male patients was usually a head of family and therefore needed to work outside. When stroke symptoms occurred, they might be alone or remote from any assistance e.g. be difficult to call emergency medical units to help them. Male might rarely seek medical attention once they get sick, while female is more interested in their own health. This makes them seeking medical attention faster.

Many of the studies reported on a systematic review that the patients had ischemic stroke more than hemorrhagic stroke.¹⁴⁰ This study found that most of the patients in both groups had ischemic stroke more than hemorrhagic stroke. However, patients who arrived at the hospital after 4.5 hours of symptom onset tended to have a higher proportion of ischemic stroke than those who arrived at the hospital within 4.5 hours of symptom onset.

The pathological of brain found that the patients who arrived at a hospital after 4.5 hours of symptom onset. There was a tendency of the brain pathology in some locations such as brainstem (the medulla oblongata, pons, midbrain) and cerebellum. This finding could not be explained. However, patients who arrived at the hospital late were more likely to be the elderly, had more severity of the disease, and had higher proportion of females.

In addition, patients who arrived at the hospital within 4.5 hours and after 4.5 hours of symptom onset had the median duration of arrival time shorter than those arriving later. The median arrival time in this group was 2 hours after symptom onset. This was similar to many of the studies reported on a systematic review that the median arrival time to acute stroke care from symptom onset was 1.5

hours in Istanbul, Turkey, 2 hours in Quezon City, Philippines, and 2.6 hours in Netherlands, respectively.¹⁴¹ While the patient who arrived at the hospital late had less severe symptoms. Patient and their relatives did not aware of warning signs of stroke. They waited to see the change of symptoms before and often they waited overnight. In the morning, if symptoms did not improve or became more severe, then they decided to go to a hospital resulted in longer median arrival time of about 24 hours. This was similar to many of the studies reported on a systematic review that a median times arrival to acute stroke care from symptom onset of 24 hours in 28 Indonesian hospitals, 16.1 hours in Singapore, and 6.0 hours in Szczecin, Poland.¹⁴¹

5.2 Functional abilities of stroke patients

The comparison of functional abilities of stroke patients who did not receive rtPA between the patients who arrived at a hospital within 4.5 hours and after 4.5 hours of symptom onset was performed by two session assessment on day 1 of admission and 3 months after the treatment. Modified Rankin Scale (mRS), The Barthel Index (BI), The National Institutes of Health Stroke Scale (NIHSS), and Glasgow Coma Scale (GCS) were done on day 1 of admission. At 3 months after treatment, Modified Rankin Scale (mRS), The Barthel Index (BI), and The World Health Organization Quality of Life (WHOQOL)-Bref-Thai were assessed.

On day 1 of admission, the NIHSS scores of both groups were significantly different. The patients who arrived at the hospital within 4.5 hours of symptom onset had more severe stroke than those who arrived at the hospital after 4.5 hours of symptom onset. Those arriving early had more proportion of NIHSS score 15-42 (moderate/severe to severe stroke) more than those arriving late. In addition, patients also tended to have weakness on their right side, and language problem more than those arriving late. The mRS, BI, and GCS score of patients in both groups were not statistically different.

At 3 months after treatment, the mRS, BI, and WHOQOL-Bref-Thai scores of both groups of patients were not statistically different. This may be from the similar treatment received in both groups. The major contributing factor for the

improved functional abilities post stroke is the rtPA. Hence, excluding patients receiving rtPA, the difference between groups was much lessened. Other supportive treatment such as admission to a stroke unit, rehabilitation, and other general care in these 2 groups might be not much different to create different outcomes. Also, patients arriving earlier had more severe stroke, therefore the chance to have the good recovery might be lower. However, in the multivariate regression analysis, the severity of stroke was adjusted and the recovery of the functional abilities between those arriving early and late was still not different.

5.3 Change of the mRS and BI score of stroke patients on day 1 of admission and at 3 months after treatment

Regarding the change of mRS score of patients of both groups between day 1 of admission and at 3 months after treatment, most patients had the improved mRS. However, patients who arrived at the hospital within 4.5 hours of symptom onset were more likely to have the improved mRS than those who arrived at the hospital after 4.5 hours of symptom onset. Patients who arrived late remained stable or worse more than those who arrived early. The mortality rate of these 2 groups were nearly the same with the mortality rate of 9.1 and 7.1 in those arriving early and late, respectively. This was similar to the studies of Yoo AJ.¹⁴² who followed 70 patients with ischemic stroke at 3 months and found that 27.1% had good outcome ($mRS \leq 2$). Castellanos M, et al.¹⁴³ followed 138 patients with hemorrhagic stroke at 3 months and found that 32.6% had good outcome ($mRS \leq 2$), 39.1% were dependent ($mRS 3-5$), and 28.3% died. Alzamora MT, et al.¹⁴⁴ followed 196 patients with ischemic stroke at 90 days, the case fatality was 12%. Grau AJ, et al.¹²⁰ followed 5,017 patients with stroke at 3 months, and the mortality rate was 9.4%.

The BI scores in each group increased in both groups. Stroke patients who arrived at the hospital within 4.5 hours of symptom onset had the mean initial BI total scores of 57.3 ± 37.4 on day 1 of admission and increased to 89.7 ± 22.2 at 3 months. Patients who arrived at the hospital after 4.5 hours of symptom onset had the mean initial BI total scores of 62.4 ± 31.2 on day 1 of admission and increased to 90.4 ± 20.7

at 3 months. This was similar to the studies of Sinha MK, et al.¹⁴⁵ which found that the mean BI increased from 40.0 ± 30.1 at baseline to 75.6 ± 22.9 at day 90 after stroke onset. Henrik S.¹⁴⁶ found that the BI score reached 80% within 6 weeks and 95% within 12.5 weeks from onset. Chantawatchai A.¹³³ found that the BI score of the stroke patients at 3 months after onset had a higher mean score than at 2 weeks after onset. Nelson MM, et al.¹⁴⁷ found that the BI score of the stroke patients at 2 months after onset had a higher score than on day 1 of admission after onset. However, the increase of the BI scores from baseline to 3 months was not statistically different when comparing both groups.

5.4 Predictors of the recovery functional abilities assessed by the mRS (improved mRS) at 3 months after treatment

In multivariate logistic regression analysis, 6 independent variables were simultaneously entered in a model to predict the improved mRS. After adjusted for all other variables in the model, 4 significant predictors associated with the recovery of functional abilities of stroke patients who did not receive rtPA of improved mRS at 3 months after treatment were as follows:

In terms of age, stroke survivors aged ≤ 60 years old had the recovery of functional abilities as the improved mRS 2.5 times more likely than those aged > 60 years old (adjusted OR=2.50, 95% CI: 1.12-5.57, $p=0.025$). This was similar to the studies of Sathirapanya P, et al.²⁰ who found that the younger stroke patients recovered better than the older. Anderson TP, et al.¹¹⁰ Brandstater ME, et al.¹¹¹ Kwakkel G, et al.¹¹² and Hong KS.¹⁴⁸ also found that elderly patients with stroke had functional abilities less than younger patients and the levels of ability reduced with the increasing age. Kim JS, et al.¹⁴⁹ found that older age was associated with a greater risk of poor functional outcome at 3 months. When compared with those aged ≤ 65 years, patients aged 66-75 years, 76-85 years and > 85 years were associated with 1.6 times (OR=1.65, 95% CI: 1.03-2.65, $p=0.035$), 3.0 times (OR=3.04, 95% CI: 1.80-5.14, $p<0.001$), and > 20.6 times (OR=20.65; 95% CI: 7.31-58.35, $p<0.001$) to recover with the poor functional outcomes, respectively.

With regard to the pre-morbid functional status, stroke survivors with pre-morbid independency were 12.6 times more likely to have recovery of functional abilities by the improved mRS than those who needed self-care before having stroke (adjusted OR=12.56, 95%CI: 1.05-150.51, $p=0.046$). This was similar to the studies of Bolander V, et al.¹³² which found that stroke patients who had a good pre-morbid functional status and could take care of themselves very well had a chance to recover from the disease better.

Regarding the severity of disease as measured by the NIHSS, stroke survivors with the NIHSS \leq 14 score were 6.6 times more likely than those with the NIHSS $>$ 14 score to get recovery of functional abilities as the improved mRS (adjusted OR=6.56, 95%CI: 2.23-19.32, $p=0.001$). This was similar to the studies of González RG, et al.¹⁵⁰ which showed that ischemic stroke patients on admission with the NIHSS \leq 10 were 5.4 times to have good outcomes when compared to patients who had the NIHSS $>$ 10 (OR=5.4, 95%CI: 3.5-8.5). Kwiatkowski TG, et al.¹¹⁹ found that 60-70% of stroke patients on admission with the NIHSS \leq 10 had good outcomes. Sablot D, et al.¹⁵¹ found that stroke patients on admission with the NIHSS $<$ 5 and symptoms regressing within 135 min were predictive of good outcome, while the NIHSS $>$ 22 and symptoms stability after 1,230 min were predictive of physical dependency or death. Kumthornthip W, et al.¹¹⁴ found that the recovery will be gradual slowly depending on the severity of the disease. Peerawach K, et al.⁵⁶ reported that neurological recovery after stroke of each patient is different, both in duration and amount, depending on the severity of the lesion. Harnphadungkit K, et al.¹⁶ found that the recovery of the body usually took time which depended on the severity of the disease and the patient's body. Kim JS, et al.¹⁴⁹ found that more-severe stroke as measured by the NIHSS carried a greater risk of poor functional outcome at 3 months: moderate severity of stroke was associated with 7.7 times of poor functional outcome than those with minor stroke (OR=7.72, 95% CI: 4.64-12.85, $p<0.001$) and severe stroke was associated with 13.3 times of poor functional outcomes than those with minor stroke (OR=13.35, 95% CI: 5.67-31.43, $p<0.001$).

With regards to the mRS score on day 1 of admission at a hospital; stroke survivors with initial mRS 0-1 was 0.3 times less likely than the initial mRS 2-5 to recover in functional abilities as determined by the improved mRS (adjusted

OR=0.35, 95%CI: 0.13-0.93, $p=0.036$). This difference might be from that the symptoms of patients with the mRS 0-1 were very mild, hence the recovery might not be obvious. Moreover, the majority of patients had mRS 0 level, therefore, the improvement in the mRS could not occur.

5.5 Strength of the study

This study has not been done before, both locally and abroad. A systematic review about the delay time in acute stroke care¹²² examined the safety and efficacy of the use of recombinant tissue plasminogen activator therapy (rtPA) in ischemic stroke within 3 hours of symptom onset¹⁸ and the extended time use of rtPA increased within 4.5 hours after symptom onset.¹⁹ Previous studies compared the recovery of stroke patients between patients who received rtPA and those who did not receive rtPA.^{152,153} However, the comparison of patients who did not received rtPA between those arriving at the hospital early and those arriving late has never done before.

This study provides predictors the factors affecting the recovery of functional activities in stroke patients who did not receive recombinant tissue plasminogen activator therapy. Similar to prior studies, factors affecting the recovery of patients from the symptoms of stroke include patient age,^{20,69} cause of the disease, size of lesions,²⁰ pathology of stroke,⁶⁶ severity of stroke on admission.^{67,68} It is also similar to a study on predictors of functional outcome in ischemic stroke treated with intra-arterial therapy.¹⁴²

5.6 Limitations of the study

1. All eligible subjects were recruited from stroke patients on admission at the hospital in Saraburi hospital only. This may cause the small sample size due to time constraints, and loss to follow-up in some patients. The sample may not be a good representative of the general population. However, this sample size was calculated from the formula to compare two proportions (sample size of each group), so the sample size should be adequate.

2. Patients on the missing group whom the follow-up assessment could not be performed had some demographic characteristics different from the complete data group such as more proportion of level of education from secondary school or above, more likely to live alone, the higher median score of severity of disease, the tendency to have right hemispheric lesion, and weakness on the left side. This might lead to follow-up bias because some patients might loss to follow-up because they have more severe disease. The research tried to contact these patients by telephone and the questionnaire was sent to the patients' address.

3. Inter-observer variation may occur in the assessment of the outcomes because of the different assessors who might have different experience and skills in the assessment resulting different scores obtained.

i. The National Institutes of Health Stroke Scale (NIHSS) for stroke patient. This is an assessment by a neurologist and a doctor have been trained on its use in assessing stroke patients.

ii. The assessment of the Modified Rankin Scale (mRS), Barthel Index (BI), and Glasgow Coma Scale (GCS) on day 1 of admission were performed by nurses from several wards. They may have different expertise or experience in evaluating patient's symptoms which results in different scores obtained. However, in the first assessment, the researcher attended patient assessment in some cases. The researcher practiced the assessment and developed skills so that the second assessment at 3 months by the researcher can be compared to the first assessment learn.

iii. The Modified Rankin Scale (mRS) and The Barthel Index (BI) were assessed at 3 months after treatment by the researcher which is different from the assessment on day 1 of admission at the hospital where a nurse was the assessor. There is likely to be different in the expertise or experience in evaluating patient's symptoms resulting in different scores.

4. Most patients were discharged from the hospital before 3 months. Therefore, the assessment of mRS, BI, WHOQOL-Bref-Thai was performed by telephone interviews and post. Sometimes, the researcher could interview directly with patients and/or caregivers at the 3 months follow-up after treatment. This may cause the inaccuracy of the data. The respondents by telephone could explain their

health illness more easily by spoken language on the telephone. There might be a bias that may arise from the description of the particular context of the assessment tools. However, the researcher prepared the telephone interview for the 3-month post-stroke assessment. The researcher asked the interviewee by questions providing the answer options according to the case record form of the assessment mRS, BI, and WHOQOL-Bref-Thai. The telephone interview can get more explanation of the patients' health better than the assessment by postal survey.

5. The Glasgow Coma Scale GCS has a ceiling effect and most patients had GCS score approximately 15. This may not be able to distinguish the difference in the slight difference in the change of consciousness. Hence, we may be unable to evaluate changes in the severity of symptoms of stroke.

6. This study was conducted only in stroke patients arriving at the hospital within 4.5 hours of symptom onset who did not receive rtPA. Patients arriving early but did not received the rtPA were because they had hemorrhagic stroke, NIHSS ≤ 4 , NIHSS > 18 , SBP ≥ 185 mmHg, DBP ≥ 110 mmHg, FBS > 400 mg/dl, CT brain showing multiple lobe infarct, large infarct size, global aphasia, brain swelling, and neurological symptoms improving rapidly.

7. Hemorrhagic stroke are the differences in treatment and recovery between those who received surgery and those who are not brain surgery.

CHAPTER VI

CONCLUSION

6.1 Conclusion

This study is a prospective cohort study design to investigate the recovery of functional abilities after treatment for 3 months in stroke patients who did not receive recombinant tissue plasminogen activator (rtPA) therapy. The researcher compared the recovery in functional abilities between patients who arrived at the hospital within 4.5 hours and those who arrived after 4.5 hours of symptom onset. Also, the researcher examined factors affecting the recovery of functional abilities in stroke patients who did not receive rtPA including; age, pre-morbid functional status, severity of disease measured by NIHSS, type of stroke, paralysis of weakness, and mRS score on day 1 of admission. Moreover, the researcher also compared the quality of life of stroke patients who did not receive rtPA. The studied population were from a purposive sampling with eligible subjects recruited from stroke patients who did not receive rtPA and the clinical diagnosis was stroke confirmed on admission at Saraburi hospital, from December 23, 2010 to August 31, 2011. The study included a total of 196 subjects. All eligible subjects gave their informed consent. Two patients died from other causes during the study and 21 patients lost to follow-up from the study because of incorrect address and telephone number. However, only 173 patients were able to complete the questionnaires or interviewed at 3 months after treatment. The eligible subjects were divided into 2 groups: patients who arrived at the hospital within 4.5 hours of symptom onset 88 cases and after 4.5 hours of symptom onset 85 cases.

The study instruments was a case record form consisting of seven parts questionnaire as follows; baseline characteristics, characteristics of factors, Modified Rankin Scale (mRS) assessment, the Barthel Index (BI) assessment, The National Institutes of Health Stroke Scale (NIHSS) assessment, Glasgow Coma Scale (GCS) assessment, and The World Health Organization Quality of Life (WHOQOL)–Bref–

Thai assessment. Data were collected by interviewing the patients and caregivers twice. The first time was when they were admitted at an inpatient ward of medicine unit of Saraburi hospital after receiving a diagnosis of stroke confirmed by a doctor. The researcher filled in the data from medical records. The second interview was after 3 months of stroke onset by telephone interview. In case of being not able to contact the patients by telephone, the questionnaire was sent out to their contact address. Data were analyzed by SPSS for Windows version 19 software.

Most of patients in both groups were male. Patients who arrived at the hospital late had the greater proportion of male patients than those who arrived at the hospital early (81.2% vs 58.0%). Patients who arrived at the hospital early and late had similar demographic characteristics as follows: mean age \pm SD of 59.9 ± 13.1 vs 63.3 ± 13.4 years, marital status as married 73.9% vs 64.7% status in a family as a head of family 58.0% vs 74.1% status of living alone 5.7% vs 8.2% graduation from primary school 67.0% vs 74.1% and occupation as unemployed 38.6% vs 41.2%. The pre-morbid functional status in both groups of patients were independent in self-care as many as 97.7% vs 97.6% respectively.

More than half of stroke patients in both groups presented with ischemic stroke more than hemorrhagic stroke. The patients who arrived at the hospital late tended to have more proportion of ischemic stroke than those who arrived at the hospital early (89.4% vs 67.0%). The patients who arrived at the hospital late had the arrival time longer than those who arrived at the hospital early with the median of 2 (interquartile range 1,3) hours vs 24 (interquartile range 7,48) hours, respectively. The patients who arrived at the hospital late had greater proportion to have lesions occurring at brainstem and cerebellum over (9.1% vs 6.1%) and weakness on the left side more than right side (55.3% vs 44.7%). Patients who arrived at the hospital early had pathology in the left hemisphere more than right hemisphere (45.4% vs 33.0%) and weakness of the right side more than left side (59.1% vs 40.9%). The median of the severity of stroke assessed by the NIHSS were 3.5 (interquartile range 2, 15) score in the patients who arrived at the hospital early which was less than 5 (interquartile range 1.5, 8.5) score in the patients who arrived at the hospital late. In terms of risk factors, patients in both groups had similar risk factors. In both groups, hypertension was the commonest risk factor followed by smoking, alcoholic drinking and

hyperlipidemia. Almost 90% in both groups did not know risk factors of stroke and the treatment of stroke patients.

After stroke, patients who arrived at the hospital early and late had similar demographic characteristics. The median costs of medical treatment on admission at the hospital were 11326.5 baht in patients who arrived early and 10599.0 baht in patients who arrived late. About half of both groups, spouse was primary caregivers (52.7% vs 51.4%) followed by children (33.6% vs 38.1%). Regarding the effect to work after stroke as assessed at 3 months, patients who arrived at the hospital early and late were likely to be unemployed (35.2% vs 43.5%) or return to work normally (33.0% vs 23.5%) at the similar proportion. Furthermore, both groups of patients had similar mortality rates. The patients who arrived at the hospital early and late had the mortality rates 9.1 and 7.1 respectively.

On day 1 of admission, the NIHSS score in both groups were different significantly in both groups ($p < 0.05$). Patients who arrived at the hospital within 4.5 hours of symptom onset were more severe as classified by the NIHSS score ≥ 15 than who arrived at the hospital after 4.5 hours of symptom onset. The BI score, mRS score, and GCS score of patients in both groups were not statistically different ($p > 0.05$). At 3 months after treatment, stroke patients in both groups did not differ ($p > 0.05$) in terms of the mRS score, BI score, and QOL score.

Considering the mRS scores of stroke patients in both groups, most patients had the good functional ability scores. Patients who arrived at the hospital within 4.5 hours of symptom onset were likely to improve in the symptoms than those who arrived at the hospital after 4.5 hours of symptom onset (78.4% vs 72.9%) while 12.5% vs 20.0% were remained stable or worse.

Comparing the BI scores of stroke patients between day 1 of admission and 3 months after treatment, there was different significantly in each group ($p < 0.05$). The mean of the change of BI total scores was 32.4 ± 29.5 in patients who arrived at the hospital within 4.5 hours of symptom onset and was 28.0 ± 25.7 in those who arrived at the hospital within 4.5 hours of symptom onset. Patients who arrived at the hospital early tended to have the BI score higher than those who arrived at the hospital late. At 3 months after treatment, stroke patients in both groups did not differ ($p > 0.05$) in terms of the change of BI scores.

In multivariate logistic regression analysis, 6 independent variables were simultaneously entered in the model of the improved mRS at 3 months after treatment which were age, pre-morbid functional status (basic activities of daily living), type of stroke, severity of disease measured by the NIHSS, paralysis, and the mRS score on day 1 of admission at the hospital. After adjusted for all other variables in the model, 4 significant predictors for the improved mRS at 3 months after treatment were age, pre-morbid functional status (basic activities of daily living), severity of disease measured by NIHSS, and mRS score on day 1 of admission at the hospital.

6.2 Clinical Implementation

Although, the study did not show difference in terms of recovery of functional abilities after treatment for 3 months in stroke patients who did not receive recombinant tissue plasminogen activator therapy comparing patients who arrived at a hospital within 4.5 hours and those who arrived after 4.5 hours of symptom onset, several issues should be taken into account. The major contributing factors for stroke recovery are thrombolytic therapy and care in stroke unit. Patients in our study did not receive the thrombolytic therapy, hence the difference in functional recovery might be not explicitly demonstrated. Every patient who is just developing stroke will not know they are eligible to the thrombolytic therapy or not, therefore immediate seeking medical care is still crucial.

6.3 Recommendations for further research

1. There should be a multi-center study to confirm such information which make the result more broadly applicable to the stroke patients.

2. The sample size should be larger. Some insignificant difference might be from small sample size. Subjects in both groups should have the similar baseline characteristics to minimize bias from different baseline characteristics.

3. There should be study to investigate the inter-observer variation for measurement scales to minimize error arising from the assessment of the outcomes.

4. There should be face-to-face interview which needs the coordination between healthcare professionals and the research team to follow up patients.

5. There should be the assessment of the recovery of stroke patients who did not receive recombinant tissue plasminogen activator therapy continuously longer than three months.

6. There should be the evaluation of the understanding and recognition of the warning signs of stroke as well as the knowledge and immediate treatment in general people.

REFERENCES

1. World Health Organization. Prevention of Cardiovascular Disease: guideline for assessment and management of total cardiovascular risk; 2007.
2. Horton R. Chronic diseases: the case for urgent global action. *Lancet*. 2007; 370: 1881-1882.
3. Bonita R. Beaglehole R. Addressing the problem of stroke at a global level. *Int J Stroke*. 2008; 3: 27.
4. World Stroke Day.[cited 2010 August 12]; Available from: www.world-stroke.org
5. Stroke Reducing Risk & Recognizing Symptom.[cited 2010 August 12]; Available from:www.stroke.org/site/DocServer/ReducingRisk08sm.pdf?docID=3324
6. Viriyavejakul A, Pongvarin N, Vannasaeng S. The prevalence of stroke in urban community of Thailand. *J Neurol*. 1985; 232: 93.
7. Viriyavejakul A, Senanarong V, Prayoonwiwat N, Praditsuwan R, Chaisevikul R, Pongvarin N. Epidemiology of stroke in the elderly in Thailand. *J Med Assoc Thai*. 1998; 81: 497-505.
8. Hanchaiphiboolkul S, Pongvarin N, Nidhinandana S, Charnnarong Suwanwela N, Puthkhao P, Towanabut S, et al. Prevalence of Stroke and Stroke Risk Factors in Thailand: Thai Epidemiologic Stroke (TES) Study. *J Med Assoc Thai*. 2011; 94: 427-436.
9. Burden of disease and injuries in Thailand: Ministry of Public Health Nov 2002. [cited 2011 August 9]; Available from: URL:<http://203.157.19.191/index-burden.htm>
10. สถิติสาธารณสุข , กลุ่มภารกิจด้านข้อมูลข่าวสารและสารสนเทศสุขภาพ สำนักนโยบายและยุทธศาสตร์ กระทรวงสาธารณสุข, เอกสารอัดสำเนา. 2551.
11. กระทรวงสาธารณสุข, สำนักโรคไม่ติดต่อ. รายงานประจำปี 2550. กรุงเทพฯ : โรงพิมพ์องค์การสงเคราะห์ทหารผ่านศึก, 2551.

12. กระทรวงสาธารณสุข, สำนักนโยบายและยุทธศาสตร์. การสาธารณสุขไทย 2548-2550. กรุงเทพฯ: โรงพิมพ์องค์การสงเคราะห์ทหารผ่านศึก, 2550.
13. ข้อมูลสถิติ, สำนักนโยบายและยุทธศาสตร์ กระทรวงสาธารณสุข. เข้าถึงได้จาก <http://bps.ops.moph.go.th/index.php?mod=bps&doc=5> (วันที่ค้นข้อมูล : 10 สิงหาคม 2554).
14. สถิติสาธารณสุข งานข้อมูลข่าวสาร กลุ่มงานพัฒนายุทธศาสตร์สาธารณสุข สำนักงานสาธารณสุขจังหวัดสระบุรี. เอกสารอัดสำเนา. 2552.
15. ข้อมูลเวชสถิติ, โรงพยาบาลสระบุรี. เอกสารอัดสำเนา. 2553.
16. กมลทิพย์ หาญผดุงกิจ. การฟื้นฟูสมรรถภาพ. ใน กิ่งแก้ว ปาจริย์. บรรณาธิการ. การฟื้นฟูสมรรถภาพผู้ป่วยโรคหลอดเลือดสมอง. พิมพ์ครั้งที่ 1. กรุงเทพฯ: งานตำราวารสารและสิ่งพิมพ์ สถานเทคโนโลยีการศึกษาแพทยศาสตร์ คณะแพทยศาสตร์ศิริราชพยาบาล มหาวิทยาลัยมหิดล, 2550.
17. วราลักษณ์ ทองใบปราสาท และคณะ. ประสิทธิภาพการปรับตัวต่อการเจ็บป่วยของผู้ป่วยโรคหลอดเลือดสมองที่อาศัยในตำบลแสนตอ อำเภอขามเฒ่าบุรี จังหวัดกำแพงเพชร. วารสารพยาบาลศาสตร์ มหาวิทยาลัยนเรศวร ปีที่ 1 ฉบับที่ 1 ม.ค.-มิ.ย. 2550: 72-84.
18. The National Institute of Neurological Disorders and Stroke t-PA Stroke Study Group: Tissue Plasminogen Activator for Acute Ischemic Stroke. The New England Journal of Medicine. 1995; 333: 1581-1587.
19. Hacke W, Kaste M, Bluhmki E. Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke. N Engl J Med. 2008; 359: 1317-1329.
20. พรชัย สติธิปัญญา. การฟื้นคืนจากโรคหลอดเลือดสมอง. ใน วุฒิชัย เพิ่มศิริวานิชย์, ดารณี สุวพันธ์. บรรณาธิการ. ก้าวทันการรักษาโรคหลอดเลือดสมอง. สงขลา : ชานเมืองการพิมพ์, 2551; หน้า 74-87.
21. Morgenstern LB, Staub L, Chan W, Wein TH, Bartholomew LK, King M, et al. Improving delivery of acute stroke therapy: the TLL Temple Foundation Stroke Project. Stroke. 2002; 33: 160-166.
22. สำนักงานหลักประกันสุขภาพแห่งชาติ. สปสช.นำร่องแพทย์ฉุกเฉินรักษาโรคหลอดเลือดสมอง 15 แห่ง. เข้าถึงได้จาก <http://www.kmddc.go.th/newsitem.aspx?itemid=5> (วันที่ค้นข้อมูล : 9 สิงหาคม 2554).
23. Brandstater ME. An overview of stroke rehabilitation. Stroke. 1990; 21: 1140-1142.

24. Skilbeck CE, Wade DT, Hewer RL, Wood VA. Recovery after stroke. *J Neurol Neurosurg Psychiatry*. 1983; 46: 5-8.
25. Kelly-Hayes M, Wolf PA, Kase CS, Gresham GE, Kannel WB, D'Agostino RB. Time course of functional recovery after stroke: the Framingham Study. *J Neurol Rehabil*. 1989; 3: 65-70.
26. World Health Organization Meeting on Community Control of Stroke and Hypertension. Control of stroke in the community: methodological considerations and protocol of WHO register. CVD/s/73.6 Geneva: WHO 1973.
27. กิ่งแก้ว ปาจริย์. ความรู้ทั่วไปเกี่ยวกับโรคหลอดเลือดสมอง. ใน กิ่งแก้ว ปาจริย์. บรรณาธิการ. การฟื้นฟูสมรรถภาพผู้ป่วยโรคหลอดเลือดสมอง. พิมพ์ครั้งที่ 1. กรุงเทพฯ : งานตำราวารสารและสิ่งพิมพ์ สถานเทคโนโลยีการศึกษาแพทยศาสตร์ คณะแพทยศาสตร์ศิริราชพยาบาล มหาวิทยาลัยมหิดล, 2550.
28. Classification of cerebrovascular disease III: special report from National Institute of Neurological Disorders and Stroke, 1989.
- 29.5 โรคภัยคร่าชีวิตคนไทย : อันดับ 4 โรคหลอดเลือดสมอง ใน เอี่ยมพร สกุลแก้ว. บรรณาธิการ. กรุงเทพฯ: สำนักพิมพ์ไกล่หมอ, 2551.
30. Robin SM, Baum HM. The national survey of stroke: incidence. *Stroke*. 1981; 12: I45-I57.
31. Boysen G, Nyboe J, Appleyard M, Sorensen PS. Stroke incidence and risk factors in Copenhagen, Denmark. *Stroke*. 1988; 19: 345-353.
32. Sacco RL, Hauser WA, Mohr JP. Hospitalized stroke incidence in blacks and Hispanics in Northern Manhattan. *Stroke*. 1991; 22: 1491-1496.
33. Kiely DK, Wolf PA, Cupples LA, Bleiser AS, Myers RS. Familial aggregation of stroke: the Framingham Study. 1993; 24: 1366-1371.
34. Shaper AG, Phillips AN, Pocock SJ, Walker M, Macfarlane PW. Risk factors for stroke in middle-aged British men. *Br Med J*. 1991; 302: 1111-1115.
35. Rodgers A, Macmahon S, Gamble G, Slattery J, Sandercock P, Warlow C. Blood pressure and risk of stroke in patients with cerebrovascular disease. *BMJ*. 1996; 313: 147.

36. Wolf PA, Abbot RD, Kannel WB. Atrial fibrillation as an independent risk factor for stroke. Framingham Study. 1991; 22: 983-988.
37. Hart RG, Jonathan L, Halperin JL. Atrial fibrillation and stroke: concepts and controversies. *Stroke*. 2001; 32: 803-808.
38. Hart RG, Benavente O, McBride R, Pearce LA, Antithroboic therapy to prevent stroke in patients with atrial fibrillation: a meta-analysis. *Ann Intern Med*. 1999; 131: 492-501.
39. Antiplatelet Trialists' Collaboration. Collaborative meta-analysis of randomized trials of antiplatelet therapy for prevention of death, myocardial infarction, and stroke in high risk patients. *BMJ*. 2002; 324: 71-86.
40. Norris JW, Zhu CZ, Bornstein NM, Chambers BR. Vascular risk of asymptomatic carotid. *Stroke*. 1991; 22: 483-485.
41. Benavente O, Mother D, Pham B. Carotid endarterectomy for asymptomatic carotid stenosis: a meta-analysis. *BMJ*. 1998; 317: 1477-1480.
42. Wolf PA, D'Agostino RB, Kannel WB, Bonita R, Belanger AJ. Cigarette smoking as a risk factor for stroke: the Framingham Study. *JAMA*. 1988; 259: 1025-1029.
43. Shinton R, Beevers G. Meta-analysis of relation between cigarette smoking and smoke. *BMJ*. 1989; 298:789-794.
44. Kawachi I, Colditz GA, Stampfer MJ, Willett WC. Smoke cessation and decrease risk in woman. *JAMA*. 1993; 269:232-236.
45. Barrett-conner E, Khaw K. Diabetes mellitus: an independent risk factor for stroke. *Am J Epidemiol*. 1988; 128: 116-123.
46. UK Prospective Diabetes Study Group. Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type II diabetes (UKPDS 33). *Lancet*. 1998; 352: 837-853.
47. Qizibash N, Lewington S, Duffy S, Peto R. Cholesterol, diastolic blood pressure, and stroke: 13,000 strokes in 450,000 people in 45 prospective cohorts: Prospective Studies Collaboration. *Lancet*. 1995; 346: 1647-1653.

48. Hebert PR, Gaziano JM, Chan KS, Hennekens CH. Cholesterol lower with statin drugs, risk of stroke, and total mortality: an overview of randomized trials. *JAMA*. 1997; 278: 313-321.
49. Burn J, Dennis M, Bamford J, Sandercock P, Wade D, Warlow C. Long-term risk of recurrent stroke after a first-ever stroke: The Oxfordshire Community Stroke Project. *Stroke*. 1994; 25: 333-337.
50. รังสรรค์ ชัยเสวีกุล. การรักษาทางอายุรกรรม. ใน กิ่งแก้ว ปาจริย์. บรรณาธิการ. การฟื้นฟูสมรรถภาพผู้ป่วยโรคหลอดเลือดสมอง. พิมพ์ครั้งที่ 1. กรุงเทพฯ: งานตำราวารสารและสิ่งพิมพ์ สถานเทคโนโลยีการศึกษาแพทยศาสตร์ คณะแพทยศาสตร์ศิริราชพยาบาล มหาวิทยาลัยมหิดล, 2550.
51. Wade DT, Hewer RL. Function abilities after stroke: measurement, natural history and prognosis. *J Neurol Neurosurg Psychiatry*. 1987; 50: 177-82.
52. Lehmann JF, DeLateur BJ, Fowler RS, Warren CG, Arnhold R, Schertzer G, et al. Stroke rehabilitation: outcome and prediction. *Arch Phys Med Rehabil*. 1975; 56: 383-389.
53. Granger CV, Hamilton BB, Fiedler RC. Discharge outcome after stroke rehabilitation. *Stroke*. 1992; 23: 978-982.
54. Heinemann AW, Roth EJ, Cichowski K, Betts HB. Multivariate analysis of improvement and outcome following stroke rehabilitation. *Arch Neurol*. 1987; 44: 1167-1172.
55. สุรเกียรติ อาชานุกาพ. 350 โรคกับการดูแลรักษาและการป้องกัน ตำราการตรวจรักษาโรคทั่วไป 2. พิมพ์ครั้งที่ 4 (มีนาคม 2551 ฉบับปรับปรุง). พิมพ์ดี. กรุงเทพฯ, 2551 หน้า 628-634.
56. กฤษณา พิรเวช. การฟื้นฟูผู้ป่วยโรคหลอดเลือดสมองระยะเฉียบพลัน. ใน นิจศรี ชาญณรงค์ . บรรณาธิการ. การดูแลรักษาภาวะสมองขาดเลือดในระยะเฉียบพลัน . กรุงเทพฯ: โรงพิมพ์แห่งจุฬาลงกรณ์มหาวิทยาลัย, 2550.
57. Murray E. Stroke rehabilitation. In: Delisa JA, Gans BM, eds. *Rehabilitation Medicine Principle and Practice*. 3rd ed. New York: Lippincott-Raven. 1998; 1176.
58. Wade DT, Wood VA, Hewer RL. Recovery after stroke the first 3 months. *J Neurol Neurosurg Psychiatry*. 1985; 48: 7-13.

59. Randolph JN. Functional and structural plasticity in motor cortex: implications for stroke recovery. *Phys Med and Rehab Clinics of North American*. 2003; 14: S57-S76.
60. Schaechter JD. Motor rehabilitation and brain plasticity after hemiparetic stroke. *Progress in Neurobiology*. 2004; 73: 61-72.
61. Lepert J, Bauder H, Miltner W.H.R., Taub E, Weiller C. Treatment induced cortical reorganization after stroke in humans. *Stroke*. 2003; 31: 1210-1216.
62. Grotta JC, Noser EA, Ro T, Boake C, Livin H, Aronowski J, et al. Constraint-induced movement therapy. *Stroke*. 2004; 35: 2699-2701.
63. Wittenberg GF, Chen R, Ishii K, Bushara KO, Taub E, Gerber LH, et al. Constraint-induced therapy in stroke: magnetic-stimulation motor maps and cerebral activation. *Neurorehab Neural Repair*. 2003; 17: 48-57.
64. Moseley AM, Stark A, Cameron ID, Pollock A. Treadmill training and body weight support for walking after stroke. *Cochrane Database Syst Rev*. 2003; 3: CD0028-40.
65. Twitchell TE. The restoration of motor function following hemiplegia in man. *Brain*. 1951; 74: 443-480.
66. Bard G, Hirshberg CG. Recovery of voluntary motion in upper extremity following hemiplegia. *Arch Phys med Rehabil*. 1965; 46: 567-572.
67. Wade DT, Hewer RL, Wood VA, Skibeck CE, Ismail HM. The hemiplegic arm after stroke: measurement and recovery. *J Neurol Neurosurg Psychiatry*. 1983; 46: 521-524.
68. Shelton FN, Reding MJ. Effect of lesion on upper limb motor recovery after stroke. *Stroke*. 2001; 32: 107-112.
69. Hankey GJ, Spiesser J, Hakimi Z, Bego G, Carita P, Gabriel S. Rate, degree, and predictors of recovery from disability following ischemic stroke. *Neurology*. 2007; 68: 1583-1587.
70. Jorgensen HS, Nakayama H, Raaschou HO, Vive-Larsen J, Stoier M, Olsen TS. Outcome and time course of recovery in stroke. Part II: Time course of recovery. The Copenhagen Stroke Study. *Arch Phys Med Rehabil*. 1995; 76: 406-412.

71. Appelros P, Nydevik I, Viitanen M. Poor outcome after first-ever stroke: predictors for death, dependency, and recurrent stroke within the first year. *Stroke*. 2003; 34: 122-126.
72. Hankey GJ, Spiesser J, Hakimi Z, Carita P, Gabriel S. Time frame and predictors of recovery from disability following recurrent ischemic stroke. *Neurology*. 2007; 68: 202-205.
73. Hankey GJ, Jamrozik K, Broadhurst RJ, Forbes S, Anderson CS. Long-term disability after first -ever stroke and related prognostic factors in the Perth Community Stroke Study, 1989-1990. *Stroke*. 2003; 33: 1034-1040.
74. Chamorr A, Vila N, Ascaso C, Elices E, Schonewille W, Blanc R. Blood pressure and functional recovery in acute ischemic stroke. *Stroke*. 1998; 29: 1850-1853.
75. Fang Y, Chen X, Li H, Lin J, Huang R, Zeng I. A study on additional early physiotherapy after stroke and factors affecting functional recovery. *Clin Rehabil*. 2003; 17: 608-617.
76. Zinn S, Dudley TK, Bosworth HB, Hoening HM, Duncan PW, Homer RD. The effect of poststroke cognitive impairment on rehabilitation process and functional outcome. *Arch Phys Med Rehabil*. 2004; 85: 1084-1090.
77. Robinson RG, Starr LB, Kubos K. A two-year longitudinal study of post-stroke mood disorders: finding during the initial evaluation. *Stroke*. 1983; 14: 736-741.
78. Ghoge H, Sharma S, Sonawalla S, Parikh R. Cerebrovascular diseases and depression. *Curr Psychiatry Rep*. 2003; 5: 231-238.
79. Eastwood MR, Rifat SL, Nobbs H, Ruderman J. Mood disorder following cerebrovascular accident. *Br J Psychiatry*. 1989; 154: 195-200.
80. Parikh RM, Robinson RG, Lipsey JR, Starkstein SE, Federoff JP, Price TR. The impact of poststroke depression on recovery in activities of daily living over a 2-year follow up. *Arch Neuro*. 1990; 47: 485-489.
81. Murray CD, Harrison B. The meaning and experience of being a stroke survivor: an interpretative phenomenological analysis. *Disability and Rehabilitation*. 2004; 26: 808-816.

82. Blake H, Lincoln NB, Clarke DD. Caregiver strain in spouse of stroke patients. *Clin Rehabil.* 2003; 17: 312-317.
83. Yanyong I, Patcharawiwatpong P. Stress in caregivers of stroke patients. *J Thai Rehabil.* 2003; 13: 63-70.
84. White CL, Mayo N, Hanley JA, Wood-Dauphinee S. Evolution of caregiving experience in initial 2 years following stroke. *Res Nurs Health.* 2003; 26: 177-189.
85. Rankin J. Cerebral vascular accidents in patients over the age of 60. *Scott Med J.* 1957; 2: 200-215.
86. Bonita R, Beaglehole R. Modification of Rankin Scale: Recovery of motor function after stroke. *Stroke.* 1988 Dec; 19: 1497-1500.
87. Van Swieten JC, Koudstaal PJ, Visser MC, Schouten HJ, Van Gijn J. Interobserver agreement for the assessment of handicap in stroke patients. *Stroke* 1988; 19: 604-607.
88. สถาบันประสาทวิทยา. แนวทางการฟื้นฟูสมรรถภาพผู้ป่วยโรคหลอดเลือดสมอง. กรุงเทพฯ, กรมการแพทย์ กระทรวงสาธารณสุข, 2549.
89. Duncan PW, Jorgensen HS, Wade DT. Outcome measures in acute stroke trials: a systematic review and some recommendations to improve practice. *Stroke.* 2000; 31: 1429-1438.
90. Quinn TJ, Dawson J, Walters MR, Lees KR. Variability in modified Rankin scoring across a large cohort of international observers. *Stroke.* 2008; 39: 2975–2979.
91. Quinn TJ, Dawson J, Walters MR, Lees KR. Reliability of the Modified Rankin Scale. A Systematic Review *Stroke.* 2009; 40: 3393-3395.
92. Mahoney FI, Barthel D. “Functional evaluation: the Barthel Index.” *Maryland State Medical Journal.* 1965; 14: 56-61.
93. Wade DT, Collin C. The Barthel ADL Index: a standard measure of physical disability. *Int Dis Studies.* 1988; 10: 64–67.
94. Quinn TJ, Langhorne P, Stott DJ. Barthel Index for Stroke Trials Development, Properties, and Application. *Stroke.* 2011; 42: 1146-1151.
95. Shah S, Vanclay F, Cooper B. Improving the sensitivity of the Barthel Index for stroke rehabilitation. *J Clin Epidemiol.* 1989; 42: 703–709.

96. Hsuh IP, Lee MM, Hsieh CL. Psychometric characteristics of the Barthel activities of daily living index in stroke patients. *J Formos Med Assoc.* 2001; 100: 526–532.
97. Leung SO, Chan CC, Shah S. Development of a Chinese version of the modified Barthel Index. *Clin Rehabil.* 2007; 21: 912–922.
98. Brott T, Adams HP, Olinger CP, Marler JR, Barsan WG, Biller J, et al. Measurements of acute cerebral infarction: a clinical examination scale. *Stroke.* 1989; 20: 864-870.
99. ยงชัย นิละนนท์ และคณะ. การศึกษาความเที่ยงตรงของแบบวัดความรุนแรงของโรคหลอดเลือดสมอง (National Institute of Health Stroke Scale, NIHSS) ภาาภาษาไทย. ใน *เชิดชัย นพมณีจำรัสเลิศ, อัครินทร์ นิมมานนิตย์ และกุลธร เทพมงคล บรรณาธิการ. เคสึดไม่ลับ R2R บริบทคณะแพทยศิริราชพยาบาล. กรุงเทพฯ : ยูเนี่ยน ครีเอชัน, 2552. หน้า 103-130.*
100. Goldstein LB, Samsa GP. Reliability of the National Institute of Health Stroke Scale: extension to nonneurologists in the context of a clinical trial. *Stroke.* 1997; 28: 307-310.
101. Muir KW, Weir CJ, Murray GD, Povey C, Lees KR. Comparison of neurological scales and scoring systems for acute stroke prognosis. *Stroke.* 1996; 27: 1817-1820.
102. นิจศรี ชาญณรงค์. แนวทางการดูแลรักษาผู้ป่วยโรคสมองขาดเลือดโดยทั่วไป. ใน *นิจศรี ชาญณรงค์. บรรณาธิการ. การดูแลรักษาภาวะสมองขาดเลือดในระยะเฉียบพลัน. กรุงเทพฯ: โรงพิมพ์แห่งจุฬาลงกรณ์มหาวิทยาลัย, 2550.*
103. Teasdale G, Jennett B. Assessment of coma and impaired consciousness. *Lancet.* 1974; 304: 81-84.
104. Teasdale G, Murray G, Parker L, Jennett B, Adding up the Glasgow Coma Scale. *Acta Neurochir.* 1979; 28: 13-16.
105. ปรีชา ศิริทองถาวร และสมศักดิ์ ฝ่องประเสริฐ. บาดเจ็บศีรษะ. ใน *ปรีชา ศิริทองถาวร, สืบวงศ์ จุฑาทิสสิทธิ์ และอนันต์ ตันมูขยกุล บรรณาธิการ. ศัลยศาสตร์อุบัติเหตุ 14 การดูแลรักษาผู้ป่วยอุบัติเหตุ ณ ห้องฉุกเฉิน. กรุงเทพฯ : โรงพิมพ์เรือนแก้วการพิมพ์, 2548.*

106. Rowley G, Fielding K. Reliability and accuracy of the Glasgow Coma Scale with experienced and inexperienced users. *The Lancet*. 1991; 337: 535-538.
107. Cohen J. Interrater reliability and predictive validity of the FOUR score coma scale in a pediatric population. *Journal of Neuroscience Nursing*. 2009; 41: 261-267.
108. World Health Organization. WHOQOL-Measuring Quality of Life. Geneva: WHO (MSA/MNH/PSF/97.4).
109. สุวัฒน์ มหัตนิรันดร์กุล และคณะ. แบบประเมินคุณภาพชีวิตขององค์การอนามัยโลกชุดย่อ ฉบับภาษาไทย. โครงการจัดทำโปรแกรมสำเร็จรูปในการสำรวจสุขภาพจิตในพื้นที่ปี พ.ศ.2545.
110. Anderson TP. Rehabilitation of patients with completed stroke. In: Kottke FJ, Lehmann JF, eds *Krusen's handbook of physical medicine and rehabilitation*, 4th ed. Philadelphia: W.B.Saunders. 1990; 656-678.
111. Brandstater ME. Stroke rehabilitation. In: Delisa JA, Gans BM, eds. *Rehabilitation medicine: principles and practice*, 3th ed. Philadelphia: Lippincott-Raven Publishers. 1998; 1165-1189.
112. Kwakkel G, Wagenaar RC, Kollen BJ, Lankhorst GJ. Predicting disability in stroke a critical review of the literature. *Age & Ageing*. 1996; 25: 479-489.
113. ศูนย์สื่อสารศึกษาเพื่อคนพิการ. เข้าถึงได้จาก : <http://www.braille-cet.in.th> (วันที่ค้นข้อมูล : 15 เมษายน 2553).
114. วิษณุ กัมพรทิพย์. ความบกพร่องของระบบประสาทสั่งการ. ใน กิ่งแก้ว ปาจริย์. บรรณาธิการ. การฟื้นฟูสมรรถภาพผู้ป่วยโรคหลอดเลือดสมอง. พิมพ์ครั้งที่ 1. กรุงเทพฯ : งานตำราวารสารและสิ่งพิมพ์ สถานเทคโนโลยีการศึกษาแพทยศาสตร์ คณะแพทยศาสตร์ศิริราชพยาบาล มหาวิทยาลัยมหิดล, 2550.
115. โบโศก รัศมีพงษ์โศก. เข้าถึงได้จาก : <http://www.med.cmu.ac.th/hospital/hpc/file/general/CVA.ppt#256,1,ภาพนิ่ง 1> (วันที่ค้นข้อมูล : 15 เมษายน 2553).
116. Broderick JP, Phillips SJ, O'Fallon WM, Bergstralh EJ. Incidence rates of stroke in the eighties: the end of the decline in stroke. *Stroke*. 1989; 20: 577-582.
117. Sacco RL, Wolf PA, Kannel WB, MacNamara PM. Survival and recurrence following stroke: The Framingham Study. *Stroke*. 1982; 13: 290-295.

118. Libman R, Sacco R, Shi M. Neurologic improvement in pure motor hemiparesis. *Neurology*. 1992; 42: 1713-1716.
119. Kwiatkowski TG, Libman RB, Frankel M, Tilley BC, Morgenstern LB, Lu M, et al. Effects of tissue plasminogen activator for acute ischemic stroke at one year. National Institute of Neurological Disorders and Stroke Recombinant Tissue Plasminogen Activator Stroke Study Group. *N Engl J Med*. 1999; 340: 1781-1787.
120. Grau AJ, Weimar C, Buggle F, Heinrich A, Goertler M, Neumaier S, et al. Risk factors, outcome, and treatment in subtypes of ischemic stroke: the German stroke data bank. *Stroke*. 2001; 32: 2559-2566.
121. สถิติ stroke data bank โรงพยาบาลจุฬาลงกรณ์ 2546 Stroke follow up study
122. Segal ME, Whyte J. Modeling case mix adjustment of stroke rehabilitation outcomes. *Am J Phys Med Rehabil*. 1997; 76: 154-161.
123. Wade DT, Hewer RL. Motor loss and swallowing difficulty after stroke: frequency, recovery, and prognosis. *Acta Neurol Scand*. 1987; 76: 50-54.
124. Gowland C. Management of hemiplegic upper limb. In: Brandstater ME, Basmajian J, eds. *Stroke rehabilitation*. Baltimore: Williams & Wilkins. 1987: 217-245.
125. Flick CL. Stroke rehabilitation: stroke outcome and psychosocial consequences. *Arch Phys Med Rehabil*. 1999; 20: S21-S26.
126. Gresham GE, Fitzpatrick TE, Wolf PA, MacNamara PM, Kannel WB, Daeber TR. Residual disability in survivors of stroke: The Framingham Study. *N Engl J Med*. 1975; 293: 954-956.
127. American Heart Association. (nd). Stroke effects. Retrieved September 11, 2010, from www.americanheart.org/presenter.jhtml?identifier=4761.
128. Zalihic A, Markotic V, Zalihic D, Mabic M. Gender and quality of life after cerebral stroke. *Bosnian journal of basic medical sciences*. 2010; 10: 94-99.
129. Masskulpan P, Riewthong K, Dajpratham P, Kuptniratsaikul V. Anxiety and depressive symptoms after stroke in 9 rehabilitation centers. *J Med Assoc Thai*. 2008; 91: 1595-1602.

130. Manimmanakorn N, Vichiansiri R, Nuntharuksa C, Permsirivanich W, Kuptniratsaikul V. Quality of life after stroke rehabilitation among urban vs. rural patients in Thailand. *J Med Assoc Thai.* 2008; 91: 394-399.
131. Rachapukdee S. Quality of life of stroke survivors: a 3 months follow-up study. Mahidol University, Thai. 2007; 34-57.
132. Bolander V, Sorensen KC, Luckmann J. Sorensen and Luckmann's Basic nursing: a psychophysiological approach. 3rd ed. Philadelphia: W.B. Saunders. 1994.
133. Chantawatchai A. Functional abilities in activities of daily living and related factors among stroke patients 3 months after onset. Master's thesis in Nursing Science (Adult Nursing, Faculty of Graduate Studies, Mahidol University, Thai. 1999).
134. Howard G. Community hospital-based stroke programs: North Carolina, Oregon, and New York III factor influencing survival after stroke: proportional hazards analysis of 4219 patients. 1986; 17: 294-299.
135. Suwanno J. Family caregiver' capabilities in caring for hospitalized stroke patients before discharge. Master's thesis in Nursing Science (Adult Nursing, Faculty of Graduate Studies, Mahidol University, Thai. 1997).
136. Tirapaiwong P. Patient-Caregiver relationships and caregiving burden in family caregivers of stroke patients. Master's thesis in Nursing Science (Adult Nursing, Faculty of Graduate Studies, Mahidol University, Thai. 1997).
137. Dewey HM, Thrift AG, Mihalopoulos C, Carter R, MacDonell R.A.L., Mcneil JJ, et al. Informal care for stroke survivors: results from the North East Melbourne Stroke Incidence Study (NEMESIS). *Stroke.* 2002; 33: 1028-1033.
138. Dorsey MK, Vaca KJ. The stroke patient and assessment of caregiver needs. *J Vasc Nurs.* 1998; 16: 62-67.
139. Bakas T. Stroke Caregiver outcomes from the Telephone Assessment and Skill-Building Kit (TASK). *Top Stroke Rehabil.* 2009; 16: 105-121.
140. Bhatnagar P, Scarborough P, Smeeton NC, Allender S. The incidence of all stroke and stroke subtype in the United Kingdom, 1985 to 2008: a systematic review. *BMC Public Health.* 2010; 10: 539.

141. Evenson KR, Foraker R, Morris DL, Rosamond WD. A Comprehensive review of prehospital and in-hospital delay times in acute stroke care. *Int J Stroke*. 2009; 4: 187-199.
142. Yoo AJ, Romeo J, Hakimelahi R, Noqueira RG, Rabinov JD, Pryor JC, et al. Predictors of functional outcome vary by the hemisphere of involvement in major ischemic stroke treated with intra-arterial therapy: a retrospective cohort study. *BMC Neurol*. 2010; 10: 25.
143. Castellanos M, Leira R, Tejada J, Gil-Peralta A, Davalos A, Castillo J. Predictors of good outcome in medium to large spontaneous supratentorial intracerebral haemorrhages. *J Neurol Neurosurg Psychiatry*. 2005; 76: 691–695.
144. Alzamora MT, Sorribes M, Heras A, Vila N, Vicheto M, Forés R, et al. Ischemic stroke incidence in Santa Coloma de Gramenet (ISISCOG), Spain. A community-based study. *BMC Neurol*. 2008; 8: 5.
145. Sinha MK, Anuradha HK, Juyal R, Shukla R, Garg RK, Kar AM. Edaravone in acute ischemic stroke, an Indian experience. *Neurology Asia*. 2009; 14: 7–10.
146. Henrik S. Outcome and time course of recovery in stroke. Part II: time course of recovery. The Copenhagen Stroke Study. *Arch Phys Rehabil*. 1995; 76: 406-412.
147. Nelson MM, Smith MA, Martinson MA, Kind A, Luepker R. Declining patient functioning and caregiver burden²health: The Minnesota Stroke Survey-Quality of Life after Stroke Study. *Gerontologist*. 2008; 48: 573-583.
148. Hong KS, Kim J, Cho YJ, Seo SY, Hwang SI, Kim SC, et al. Burden of ischemic stroke in Korea: analysis of disability-adjusted life years lost. *J Clin Neurol*. 2011 June; 7: 77-84.
149. Kim JS, Lee KB, Roh H, Ahn MY, Hwang HW. Gender Differences in the functional recovery after acute stroke. *J Clin Neurol*. 2010; 6: 183-188.
150. González RG, Lev MH, Goldmacher GV, Smith WS, Payabvash S, Harris GJ, et al. Improved outcome prediction using CT angiography in addition to standard ischemic stroke assessment: results from the STOP Stroke study. *PLoS One*. 2012; 7: e30352.

151. Sablot D, Belahsen F, Vuillier F, Cassarini JF, Decavel P, Tatu L, et al. Predicting Acute Ischaemic Stroke Outcome Using Clinical and Temporal Thresholds. *ISRN Neurol.* 2011; 2011: 354642.
152. Morgenstern LB, Staub L, Chan W, Wein TH, Bartholomew LK, King M, et al. Improving delivery of acute stroke therapy: the TLL Temple Foundation Stroke Project. *Stroke.* 2002; 33: 160–166.
153. Kobayashi A, Skowronska M, Litwin T, Czlonkowska A. Lack of experience of intravenous thrombolysis for acute ischaemic stroke does not influence the proportion of patients treated. *Emerg Med J.* 2007; 24: 96–99.

APPENDICES

APPENDIX A
SIRIRAJ INSTITUTIONAL REVIEW BOARD
CERTIFICATE OF APPROVAL (RENEWAL)

2 PRANNOK Rd. BANGKOKNOI
 BANGKOK 10700



MAHIDOL UNIVERSITY
 Since 1988

Tel. (662) 4196405-6
 FAX (662) 4196405

Siriraj Institutional Review Board
Certificate of Approval (Renewal)

COA no. SI 580/2010

Protocol Title : Recovery of functional abilities after treatment for 3 months in stroke patients who did not receive recombinant tissue plasminogen activator therapy: the comparison between patients who arrived at a hospital within 4.5 hour and those who arrived after 4.5 hour of the symptom onset

Protocol number : 549/2553(EC3)

Principal Investigator/Affiliation : Miss Sujitra Duangjit / Department of Preventive and Social Medicine
 Faculty of Medicine Siriraj Hospital, Mahidol University

Research site : Faculty of Medicine Siriraj Hospital

Approval includes :

1. SIRB Submission Form
2. Proposal Amendment 1 dated 17 August 2011
3. Informed Consent Form Amendment 1 dated 17 August 2011
4. Case Record Form
5. Principle Investigator's curriculum vitae

Renewal date (1st) : October 29, 2011

Expired date : October 28, 2012

This is to certify that Siriraj Institutional Review Board is in full Compliance with International Guidelines For Human Research Protection such as the Declaration of Helsinki, the Belmont Report, CIOMS Guidelines and the International Conference on Harmonization in Good Clinical Practice (ICH-GCP).

Jarupim Soongswang

 (Prof. Jarupim Soongswang, M.D.)
 Chairperson

September 29, 2011

 date

T. Kulthanan

 (Clin. Prof. Teerawat Kulthanan, M.D.)
 Dean of Faculty of Medicine Siriraj Hospital

- 3 OCT 2011

 date

APPENDIX B

INFORMED CONSENT FORM (THAI)

เอกสารหมายเลข 4

หนังสือแสดงเจตนายินยอมเข้าร่วมโครงการวิจัย
(Informed Consent Form)

วันที่..... เดือน..... พ.ศ.....

ข้าพเจ้า..... อายุ..... ปี
อาศัยอยู่บ้านเลขที่..... ถนน..... แขวง/ตำบล.....
เขต/อำเภอ..... จังหวัด..... รหัสไปรษณีย์.....
โทรศัพท์.....

ขอแสดงเจตนายินยอมเข้าร่วมโครงการวิจัยเรื่อง “การฟื้นตัวด้านความสามารถในการประกอบกิจวัตรประจำวันของผู้ป่วยโรคหลอดเลือดสมองที่ไม่ได้รับยาละลายลิ่มเลือด หลังรับการรักษา 3 เดือน : เปรียบเทียบระหว่างผู้ป่วยที่มาโรงพยาบาลเร็วภายใน 4.5 ชั่วโมง และมาช้ามากกว่า 4.5 ชั่วโมง หลังเกิดอาการ”

ชื่อผู้วิจัย นางสาวสุจิตตรา ดวงจิต

สถานที่ทำวิจัย ตึกอายุรกรรม โรงพยาบาลสระบุรี

สถานที่ทำงานและหมายเลขโทรศัพท์ของหัวหน้าโครงการวิจัยที่ติดต่อได้ทั้งในและนอกเวลาราชการ
กลุ่มงานเวชปฏิบัติครอบครัวและชุมชน โรงพยาบาลเสาไห้ อำเภอเสาไห้ จังหวัดสระบุรี 18160

หมายเลขโทรศัพท์ที่ติดต่อได้ทั้งในและนอกเวลาราชการ 089-9363796

ผู้สนับสนุนทุนวิจัย ไม่มี

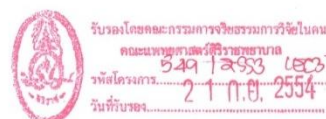
ระยะเวลาในการวิจัย 1 ปี 6 เดือน

โครงการวิจัยนี้ทำขึ้นเพื่อ ทราบการฟื้นตัวด้านความสามารถในการประกอบกิจวัตรประจำวันของผู้ป่วยโรคหลอดเลือดสมองที่ไม่ได้รับยาละลายลิ่มเลือด หลังรับการรักษา 3 เดือน : เปรียบเทียบระหว่างผู้ป่วยที่มาโรงพยาบาลเร็วภายใน 4.5 ชั่วโมง และมาช้ามากกว่า 4.5 ชั่วโมง หลังเกิดอาการ

ประโยชน์ที่คาดว่าจะได้รับคือ เพื่อเป็นแนวทางในการดูแลรักษาผู้ป่วยโรคหลอดเลือดสมองที่เหมาะสมสำหรับบุคลากรสาธารณสุขต่อไป

ข้าพเจ้าได้รับเชิญให้เข้าร่วมการวิจัยนี้เพราะ ข้าพเจ้าเป็นผู้ป่วยที่ได้รับการวินิจฉัยจากแพทย์ว่าเป็นโรคหลอดเลือดสมอง จะมีผู้เข้าร่วมการวิจัยนี้ทั้งสิ้นประมาณ 146 คน โดยคัดเลือกผู้เข้าร่วมการวิจัยที่เข้าพักรักษาตัวเป็นผู้ป่วยใน สาขาอายุรกรรม โรงพยาบาลสระบุรี

หากข้าพเจ้าตัดสินใจเข้าร่วมการวิจัยแล้วจะมีขั้นตอนการวิจัยดังต่อไปนี้คือ ข้าพเจ้าจะต้องตอบคำถามโดยผู้วิจัยจะสัมภาษณ์ข้าพเจ้า 2 ครั้ง ครั้งแรกคือ ในวันนี้และอีกครั้งหลังจากนี้ 3 เดือน โดยครั้งที่ 2 จะเป็นการสัมภาษณ์ทางโทรศัพท์ การเข้าร่วมการวิจัยนี้ความเสี่ยงที่อาจเกิดขึ้นจากการตอบแบบสอบถามในการประเมินครั้งที่ 2 โดยการสัมภาษณ์ทางโทรศัพท์ ได้แก่ ผู้ป่วยและญาติอาจรู้สึกหงุดหงิด



ไม่พึงพอใจ รำคาญใจ ถ้าต้องตอบคำถามเป็นเวลานาน ดังนั้นจึงได้ประเมินเฉพาะส่วนที่จำเป็นและคาดว่าใช้เวลาประมาณไม่เกิน 15 นาที และในกรณีที่ไม่สามารถติดต่อทางโทรศัพท์ได้ จะใช้การติดตามโดยส่งเป็นจดหมายตอบกลับแทน

และหากข้าพเจ้าไม่เข้าร่วมในโครงการวิจัยนี้ ข้าพเจ้าก็จะได้รับการตรวจเพื่อการวินิจฉัยและรักษาโรคของข้าพเจ้าตามวิธีการที่เป็นมาตรฐานตามแนวทางการดูแลผู้ป่วยโรคหลอดเลือดสมองตามเดิม การเข้าร่วมการวิจัยนี้ไม่มีค่าใช้จ่าย และข้าพเจ้าจะไม่ได้รับค่าตอบแทน

หากมีข้อข้องใจที่จะสอบถามเกี่ยวข้องกับกรวิจัย หรือหากเกิดผลข้างเคียงที่ไม่พึงประสงค์จากการวิจัย ข้าพเจ้าสามารถติดต่อติดต่อ นางสาวสุจิตตรา ดวงจิต หมายเลขโทรศัพท์ที่สามารถติดต่อได้ 24 ชั่วโมง คือ 089-9363796

หากมีข้อมูลเพิ่มเติมทั้งด้านประโยชน์และโทษที่เกี่ยวข้องกับการวิจัยนี้ ผู้วิจัยจะแจ้งให้ข้าพเจ้าทราบโดยรวดเร็วและไม่ปิดบัง

ข้อมูลส่วนตัวของข้าพเจ้าจะถูกเก็บรักษาไว้โดยไม่เปิดเผยต่อสาธารณะเป็นรายบุคคล แต่จะรายงานผลการวิจัยเป็นข้อมูลส่วนรวมโดยไม่สามารถระบุข้อมูลรายบุคคลได้ ข้อมูลของผู้เข้าร่วมการวิจัยเป็นรายบุคคลอาจมีคณะบุคคลบางกลุ่มเข้ามาตรวจสอบได้ เช่น ผู้ให้ทุนวิจัย สถาบัน หรือองค์กรของรัฐที่มีหน้าที่ตรวจสอบ รวมถึงคณะกรรมการจริยธรรมการวิจัยในคน เป็นต้น

ข้าพเจ้ามีสิทธิ์ถอนตัวออกจากโครงการวิจัยเมื่อใดก็ได้ โดยไม่ต้องแจ้งให้ทราบล่วงหน้าหรือระบุเหตุผล และการไม่เข้าร่วมการวิจัยหรือถอนตัวออกจากโครงการวิจัยนี้ จะไม่มีผลกระทบต่อค่าบริการและการรักษาที่สมควรจะได้รับตามมาตรฐานแต่ประการใด

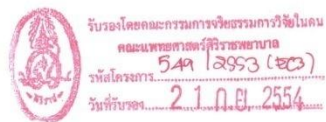
หากข้าพเจ้าได้รับการปฏิบัติที่ไม่ตรงตามที่ระบุไว้ในเอกสารชี้แจงนี้ ข้าพเจ้าสามารถแจ้งให้ประธานคณะกรรมการจริยธรรมการวิจัยในคนทราบได้ที่ สำนักงานคณะกรรมการจริยธรรมการวิจัยในคน ดิโกดูลยเคชวิกรม ชั้น 6 ร.พ.ศิริราช โทร. (02) 419-6405-6 โทรสาร (02) 419-6405

ข้าพเจ้าได้ทราบถึงสิทธิ์ที่ข้าพเจ้าจะได้รับข้อมูลเพิ่มเติมทั้งทางด้านประโยชน์และโทษจากการเข้าร่วมการวิจัย และสามารถถอนตัวหรือดเข้าร่วมการวิจัยได้ทุกเมื่อ โดยจะไม่มีผลกระทบต่อค่าบริการและการรักษาพยาบาลที่ข้าพเจ้าจะได้รับต่อไปในอนาคต และยินยอมให้ผู้วิจัยใช้ข้อมูลส่วนตัวของข้าพเจ้าที่ได้รับจากการวิจัย แต่จะไม่เผยแพร่ต่อสาธารณะเป็นรายบุคคล โดยจะนำเสนอเป็นข้อมูลโดยรวมจากการวิจัยเท่านั้น

ข้าพเจ้าได้รับทราบข้อมูลของโครงการข้างต้น ตลอดจนข้อดี ข้อเสีย ที่จะได้รับการเข้าร่วมโครงการในครั้งนี้และข้าพเจ้ายินยอมที่จะเข้าร่วมในโครงการดังกล่าว จึงลงลายมือชื่อไว้

ลงชื่อ..... ผู้เข้าร่วมการวิจัย/ผู้แทนโดยชอบธรรม/วันที่.....
(.....)

ลงชื่อ..... ผู้ให้ข้อมูลและขอความยินยอม/หัวหน้าโครงการวิจัย/วันที่.....
(.....)



ในกรณีนี้ผู้เข้าร่วมการวิจัยอ่านหนังสือไม่ออก

ผู้ที่อ่านข้อความทั้งหมดแทนผู้เข้าร่วมการวิจัยคือ

จึงได้ลงลายมือชื่อไว้เป็นพยาน

ลงชื่อ..... พยาน/วันที่.....

(.....)



APPENDIX C

CASE RECORD FORM (THAI)

แบบบันทึกข้อมูลสำหรับการทำวิจัย (Case Record Form)

การฟื้นตัวด้านความสามารถในการประกอบกิจวัตรประจำวันของผู้ป่วยโรคหลอดเลือดสมอง
ที่ไม่ได้รับยาละลายลิ่มเลือด หลังรับการรักษา 3 เดือน : เปรียบเทียบระหว่างผู้ป่วยที่มา
โรงพยาบาลเร็วภายใน 4.5 ชั่วโมง และมาช้ามากกว่า 4.5 ชั่วโมง หลังเกิดอาการ

คำชี้แจง

งานวิจัยนี้ต้องการศึกษาการฟื้นตัวด้านความสามารถในการประกอบกิจวัตรประจำวันของผู้ป่วยโรคหลอดเลือดสมองที่ไม่ได้รับยาละลายลิ่มเลือด หลังรับการรักษา 3 เดือน : เปรียบเทียบระหว่างผู้ป่วยที่มาโรงพยาบาลเร็วภายใน 4.5 ชั่วโมง และมาช้ามากกว่า 4.5 ชั่วโมง หลังเกิดอาการ ซึ่งผู้วิจัยจะนำข้อมูลที่ได้เป็นแนวทางปฏิบัติของผู้ป่วยและญาติในการเฝ้าระวังการเกิดโรคหลอดเลือดสมองซ้ำ เพื่อให้ผู้ป่วยมีการรอดชีวิตมากขึ้น หลงเหลือความพิการหรือรอยโรคที่เกิดจากภาวะเจ็บป่วยที่เกิดขึ้นให้น้อยที่สุด และขอรับรองว่าจะไม่เปิดเผยข้อมูลใด ๆ ที่ได้จากการสัมภาษณ์ครั้งนี้ในทางก่อให้เกิดความเสียหายต่อผู้ให้ข้อมูล ถ้าคำถามข้อใดในแบบบันทึกข้อมูลสำหรับการทำวิจัยฉบับนี้ ทำให้ผู้ตอบคำถามรู้สึกไม่สบายใจหรือไม่สะดวกใจที่จะตอบ ผู้ตอบคำถามสามารถหยุดตอบแบบบันทึกข้อมูลสำหรับการทำวิจัยได้ โดยไม่มีข้อเรียกร้องใด ๆ ทั้งสิ้น

แบบบันทึกข้อมูลสำหรับการทำวิจัยมีทั้งหมด 7 ส่วน

- ส่วนที่ 1 ข้อมูลทั่วไปของผู้ป่วย
- ส่วนที่ 2 ข้อมูลด้านปัจจัย
- ส่วนที่ 3 แบบประเมินความสามารถในการช่วยเหลือตนเองของผู้ป่วย
- ส่วนที่ 4 แบบประเมินการทำกิจวัตรประจำวันของผู้ป่วย
- ส่วนที่ 5 แบบประเมินอาการทางระบบประสาทของผู้ป่วย
- ส่วนที่ 6 แบบประเมินระดับการเปลี่ยนแปลงความรู้สึกตัวของผู้ป่วย
- ส่วนที่ 7 แบบประเมินคุณภาพชีวิตขององค์การอนามัยโลกชุดย่อ ฉบับภาษาไทย

ขอขอบพระคุณเป็นอย่างสูงที่ท่านสละเวลาในการตอบแบบบันทึกข้อมูลสำหรับการทำวิจัยฉบับนี้



รับรองโดยคณะกรรมการจริยธรรมการวิจัยในคน
คณะแพทยศาสตร์ศิริราชพยาบาล
รพ.ศิริราช 549 13553 (EC3)
วันที่โครงการ..... 21 ก.ย. 2554
วันที่รับของ.....



วัน/เดือน/ปีที่เก็บข้อมูล.....

คำชี้แจง กรุณาทำเครื่องหมาย ✓ ลงใน หน้าข้อความที่เป็นคำตอบและเติมข้อความลงในช่องว่างตามความเป็นจริง

ส่วนที่ 1 ข้อมูลทั่วไป

1. เพศ 1. ชาย 2. หญิง
2. อายุ.....ปี
3. สถานภาพสมรส 1. โสด 2. คู่
 3. หม้าย 4. หย่า/แยก
4. สถานภาพในครอบครัว 1. หัวหน้าครอบครัว 2. สมาชิกในครอบครัว
 3. ผู้อาศัย 4. อื่น ๆ ระบุ.....
5. ระดับการศึกษา 1. ไม่ได้เรียน 2. ประถมศึกษา
 3. มัธยมศึกษา 4. อนุปริญญาหรือเทียบเท่า
 5. ปริญญาตรี 6. สูงกว่าปริญญาตรี
6. อาชีพ 1. เกษตรกร (ทำนา ทำไร่) 2. รับจ้างทั่วไป
 3. รับราชการ 4. ช่างราชการ/บ้านญาติ
 5. รัฐวิสาหกิจ 6. พนักงานองค์กรเอกชน
 7. ค้าขาย 8. นักบวช
 9. พ่อบ้าน-แม่บ้าน (ไม่ได้ประกอบอาชีพ)
7. ปัจจุบันใครเป็นผู้ดูแลเลี้ยงดูท่าน (ตอบได้มากกว่า 1 ข้อ)
 1. ไม่มี 2. คู่สมรส
 3. บุตร 4. บุตรเขย/สะใภ้
 5. ญาติสนิท 6. ลูกจ้าง
8. จากการเจ็บป่วยด้วยโรคนี้มีผลกระทบต่ออาชีพหรืองานที่มีรายได้ได้อย่างไร
 1. ทำงานได้ตามปกติเหมือนเดิมทุกอย่าง
 2. ยังคงทำงานเหมือนเดิมแต่ทำงานได้ลดลงเล็กน้อยลง
 3. ต้องเปลี่ยนงานหรืออาชีพหรือตำแหน่งที่เคยทำ
 4. ยังไม่สามารถกลับไปทำงานได้
 5. ปัจจุบันไม่ได้ทำงาน
9. ความสามารถในการประกอบกิจวัตรประจำวันก่อนหน้าการเกิดโรค
 1. สามารถประกอบกิจวัตรประจำวันได้เองตามปกติ
 2. สามารถประกอบกิจวัตรประจำวันได้ แต่ต้องพึ่งผู้อื่น
 3. ไม่สามารถประกอบกิจวัตรประจำวันได้เอง ต้องพึ่งผู้อื่นทุกอย่าง
10. ค่าใช้จ่ายในการรักษาพยาบาล.....บาท
11. ความรุนแรงของการเกิดโรค วัดโดย NIHSS Scaleคะแนน
12. ชนิดของโรค 1. โรคหลอดเลือดสมองตีบหรืออุดตัน 2. โรคหลอดเลือดสมองแตก

ส่วนที่ 2 ข้อมูลด้านปัจจัย (จากเวชระเบียน ผู้วิจัยเป็นผู้บันทึกเอง)

13. ตำแหน่งของการเกิดโรค

13.1 บริเวณของสมองที่มีพยาธิสภาพ

1. ขวา (ระบุ) 1.1 Cortex 1.2 Basal ganglia 1.3 อื่น ๆ
2. ซ้าย (ระบุ) 2.1 Cortex 2.2 Basal ganglia 2.3 อื่น ๆ
3. ก้านสมอง (Brain stem) 4. สมองน้อย (Cerebellum)
5. ปกติ 6. อื่น ๆ (ระบุ).....

13.2 ขณะป่วยมีอาการอ่อนแรงครึ่งซีกหรือซาด้าน

1. ขวา 2. ซ้าย
3. ทั้งสองด้าน 4. ไม่มี

14. มีปัจจัยเสี่ยงต่อการเกิดโรคหลอดเลือดสมองอะไรบ้าง

1. ความดันโลหิตสูง
2. หัวใจเต้นผิดจังหวะ
3. โรคหลอดเลือดหัวใจ / กล้ามเนื้อหัวใจตายเฉียบพลัน
4. ความผิดปกติของหลอดเลือดแดงที่คอ
5. การสูบบุหรี่
1. สูบ.....มวนต่อวัน 2. เคยสูบ (ปัจจุบันหยุดแล้ว) 3. ไม่สูบ
6. โรคเบาหวาน
7. ภาวะไขมันในเลือดสูง
8. โรคอ้วน (น้ำหนัก.....กิโลกรัม , ส่วนสูง.....เซนติเมตร)
9. การใส่ยาคุมกำเนิด
10. การใช้ฮอร์โมนทดแทน ระบุ.....
11. การดื่มเครื่องดื่มแอลกอฮอล์
1. ดื่ม.....ขวด/วัน 2. เคยดื่ม (ปัจจุบันหยุดแล้ว) 3. ไม่ดื่ม
12. มีพันธุกรรมเป็นโรคหลอดเลือดสมอง
13. อื่น ๆ ระบุ.....

15. ท่านเคยได้รับรู้เกี่ยวกับปัจจัยเสี่ยงต่อการเกิดโรคหลอดเลือดสมองหรือไม่

1. เคย ระบุ..... 2. ไม่เคย

16. ท่านเคยได้รับรู้เกี่ยวกับการดูแลรักษาผู้ป่วยโรคหลอดเลือดสมองหรือไม่

1. เคย ระบุ..... 2. ไม่เคย

17. ระยะเวลาที่ผู้ป่วยโรคหลอดเลือดสมองมาถึงโรงพยาบาล หลังเกิดอาการ


1. ภายใน 4.5 ชั่วโมงแรกหลังเกิดอาการ
2. มากกว่า 4.5 ชั่วโมงหลังเกิดอาการ



รับรองโดยคณะกรรมการจริยธรรมการวิจัยในคน
คณะแพทยศาสตร์ศิริราชพยาบาล
รหัสโครงการ: 549-15553 (ECG)
วันที่รับรอง: 21 ก.ย. 2554

ส่วนที่ 3 แบบประเมินความสามารถในการช่วยเหลือตนเองของผู้ป่วยโรคหลอดเลือดสมอง (mRS)

กิจวัตรประจำวัน	แรกรับจากการ ซักประวัติญาติ วันที่.....	หลังรับการ รักษา 3 เดือน วันที่.....
0 = ไม่มีความผิดปกติเลย		
1 = ไม่มีความผิดปกติที่รุนแรง สามารถประกอบกิจวัตร ประจำวันได้ตามปกติทุกอย่าง		
2 = มีความผิดปกติเล็กน้อย สามารถประกอบกิจวัตร ประจำวันได้เกือบทุกอย่าง		
3 = มีความผิดปกติพอควร ต้องการคนอื่นช่วยในการทำ กิจวัตรประจำวันบางอย่าง แต่สามารถเดินเองได้โดย ไม่ต้องมีคนช่วย		
4 = มีความผิดปกติมาก สามารถเดินได้ แต่ต้องมีคนช่วย พยุง ไม่สามารถทำกิจวัตรประจำวันโดยไม่มีคนช่วยได้		
5 = มีความผิดปกติรุนแรงต้องนอนกับเตียง บัสสาวะราด ต้องการการดูแลอย่างใกล้ชิด		
6 = เสียชีวิต		
ผู้ประเมิน		


 รับรองโดยคณะกรรมการจริยธรรมการวิจัยในคน
 คณะแพทยศาสตร์ศิริราชพยาบาล
 รหัสโครงการ: 54971853-1603
 วันที่รับรอง: 21 พ.ย. 2554
 วันที่รับรอง:

ส่วนที่ 4 แบบประเมินการทำกิจวัตรประจำวันของผู้ป่วยโรคหลอดเลือดสมอง (Barthel Index)

กิจกรรม - คะแนน	แรกรับ วันที่.....	หลัง 3 เดือน วันที่.....
1. ล้างหน้า แปรงฟัน หวีผม <input type="checkbox"/> ต้องมีคนช่วย (0) <input type="checkbox"/> ทำได้เอง (5)		
2. การอาบน้ำ <input type="checkbox"/> ต้องมีคนช่วย (0) <input type="checkbox"/> ทำได้เอง (5)		
3. การแต่งตัว <input type="checkbox"/> ต้องมีคนช่วย (0) <input type="checkbox"/> มีคนช่วยบางส่วน (5) <input type="checkbox"/> ทำเองได้รวมทั้งการติดเข็ม ติดกระดุม (10)		
4. การรับประทานอาหาร <input type="checkbox"/> ต้องมีคนช่วย (0) <input type="checkbox"/> มีคนช่วยบางส่วน (5) <input type="checkbox"/> ทำได้เอง (10)		
5. การปัสสาวะ <input type="checkbox"/> ปัสสาวะเองไม่ได้คาสายสวน (0) <input type="checkbox"/> สวนบางครั้ง ไม่เกิน 1 ครั้งต่อวัน (5) <input type="checkbox"/> ปัสสาวะเองได้ (10)		
6. การถ่ายอุจจาระ <input type="checkbox"/> ถ่ายอุจจาระเองไม่ได้ ต้องมีคนช่วย (0) <input type="checkbox"/> อุจจาระเองได้เป็นส่วนใหญ่ ต้องการคนช่วยเหลือหรือเหน็บยาเป็น บางครั้ง ไม่เกิน 1 ครั้งต่อสัปดาห์ (5) <input type="checkbox"/> ทำเองได้ สวนหรือเหน็บยาเองได้ (10)		
7. การเข้าห้องน้ำ <input type="checkbox"/> ต้องมีคนช่วย (0) <input type="checkbox"/> มีคนช่วยบางส่วน (5) <input type="checkbox"/> ทำได้เอง (10)		
8. การขึ้นลงจากเตียง <input type="checkbox"/> ลุกจากเตียงไม่ได้ (0) <input type="checkbox"/> ลุกนั่งได้แต่ต้องมีคนคอยช่วยพยุง 1-2 คน (5) <input type="checkbox"/> ลุกนั่งได้ ต้องการคนคอยช่วยเหลือเล็กน้อย (10) <input type="checkbox"/> ลุกนั่งได้เอง ยกเท้าวางบนรถเข็นได้เอง (15)		
9. การเคลื่อนไหว นั่ง ยืน เดิน <input type="checkbox"/> นั่งบนรถเข็นได้ แต่ไปไหนเองไม่ได้ (0) <input type="checkbox"/> นั่งบนรถเข็น และไปได้ไกล 50 หลา (5) <input type="checkbox"/> เดินได้ไกล 50 หลา โดยมีคนช่วยเล็กน้อย (10) <input type="checkbox"/> เดินได้เอง อาจใช้ไม้เท้าช่วย (15)		
10. การขึ้นบันได <input type="checkbox"/> ขึ้นบันไดเองไม่ได้ (0) <input type="checkbox"/> ขึ้นบันไดเองได้ แต่ต้องการคนช่วยเหลือเล็กน้อย (5) <input type="checkbox"/> ขึ้นบันไดเองได้ อาจจะต้องเกาะราวช่วย (10)		
รวมคะแนน		



รับรองโดยคณะกรรมการจริยธรรมการวิจัยในคน
คณะแพทยศาสตร์ศิริราชพยาบาล
รหัสโครงการ: ๒๕๓๓๕๕๓ (๒๕๓)
วันที่รับรอง: 21 ก.ย. 2554



รับรองโดยคณะกรรมการจริยธรรมการวิจัยในคน
คณะแพทยศาสตร์โรงพยาบาล
รพศิริรามา 546/3553 (EE)
วันที่โครงการ.....
วันที่รับรอง..... 21 ก.ย. 2554

ส่วนที่ 6 แบบประเมินระดับการเปลี่ยนแปลงความรู้สึกตัวของผู้ป่วยโรคหลอดเลือดสมอง
(Glasgow Coma Scale)

รายการประเมิน			แรกจับ วันที่.....	หลัง 3 เดือน วันที่.....
Coma Scale	การลืมตา (C = ตาปิด)	ลืมตาได้เอง	4	
		ลืมตาเมื่อเรียก	3	
		ลืมตาเมื่อเจ็บ	2	
		ไม่ลืมตาเลย	1	
	การพูดที่ดีที่สุด (T = Tube)	พูดได้ไม่สับสน	5	
		พูดได้แต่สับสน	4	
		พูดเป็นคำๆ	3	
		ส่งเสียงไม่เป็นคำ	2	
		ไม่ออกเสียงเลย	1	
	การเคลื่อนไหว ที่ดีที่สุด	ทำตามคำสั่ง	6	
		ทราบดีตำแหน่งเจ็บ	5	
		ชักแขนขาหนี	4	
		แขนมี ab. Flex	3	
		แขนมี ab. Ext	2	
		ไม่เคลื่อนไหว	1	
รวม	Score	15		
Pupil	Right			
	Left			
Motor Power	Right	Upper		
		Lower		
	Left	Upper		
		Lower		
Vital Signs	BP (mmHg)			
	P (/min)			
	R (/min)			
	CVP (cm H ₂ O)			
	T.V.Bird's (cc)			
	T.V.Patient (cc)			
	I.V.Fluid (d/min)			
หมายเหตุ				



ส่วนที่ 7 แบบประเมินคุณภาพชีวิตขององค์การอนามัยโลก ฉบับภาษาไทย (WHOQOL-BREF-THAI)

คำชี้แจง ข้อคำถามต่อไปนี้จะถามถึงประสบการณ์อย่างใดอย่างหนึ่งของท่าน ในช่วง 2 สัปดาห์ที่ผ่านมา ให้ท่านสำรวจ

ตัวท่านเอง และประเมินเหตุการณ์หรือความรู้สึกของท่าน แล้วทำเครื่องหมาย ✓ ในช่องคำตอบที่เหมาะสม

และเป็นจริงกับตัวท่านมากที่สุด โดยคำตอบมี 5 ตัวเลือก

ไม่เลย หมายถึง ท่านไม่มีความรู้สึกเช่นนั้นเลย รู้สึกไม่พอใจมาก หรือรู้สึกแย่มาก

เล็กน้อย หมายถึง ท่านมีความรู้สึกเช่นนั้นนาน ๆ ครั้ง รู้สึกเช่นนั้นเล็กน้อย รู้สึกไม่พอใจ หรือรู้สึกแย่น้อย

ปานกลาง หมายถึง ท่านมีความรู้สึกเช่นนั้นปานกลาง รู้สึกพอใจระดับกลาง ๆ หรือรู้สึกแย่น้อยระดับกลาง ๆ

มาก หมายถึง ท่านมีความรู้สึกเช่นนั้นบ่อย ๆ รู้สึกพอใจหรือรู้สึกดี

มากที่สุด หมายถึง ท่านมีความรู้สึกเช่นนั้นเสมอ รู้สึกเช่นนั้นมากที่สุด หรือรู้สึกดีว่าสมบูรณ์แบบ

ข้อที่	ในช่วง 2 สัปดาห์ที่ผ่านมา	ไม่เลย	เล็กน้อย	ปานกลาง	มาก	มากที่สุด
1	ท่านพอใจกับสุขภาพของท่านในตอนนี้อย่างไร					
2	การเจ็บปวดตามร่างกาย เช่น ปวดหัว ปวดท้อง ปวดตามตัว ทำให้ไม่สามารถทำในสิ่งที่ต้องการมากนักน้อยเพียงใด					
3	ท่านมีกำลังเพียงพอที่จะทำสิ่งต่าง ๆ ในแต่ละวันไหม (ทั้งเรื่องงาน หรือการดำเนินชีวิตประจำวัน)					
4	ท่านพอใจกับการนอนหลับของท่านมากน้อยเพียงใด					
5	ท่านรู้สึกพึงพอใจในชีวิต (เช่น มีความสุข ความสงบ มีความหวัง) มากน้อยเพียงใด					
6	ท่านมีสมาธิในการทำงานต่าง ๆ ดีเพียงใด					
7	ท่านรู้สึกพอใจในตนเองมากน้อยแค่ไหน					
8	ท่านยอมรับรูปร่างหน้าตาของตัวเองได้ไหม					
9	ท่านมีความรู้สึกไม่ดี เช่น รู้สึกเหงา เศร้า หดหู่ สิ้นหวัง วิตกกังวล บ่อยแค่ไหน					
10	ท่านรู้สึกพอใจมากน้อยแค่ไหนที่สามารถทำอะไร ๆ ผ่านไปได้ในแต่ละวัน					
11	ท่านจำเป็นต้องไปรับการรักษาพยาบาลมากน้อยเพียงใด เพื่อที่จะทำงานหรือมีชีวิตรอดอยู่ได้ในแต่ละวัน					
12	ท่านพอใจกับความสามารถในการทำงานได้อย่างที่เคยทำมา มากน้อยเพียงใด					
13	ท่านพอใจต่อการถูกมีตรและเข้ากับคนอื่นอย่างที่ผ่านมาแค่ไหน					

ข้อที่	ในช่วง 2 สัปดาห์ที่ผ่านมา	ไม่เลย	เล็กน้อย	ปานกลาง	มาก	มากที่สุด
14	ท่านพอใจกับการช่วยเหลือที่เคยได้รับจากเพื่อน ๆ ไหม					
15	ท่านรู้สึกว่าคุณมีความมั่นคงปลอดภัยดีไหมในแต่ละวัน					
16	ท่านพอใจกับสภาพบ้านเรือนที่อยู่ตอนนี้มากน้อยแค่ไหน					
17	ท่านมีเงินพอใช้จ่ายตามความจำเป็นมากน้อยแค่ไหน					
18	ท่านพอใจที่จะสามารถไปใช้บริการสาธารณสุขได้ตามความจำเป็นเพียงใด					
19	ท่านได้รู้เรื่องราวข่าวสารที่เป็นในชีวิตแต่ละวันมากน้อยเพียงใด					
20	ท่านมีโอกาสได้พักผ่อนคลายเครียดมากน้อยเพียงใด					
21	สภาพแวดล้อมต่อสุขภาพของท่านมากน้อยเพียงใด					
22	ท่านพอใจกับการเดินทางไปไหนมาไหนของท่าน (หมายถึงการคมนาคม) มากน้อยเพียงใด					
23	ท่านรู้สึกว่าคุณมีความหมายมากน้อยแค่ไหน					
24	ท่านสามารถไปไหนมาไหนด้วยตนเองได้ดีเพียงใด					
25	ท่านพอใจในชีวิตทางเพศของท่านแค่ไหน (ชีวิตทางเพศ หมายถึง เมื่อเกิดความรู้สึกทางเพศขึ้นแล้ว ท่านมีวิธีจัดการทำให้ผ่อนคลายลงได้ รวมถึง การช่วยตัวเอง หรือการมีเพศสัมพันธ์)					
26	ท่านคิดว่าท่านมีคุณภาพชีวิต (ชีวิตความเป็นอยู่) อยู่ในระดับใด					



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