FACTORS INFLUENCING FUNCTIONAL OUTCOME OF STROKE PATIENTS ADMITTED TO A TERTIARY HOSPITAL

BY

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KEY WORDS

- Stroke
- Tertiary hospital
- Stroke unit
- Rehabilitation
- Functional outcome
- Factors influencing

DECLARATION

I hereby declare that the "Factors influencing functional outcome of stroke patients admitted to a tertiary hospital" is my own work, that it has not been submitted, in full or in part, for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

Signature:……..

Ishita Parekh

November 2011

Witnesses:

……..

Prof Anthea Rhoda

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ABSTRACT

Stroke is a leading cause of death and disability worldwide. Individuals with stroke often face functional limitations. There are several factors that are associated with functional outcome post stroke. Treatment in a stroke unit with a multidisciplinary approach reduces the likelihood of dependency after stroke. The aim of the present study is to identify factors influencing functional outcome of stroke patients admitted to a South African tertiary hospital. A descriptive, observational, longitudinal quantitative study design was used to obtain the data. Convenience non-probability sampling method was used. The research instruments used to collect the data were National Institute of Health Stroke Scale (NIHSS), Hospital Anxiety and Depression Scale (HADS), Barthel Index and a socio-demographic and medical profile data form. All the instruments were used at admission and discharge while at two months only Barthel Index was used for data collection. The data analysis was done using SPSS v 18 and SAS v 9. Mean, standard deviation, range and percentages were used for descriptive purposes and Tobit analysis was used to determine the association between independent and dependent variables. The descriptive results showed that the mean age was 59.83 years with number of females slightly more than males and hypertension being the most common risk factor. The results of the quantitative analysis revealed four factors that influence functional outcome at either discharge or at two months: age, severity of stroke, functional level at admission. Age and severity of stroke influenced the functional outcome at both the stages. The necessary ethical clearance was obtained in prior to commencement of the study. The outcomes of the study could contribute to enhance rehabilitation of stroke patients at an inpatient settings and awareness among population.

ABBREVIATIONS

ADL	Activities of Daily Living
AIDS	Acquired Immunodeficiency Syndrome
BI	Barthel Index
CCT	Clinical Controlled Trials
CVA	Cerebrovascular Accident
DoH	Department of Health
ESD	Early Supported Discharge
HADS	Hospital Anxiety and Depression Scale
HIV	Human Immunodeficiency Virus
MRC	Medical Research Council
NIHSS	National Institute of Health Stroke Scale
NINDS	National Institute of Neurological Diseases and Stroke
RCT	Randomised Controlled Trials
SAS	Statistical Analysis Software
SPSS	Statistical Package for the Social Sciences
WCPT	World Confederation for Physical Therapy
WHO	World Health Organisation

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1 INTRODUCTION

1.1 Introduction

Stroke is a major cause of death and disability worldwide (Bakas, Austin, Okonkwo, Lewis and Chadwick, 2002). Numerous factors such as age, gender, associated medical conditions, type and severity of stroke, depression, various sensory, motor and cognitive deficits affect the outcome post stroke. It has been confirmed by scientific studies that rehabilitation can improve functional outcome and quality of life post stroke. For effective utilization of rehabilitation resources, it is important to identify various factors affecting functional outcome, which is important for a better lifestyle after stroke. (Milinaviciene, Rastenyte and Krisciūnas, 2007).

The aim of this study is to identify factors influencing functional outcome of stroke patients admitted to a South African tertiary hospital. Identifying factors that influence functional outcome will help to modify the rehabilitation interventions to produce better patient outcome. Rehabilitation has been found to be effective to address the disability experienced by the person with stroke. Stroke patients who are managed in an organized manner by a multidisciplinary team in a stroke unit have better outcomes related to mortality, independence and the need for admission to an institution (Stroke Unit Trialists' Collaboration, 2007). Rehabilitation can be provided on an in or outpatient basis. In South Africa, inpatient rehabilitation facilities are few in the public sector and are usually located in urban areas. The outpatient rehabilitation does not often achieve the intensity of inpatient rehabilitation setting (Bryer, 2009). To introduce this study elaborately, the rest of the chapter provides a background, problem statement, aim, objectives and significance of the study. The chapter concludes with the summary of organization of the thesis.

1.2 Background

"Stroke", the term defined by the World Health Organisation (WHO) is *"an acute neurological dysfunction of vascular origin with sudden (within seconds) or at least rapid (within hours) occurrence of symptoms and signs corresponding to the involvement of focal areas in the brain"* (World Health

Organisation (WHO), 1989). It is also known as a Cerebrovascular Accident (CVA). Among the stroke survivors, some recover completely, some others have residual disability and a few are left with complete dependence. There are two broad types of stroke, Ischemic and Hemorrhagic, which are diametrically opposite conditions: Hemorrhage is bleeding in a closed cranial cavity due to rupture of blood vessel while Ischemia is lack of blood to supply oxygen and nutrient in a part of brain because of thrombosis or embolism. Ischemic stroke is the most common type, affecting about 80% of individuals with stroke (Josephson, 2011).

Stroke is the second highest cause of death in the world after ischemic heart disease. From South Africa Medical Research Council (MRC) Report, 'Initial burden of disease estimates for South Africa, 2000', stroke was found to be the fourth most common cause of death, accounting for 6% of all deaths in 2000 (Bradshaw, Nannan, Laubsher, Groenewald, Joubert, et al. 2003). Bradshaw, et al. (2004) found stroke as the second most common cause of death in the Western Cape. Overall age-standardized mortality rate for stroke was 124.9/100 000.

Stroke can lead to various impairments such as motor, sensory and cognitive deficits. Psychological impairments such as depression are also an important and common problem occurring as a result of stroke (West, Hill, Hewison, Knaap and House, 2010). Motor control (the ability to move muscles in a coordinated manner) is often impaired as a result of hemiplegia or hemiparesis. Apart from these impairments, various other factors such as age, gender, severity and type of stroke, associated risk factors, psychological factors, rehabilitation and functional level at admission also influence their functional performance. Physical function refers to those sensory-motor skills necessary to perform usual daily activities. The basic functional activities include feeding, bathing, grooming, dressing, bowel and bladder control, using toilet, transfers in and out of bed, moving around with or without assistive devices and stair climbing. So it is understood the stroke patients, who have motor, sensory or cognitive impairments, have difficulty or inability to perform activities of daily living as normally as before.

1.2.1 Stroke rehabilitation

Stroke rehabilitation is a goal-orientated process that attempts to obtain maximum function in patients who have had strokes and who suffer from a combination of physical, cognitive and language disabilities. A stroke rehabilitation is applied on either in or outpatient bases. Stroke unit comprises of core disciplines of various health care professionals who manage the stroke patients in a strategic priority. It is well documented in the studies that organized inpatient stroke unit rehabilitation services are effective in improving short-term survival, functional ability, and the most independent discharge location (Bryer, Connor, Haug, Cheyip, Staub, et al. 2010; de Villers, Badri, Ferreira and Bryer, 2011).

The rehabilitation interventions amongst others include Physiotherapy, Occupational Therapy, and Speech Language Therapy. The primary goal of Physiotherapy is to achieve maximum available movement. A systematic review included 151 studies in which 123 were randomized controlled trials (RCTs) and 28 were controlled clinical trials (CCTs) (Van Peppen, Kwakkel, Wood-Dauhinee, Hendriks, Van der Wees, et al. 2004). The study found strong evidence for therapies that were focused on functional training of upper limb. Strong evidence was also found for task-orientated exercise training to restore balance and gait and strengthening lower paretic limb, particularly when applied intensely and early after stroke onset (Van Peppen, et al. 2004). A small but significant association has been found between occupational therapy and primary ADL, extended ADL and social participation (Steultjens, Dekker, Bouter, van de Nes and Cup, 2003). Intense therapy over a short amount of time can improve outcomes of speech and language therapy for stroke patients with aphasia (Bhogal and Teasel, 2003).

In South Africa, the department of health has adopted a primary health care approach for the management of stroke patients. The stroke is seen as a general medical service where insufficient bed facilities and services are prevalent. In addition, because of lack of human resources and proper setting of rehabilitation, patients are often discharged home early. Minor strokes are often undiagnosed. This could be the possible reason of increased number of disabled stroke survivors in South Africa (Bryer, et al. 2010). Typically, inpatient rehabilitation therapy is justified when patient requires three

modalities of rehabilitation intervention or is unable to transfer independently and this is especially true for patients with moderate and severe stroke. In context of South Africa, the outpatient rehabilitation rarely achieves intensity of inpatient rehabilitation units as provided in a guideline of The South African Stroke Society and Writing Committee (Bryer, et al. 2010).

1.3 Problem statement

In South Africa, an increasing number of deaths is recorded as a result of stroke (Statistics South Africa, 2009). The risk of stroke is increasing with age and more stroke deaths are recorded in older than younger patients. Much of the population of South Africa is undergoing a rapid epidemiological transition with increased exposure to risk factors of stroke. Optimal functional outcome is the ultimate goal in stroke rehabilitation. The research in developed countries identified various factors that influence functional outcome of stroke. There is limited or no information available on the factors that influence functional outcome of stroke in context to South Africa. The South African Stroke Society (SASS) has recommended that all patients with acute stroke should be treated in a stroke unit (Bryer, et al. 2010). Treatment in a stroke unit has been shown to reduce mortality as well as reduce the likelihood of dependency after stroke. In the Western Cape, the Department of Health (DoH) adopts a primary health care approach to manage the health of the people of the province. Hence, the treatment resource of stroke patients is more focused on the primary health care levels. Conversely, limited or no information is available of the factors influencing and functional outcomes of patients admitted to a tertiary institution such as Groote Schuur Hospital. No such information is available on the factors that influence functional outcome from the studies in South Africa.

1.4 Research Question

What are the factors influencing functional outcome of stroke patients admitted to a South African tertiary hospital?

1.5 Aim of the Study

The study aims to determine the factors influencing functional outcome of stroke patients admitted to Groote Schuur Tertiary Hospital in South Africa.

1.6 Objectives

1. To determine socio-demographic profile and its influence on functional outcome of stroke patients

   (a) To determine age, gender, level of education and employment status

   (b) To determine documented medical profile

   (c) To determine type and severity of stroke, side of lesion and side of impairment

   (d) To determine associated risk factors

   (e) To determine type of treatments provided (medical, physiotherapy, occupational therapy and speech therapy)

   (f) To determine length of hospital stay

   (g) To determine total treatment sessions spent with rehabilitation professional (physiotherapy, occupational therapy and speech therapy)

2. To determine existence of psychological symptoms of anxiety and depression and their influence on functional outcome of stroke patients

3. To determine functional level of participants on admission, discharge and two months post-stroke

4. To determine the factors (age, severity of stroke, total treatment sessions spent with rehabilitation professional and functional status at admission) influencing functional outcome of stroke patients at discharge and two months post-stroke

1.7 Definitions and explanations of the terms used in the thesis

1. Stroke defined by WHO is *"an acute neurological dysfunction of vascular origin with sudden (within seconds) or at least rapid (within hours) occurrence of symptoms and signs corresponding to the involvement of focal areas in the brain"* (WHO, 1989). The representation of stroke is in terms of rapidly developing clinical signs. As a leading cause of disability, it is an area of research and interest in rehabilitation field.

2. Functional outcome described here is a level of dependence in activities of daily living post stroke.

3. Tertiary hospital is dedicated to a specific sub-specialty care (pediatric centers, oncology centers, psychiatric hospitals). Patients are often referred from smaller hospitals to a tertiary hospital for major operations, consultations with sub-specialists and when sophisticated intensive care facilities are required. Usually the hospital stay is shorter as the patients are referred back to secondary or primary level institutions or to rehabilitation facilities.

4. A stroke unit is a dedicated and geographically defined part of a hospital that takes care of stroke patients in both the acute and immediate post-acute phase (Bryer, et al. 2010). It has a specialized staff with a coordinated multidisciplinary team approach to treatment and care.

5. International Classification of Functioning, Disability and Health (ICF) (World Health Organisation, 2001b) definition of impairment is *"problems in body function or structure such as significant deviation or loss"*. Impairment refers to any loss or abnormality in psychological, physiological or anatomical structure or function (Wood, 1980). An activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations. Here it particularly refers to impairments resulting from stroke, which could be sensory, motor or cognitive impairment.

6. Disability is an umbrella term, covering impairments, activity limitations and participation restrictions. Thus, disability is a complex phenomenon, reflecting an interaction between features

of a person's body and features of the society in which he or she lives. It denotes the negative aspects of interaction between an individual who has a health condition and that individual's contextual factors, which are environmental and personal factors (WHO, 2001b).

1.8 Outline of thesis

This thesis is organized into six chapters. Chapter one describes the basis of the current study. Stroke, as a devastating condition, necessitates identifying various factors that influence its functional outcome. Due to primary health care approach for stroke in South Africa, the effect of inpatient rehabilitation is not often achieved. To explain this, the researcher provided background of information. It contains problem statement, research question, aim and objectives of the study. At the end of chapter one, outline of the thesis is given.

Chapter two summarizes the review of relevant literature in order to understand the need for conducting the study. In the chapter, the influence of various factors on outcome of stroke has been discussed elaborately. The epidemiology of stroke has been explained globally through incidence, prevalence and mortality. Various risk factors have been looked for the generalized view of factors associated with stroke. The outcome of rehabilitation has been emphasized, especially the basic functional activities of daily living with the use of Barthel Index (BI). Inpatient rehabilitation and its importance are well explained in chapter two.

In chapter three, the methodology used in the study is described. The employment of quantitative study design has been described. The use of longitudinal observational study design is explained with advantages and drawbacks. Study population and sampling are also depicted. A self-developed socio-demographic and medical profile data form and National Institute of Health Stroke Scale (NIHSS) address the research question to identify the factors influencing functional outcome of stroke. The functional outcome of stroke is represented using Barthel Index. Finally, the researcher explained statistical analysis and ethical considerations.

Chapter four contains the results of statistical analysis of the quantitative study. Descriptive results such as mean, standard deviation and percentage of individual factors are described first. Tobit anal-

ysis was used to find out the association between dependent factors with independent factor.

Chapter five focuses on discussion and interpretation of current study findings and compares with similar published research. The discussion highlights implications of results at local and global level. The influence of various factors on functional outcome is discussed with explanations.

Chapter six, entitled 'Conclusion, Significance and Recommendations', concludes the thesis. The researcher provides overall summary, significance of the study findings and highlights the recommendations arose from the results of the study. The recommendation is addressed to the hospital staff and to conduct further study.

1.9 Summary of the chapter

Stroke is a devastating and disabling condition worldwide and in South Africa. Various physical and psychological factors are associated with stroke and its outcome. In an acute stage, functional independence is the prior goal of the stroke rehabilitation. Inpatient rehabilitation has been found to have improved outcome due to multidisciplinary team. In South Africa, inpatient rehabilitation facilities are few and need to be given emphasis on improving patient care. Stroke unit treatment is beneficial in achieving better outcome in terms of independence. In order to gain better functional outcome, the aim of the current study is focused on identifying factors that influence functional outcome and the study is based in tertiary hospital. To explain the rationale of the study, the researcher provided background, problem statement and objectives of the study. This chapter concludes with outline of thesis.

2 LITERATURE REVIEW

2.1 Introduction

In this chapter, the researcher provides a comprehensive review of existing literature on stroke as well as relevant issues. The chapter begins with definition and pathophysiology of stroke. In the epidemiology section the mortality, prevalence and incidence of stroke in the world and South Africa are discussed. Various risk factors including smoking, alcohol and pre-existing medical conditions are discussed. The main focus is on how the different factors affect functional outcome of stroke at different time periods. The factors correlated to the current study are given more importance, as those are associated with functional outcome. Psychological factors have also been discussed as they are reported to have impact on stroke outcome. The rehabilitation of stroke includes starting time and content. Their aims and effect on outcome are explained. The current scenario of acute care inpatient rehabilitation facilities in South Africa is presented.

2.2 Definition and pathophysiology of stroke

In stroke, as defined in 1.7 in chapter one, the term 'rapidly developing' applies to sudden onset of symptoms within seconds or at least within hours. The 'global involvement' is applied to the patients in deep coma and those with subarachnoid hemorrhage (SAH). The term 'vascular origin' implies that its origin lies in the vessels supplying or draining the brain. An episode lasting less than 24 hours without any residual effect is called as Transient Ischemic Attack (TIA). As the brain does not have reserved oxygen, any kind of interruption in blood flow for a few seconds results in neurologic deficit. Brain tissue ceases to function if deprived of oxygen for more than 60 to 90 seconds and after approximately three hours (Deb, Sharma and Hassan, 2010).

A stroke can be classified into two main types: ischemic and hemorrhagic (WHO, 1989). This classification is according to the underlying cause. Ischemic stroke is caused by interruption to the flow of blood to the brain; always caused by a blood clot blocking a blood vessel. While hemorrhagic stroke occurs as the result of a ruptured cerebral artery, cutting off the supply of oxygen and nutrition to part

of the brain (Mower, 1997). According to Trial of Org 10172 in Acute Stroke Treatment (TOAST) classification, there are five diagnostic subgroups of ischemic stoke: large vessel atherosclerosis, cardio embolism, lacunar (small vessel occlusion), stroke of other determined etiology and stroke of undetermined etiology. While haemorrhagic stroke can be classified as primary intracerebral haemorrhage (ICH) or sub-arachnoid haemorrhage (SAH) (Bamford, Sandercock, Dennis, Burn and Warlow, 1991). Changes in the vessel wall, stenosis or rupture of blood vessel (atherosclerosis), occlusion of lumen by thrombus or embolism or alteration in viscosity of blood lead to obstruction of blood flow. Ischemic strokes produce cerebral edema, an accumulation of fluids within the brain that begins within minutes of insult and reaches maximum by three to four days. This swelling subsides in two to three weeks. Edema can elevate intracranial pressure which gives rise to clinical symptoms of loss of consciousness, irregular pulse rate and respiratory rate, non-reactive pupils, vomiting and papilledema (O'Sullivan, 2007). Complete cerebral circulatory arrest results in irreversible cellular damage with a core area of focal infarction within minutes (O'Sullivan and Schmitz, 2007). Hemorrhagic stroke results in tissue injury. Blood released by brain hemorrhage appears to have toxic effect on brain tissue and vasculature (National Institute of Neurological Disorders and Stroke, 1999).

The majority of strokes occur as the result of a cerebral infarction (Terent, 1993). Between the years 2000 and 2006, Data from a hospital-based stroke register in Cape Town revealed that ischemic infarction resulted in 81% of all strokes in patients older than 45 years, while primary cerebral haemorrhage accounted for 11% of strokes and 8% were unidentified (Bryer, Tipping and De Villiers, 2006).

There is found to be some correlation between type of stroke and functional outcome. In a case-controlled study of 270 inpatients with first stroke were assessed to identify specific influence of stroke etiology on rehabilitation results. The results provide further evidence of better functional prognosis in haemorrhagic stroke survivors (Paolucci, Antonucci, Grasso, Bragoni, Coiro, et al. 2003). Another study of Chae, Zorowitz and Johnson (1996) reported that haemorrhagic stroke patients appear to exhibit functional gains somewhat faster than non-haemorrhagic stroke.

2.3 Epidemiology of stroke

Epidemiology of stroke has been organized into three subsections namely incidence, prevalence and mortality.

2.3.1 Incidence

Stroke incidence is the number of new cases presented over a given period (Orencia and Ballard, 1993). The incidence of stroke differs according to geographical locations, age, gender and ethnicity (Stansbury, Jia, Williams, Vogel and Duncan, 2005). The incidence increases with age. The age over 45 years have stroke incidence between 10-30 per 100 000, while it is 1200-2000 per 100 000 for the age 75-85 years (Feign, 2003). The World Health Organisation Monica Project was conducted in 16 European and 2 Asian populations. This study showed that incidence rate was 101–285 for men and 47–198 for females per 100 000 of the population (Thorsveldsen, Asplund, Kuulasmaa, Rajakangas and Schroll, 1995). From the studies in Europe, Russia, Australasia and the United States showed that incidence rates recorded in the age groups 45–84 years in these countries were similar between 300-500 per 100 000. The rates were found to be significantly lower in Dijon, France at 238/100 000 and higher in Novosibirsk, Russia at 627/100 000 (Sudlow and Warlow, 1997). No studies have been conducted in sub-Saharan Africa on population-based stroke incidence (Kengne and Anderson, 2006). The Tanzanian Stroke Incidence Project (TSIP) in 2010 investigated the stroke incidence in rural and urban areas in Tanzania. The annual age-standardized (to the WHO world population) incidence rates were three times higher in urban (315.9 per 100 000) than in rural (108.6 per 100 000) Tanzania.

A systematic review of 15 population-based studies was conducted in more developed countries that aimed to determine incidence, prevalence, mortality, and case-fatality rate of stroke in late twentieth century (Feign, Lawes, Bennet and Anderson, 2003). This study reported that stroke incidence increases with age. The people above 45 years of age have a stroke incidence rate of 10-30 per 100 000 while the incidence rate increased for the people above 75 years of age and it ranged 1200-2000 per 100 000.

2.3.2 Prevalence

The prevalence of a disease is a proportion of the population affected by a specific disease at a given point of time or at a certain period (Orencia and Ballard, 1993). Prevalence is used to plan health services. In South Africa, the age-standardized prevalence of stroke was 290 per 100 000 (95% CI, 250-357 per 100 000) (Connor, Thorogood, Casserley, Dobson and Warlow, 2004). In 2004, the South African Stroke Prevention Initiative Team (SASPI) recorded prevalence of 300/100 000 of the population (Confidence Interval 95%), which is lower than similar estimate in New Zealand. However, the prevalence of stroke survivors who need help with activities of daily living was higher than that of New Zealand, at 200 comparing with 173 of New Zealand. The prevalence rate was recorded by the SASPI team was higher in females (348 per 100 000) than in males (246 per 100 000). While a systematic review conducted in New Zealand by Feign, et al. (2003) recorded prevalence was higher in males (5880-9260 per 100 000) than in females (3220-6120 per 100 000) for age over 65 years.

2.3.3 Mortality

The WHO report states that stroke causes 10% of deaths worldwide (The World health report, 2004). In 2004, 5.7 million (9.7%) people died of stroke, which is the second highest cause of death globally. Stroke is a leading cause of death in middle-income countries with estimation of 3.47 million (14.2%). In high-income countries, it is second highest cause of death with 0.76 million (9.3%). Low-income countries have a stroke as a fifth highest cause of death with 1.48 million (5.6%).

In United States, stroke is a third leading cause of death after heart disease and cancer. Mortality data reported in 2007 indicate that stroke accounted for $\approx$1 for every 18 deaths in United States (Roger, Go, Lloyd-Jones, Adams, Berry, et al. 2011).

The South African National Burden of Disease Study estimated stroke mortality for the year 2000. In 2000, stroke accounted for 6.5% of all deaths i.e. third most common cause of death after HIV/AIDS and ischemic heart diseases and the study was revised in 2006 (Bradshaw, et al. 2003; Norman, Bradshaw, Schneider, Pieterse and Groenewald, 2006). In 2007, just over 25 000 deaths were reported by

Statistics South Africa. For non-communicable diseases, stroke is highest for females and ischemic heart disease is for males. The study estimations showed that females (18 184) died of stroke more than males (13 930). Internationally, the age-standardized mortality rate of stroke was 124.5/100 000. The Southern African Stroke Prevention Initiative (SASPI, 2004) found that stroke was about half as common in rural South Africa as in typical high-income populations of the world, but twice that found elsewhere in Africa.

2.4 Risk factors for stroke

The risk factors for stroke are of two types: modifiable and non-modifiable (Salter, Teasall, Foley, Bhogal and Speechley, 2007). The common modifiable risk factors are hypertension, diabetes, increased cholesterol, circulation problems, smoking and increased alcohol intake. These risk factors are a result of individual's lifestyle and habits. While age, sex and previous history of TIA or stroke are non-modifiable risk factors (Salter, et al. 2007). In United Kingdom, a very high rate of 87.5% of patients with first-ever stroke was found to have at least one modifiable risk factor for stroke (Redfern, Mckevitt, Dundas and Rudd, 2000).

The study of Feign, et al. (2003) reported that average age for stroke is 70 years for females and 75 years for males. However, the study conducted in sub-Saharan African countries found the mean age of stroke to be very lower at <60 years (Kengne and Andersen, 2006). Another study of Brown, Whisnant, Sicks, O'Fallon and Wiebers (1996) also found that the risk of stroke increases more than double after age of 55 in both sexes, for each successive ten years. Patients with severe functional impairment at admission to rehabilitation facility have negative correlation of age with functional outcome at discharge. Therefore, along with age, there is a need to consider comorbidities and admission functional level.

Although it is commonly known that men are at higher risk of stroke for most age groups below the age of 85 years, after this age the incidence reverses dramatically, with women being much more at a risk (Persky, Turtzo and McCullough, 2010). The higher case fatality was recorded in women in almost all populations studied as part of the WHO MONICA project (Thorvaldsen, et al. 1995)

and international stroke trial (Niewada, Kobayashi, Sandercock and Kamiski, 2005). The study of Petrea, Beiser, Seshadri, Kelly-Hayes, Kase, et al. (2009) found that women experience their first-ever stroke on an average about five years later than men at a younger age. Because of a greater life expectancy, women have more lifetime risk for stroke (Petrea, et al. 2009). This study explored short-term disability outcome at three and six months post stroke and observed that women were more disabled than men and rates of institutionalization significantly higher for women. However, severity of stroke was not associated with gender-difference.

Hypertension is the most important modifiable risk factor for stroke and intracerebral heamorrhage (ICH), and the risk of stroke increases with increase in blood pressure independent of other risk factors (Chobanian, Bakris, Black, Cushman, Green, et al. 2003). The INTERSTROKE study evaluated the contribution of various risk factors of stroke worldwide. It concluded that hypertension provided 34.6% of the population attributable factor for stroke (O'Donnell, Xavier, Liu, Zhang, Chin, et al. 2010). People with a systolic blood pressure of $\geq$140 mm Hg and diastolic $\geq$90 mm Hg, are said to be having an increased lifetime risk of stroke than those with normal blood pressure (Seshadri, Beiser, Kelly-Hayes, Kase, Au, et al. 2006). It has been studied by Girerd and Giral (2004) that each 2 mm reduction in systolic blood pressure was associated with 25% reduction in stroke events. Jones, Simpson, Mitchell, Haggarty, Campbell, et al. (2008) estimated that 35-44% of reduction in new strokes can be achieved by lowering blood pressure. In terms of management of hypertension, a meta-analysis of 23 randomized trials on antihypertensive medication compared with no drug therapy found 32% reduction in stroke risk with pharmacologic treatment (Lumley, Furberg, Schellenbaum, Pahor, Alderman, et al. 2003). Similarly another study suggested that in people aged 60–69 with a diastolic blood pressure of 90 mmHg, three drugs from the five (thiazides, β blockers, angiotensin converting enzyme inhibitors, angiotensin receptor blockers, and calcium channel blockers) at half standard dose in combination reduced the risk of stroke by 62% (Law, Morris and Wald, 2009).

Various cardiac conditions such as atrial fibrillation, cardiac failure and coronary heart disease have been shown to be associated with increased risk of stroke (Sacco, Benjamin, Broderick, Dyken, Easton, et al. 1997). Among these, Atrial fibrillation is found as a more potential risk factor. The Framingham study (Wolf, Abbott and Kannel, 1991) estimated that almost half of the cardioembolic

strokes occur as a result of Atrial Fibrillation. In the same study when multivariate analysis was used, the stroke risk increased twofold by coronary heart disease, threefold by electrocardiographic left ventricular hypertrophy and three to fourfold by cardiac failure (Wolf, et al. 1991).

Patients with diabetes are at 1.5 to 3 times the risk of stroke compared with the general population (Sander, Sander and Poppert, 2008). The study of Nannetti, Paci, Baccini, Rinaldi and Taiti (2009) concluded that the presence of diabetes is associated with significantly greater permanent neurological and functional disability and longer hospital stay. With diabetic patients, the risk of stroke increases two to six fold as stated by Flemming and Brown, 2004. They also suggested that aggressive treatment of diabetes could reduce the risk of stroke in individuals who have hypertension.

Higher HDL cholesterol was associated with lower risk of stroke (Asplund, Karvanen, Giampaoli, Jousilahti, Niemelä, et al. 2009). Salter, et al. (2007) suggested that high concentration of total serum cholesterol are increased risk of non-hemorrhagic stroke. Although it has been studied that cholesterol is a very weak risk factor for ischemic stroke, in contrast to coronary artery disease (Donnan and Davis, 2005).

Neurological involvement in patients with HIV infection occurs commonly (McGuire, 2003). According to a Danish study, stroke risk was found to be higher among HIV positive people irrespective of proven risk factors (Rasmussen, Engsig, Christensen, Gerstoft, Kronborg, et al. 2011). The risk is associated with higher injection drug abuse (IDU), low CD4 cell count, and treatment with abacavir. Another study, aimed to find out correlation between ischemic stroke occurring at the age of early fifties, found the rate of stroke was 67% higher in HIV positive patients (Ovbiagele and Nath, 2011). In this study, patients with comorbid HIV infection comprised 0.08% of ischemic strokes in 1997 vs. 0.18% in 2006, but proportion of hemorrhagic strokes did not change significantly.

Researchers found out that smoking is a direct, independent risk factor for stroke (Aldoori and Rahman, 1998; Paul, Thrift and Donnan, 2004) The studies of Wannamathee, Shaper, Whincup and Walker (1995) and Flemming and Brown (2004) reported that frequency of smoking also has a direct influence on stroke as a risk factor. Heavy smokers who smoke 20 or more cigarettes per day have a tow-four times greater risk for stroke than non-smokers. Since the late 1980s it has been studied

that smoking nearly doubles the risk of ischemic stroke. Similarly, Kawachi, Colditz, Stampfer, Willett, Manson, et al. (1993) reported that decreased risk of stroke has been found with cessation by five years after smoking. Current smokers at the time of stroke experience comparatively poor functional outcome than non-smokers according to the study of Ovbiagele, et al. (2006). The MORGAM (MOnica, Risk, Genetic, Archving and Monograph) project found that smoking confers high risk of stroke across Europe with similar excess risk in men and women (Asplund, et al. 2009).

The risk of stroke and alcohol consumption is related according to the amount of alcohol consumption (Reynolds, Lewis, Nolen, Kinney, Sathya, et al. 2003). It is estimated that increased risk of stroke is associated with heavy alcohol consumption. Consumption of more than 60 g of alcohol per day is associated with an increased relative risk of total stroke. While consumption of less than 12 gram/day is associated with a reduced relative risk of total stroke (Reynolds, et al. 2003). Whereas moderate amount of one to two glasses per day are considered to be having least risk of stroke. A preliminary findings of one recent study stated that a minimum amount of alcohol consumption is associated with a transient increase in the risk of stroke in the subsequent hour (Mostofsky, Burger, Schlaug, Mukamal, Rosamond, et al. 2010). This study is differing to some other studies that stated that moderate drinking might provide transient health improvements (Hashimoto, Kim, Eto, Iijima, Ako, et al. 2001; Sierksma, van der Gaag, Kluft and Hendriks, 2002; Vlachopoulos, Tsekoura, Tsiamis, Panagiotakos and Stefanadis, 2003).

2.5 Diagnosis of stroke

It is well known that an accurate diagnosis of stroke can only be made conclusively by CT scan or MRI (Connor, 2006a). However, the most important thing to consider is the timing of scan. Naitonal Institute of Neurological Diseases and Stroke rt-PA Stroke Study Group (1995) approved that a thrombolytic agent named tissue Plasminogen Activator (tPA) should be given intravenously within 3 hours of onset if CT scan diagnoses patient having ischemic stroke. Treating the ischemic stroke with tPA, the NINDS reported that after 90 days, there was 11-13% absolute increase in essentially full neurologic recovery. It is important to distinguish small cerebral hemorrhages from small

infarcts as the hemorrhages can resolve within a few hours. Yet, it is advised that scan should be done within at the most two weeks of onset of stroke (Connor and Bryer, 2006). In sub-Saharan Africa, this facility is not available freely due to the cost of imaging. This resulted in lack of affordability of CT scan and MRI by half of the stroke population in these countries (Connor, 2006).

Although CT scan and MRI are conclusive about the diagnosis of stroke types, various clinical measurements are also proposed. These scoring systems are Guy's Hospital Stroke Score and the Siriraj Hospital Stroke Score (Hawkins, Bonita, Broad and Anderson, 1995). Guy's Hospital Stroke Score measures intracerebral hemorrhage. The unavoidable overlap in clinical presentation in patients with cerebral infarction and those with hemorrhage limits the use of Guy's Hospital Stroke Score (Sandercock, et al. 1985). The Siriraj Hospital Stroke Score as (2.5 x consciousness) + (2 x vomiting) + (2 x headache) + (0.1 x diastolic blood pressure) – (3 x atheroma markers) - 12. A score above 1 indicates supratentorial intracerebral hemorrhage, while a score below -1 indicates infarction (Poungvarin, Viriyavejakul and Komontri, 1991). However, these systems are not as accurate as CT scan and proven as invalid and non-reliable (Hawkins, Bonita, Broad and Anderson, 1995). The researchers reported in an urban South African study that the Siriraj Hospital Stroke Score gave uncertain results in 44 (20%) and Guy's Hospital Stroke Score in 65 (29%) of the total 222 patients with stroke (Connor, Modi and Warlow, 2007).

2.6 Disability

The outcomes of stroke patients can be conceptualize using International Classification of Functioning, Disability and Health (ICF) model (WHO, 2001). This is a revised version of International Classification of Impairment, Disability and Handicap (ICIDH) by WHO (1980). The ICF includes different components such as impairments, activity limitation, participation restriction, body structures and functions and environmental factors. Impairments are *"problems in body structures or functions such as significant loss or deviation"*. Activity limitations are described as difficulties an individual may have in performing activities. Participation restrictions are *"problems an individual may experience in physical, social or environmental attitudes in which people live and conduct their*

lives". In this model, the term disability covers impairment, activity limitations and participation restrictions. This study has considered impairments and activity (functional) level for outcomes of stroke.

The most common impairments identified are motor and sensory function, abnormal muscle tone, cognitive and perceptual limitations, speech impairments, depression, urinary incontinence and dysphagia (Lawrence, Coshall, Dundas, Stewart, Rudd, et al. 2001). Many of the stroke sufferers face inability to communicate properly. However, motor impairments are found to be the most common impairments with upper limbs affected more than lower limbs (Lawrence, et al. 2001). Due to abnormal muscle tone, injuries from falls are a common complication of motor impairments. The impairment of mouth, tongue or throat muscles lead to dysphagia, or difficulty swallowing which in turn can produce aspiration pneumonia. Many stroke victims suffer from sensory impairments such as problems with vision, hearing, touch or pain perception. Patients with paralyzed or weak limb may experience paresthesias. Certain types of sensory problems can produce urinary incontinence. Feelings of shame, frustration and anger from incontinence can give rise to psychological symptoms such as anxiety or depression. Stroke can also affect communication, a condition known as aphasia or dysarthria.

A study of Duncan, Goldstein, Matchar, Divine and Feussner (1992) reported that a patient could become total independent in ADLs even though the level of impairment remains same. Soyuer and Soyuer (2005) conducted a study aimed to describe the association between motor impairment and disability. A total of 100 participants were assessed using Rivermead Motor Assessment (RMA) and Functional Independence Measure (FIM) scales. The study found significant correlation between RMA and FIM for seven to ten days and three months. Admission motor impairment has found to be a predictor for discharge impairment and activities of daily living mobility functional scores (Shelton, Volpe and Reding, 2001).

Initial severity of stroke, often measured by NIHSS, is one of the major predictors of poor outcome, including mortality, after stroke in many studies (Mohr, 2004). A study by Muir, Weir, Murray, Povey and Lees (1996) shows that baseline NIHSS predicts three-month outcomes. A score of 13 or more has a poor functional outcomes compared with those who scored 13 or less. Another study on 50

ischemic stroke patients was conducted to evaluate the baseline NIHSS as a predictor of functional outcome. Barthel Index was used to measure functional outcome. NIHSS was found to be a strongest predictor having p-value <0.001 after ischemic stroke (Ahmed, Zuberi and Afsar, 2004).

Various emotional and behavioural disorders occur following cerebrovascular lesions. Depression is the most common of these, affecting up to 40% of patients (Robinson, 1997). Robinson (1997) identified that Post-stroke Depression (PSD) has a substantial impact on recovery in ADLs, cognitive function and survival. Those who develop PSD in acute stroke period, are more likely to die during first few years after stroke, generally due to the ongoing apathy, eating problems, and loss of personal will to live and be engaged in normal ADLs. The Diagnostic and Statistical Manual (DSM) IV (1994) categorizes PSD as "mood disorder due to a general medical condition (i.e. stroke)". One of the older studies suggest that the patients with depression showed significantly less improvement in ADL scores than nondepressed patients (Parikh, Robinson, Lipsey, Starkenstein, Fedoroff, et al. 1990). Although depression scores at two years were not significantly different in both the groups. The recent study of Schmid, Kroenke, Hendrie, Bakas, Sutherland, et al. (2011) says that in the patients with PSD, the severity of depression symptoms at baseline is associated with dependence. However, the results are not conclusive as to whether improvement of depression is independently associated with functional recovery at 12 weeks.

2.7 Rehabilitation of patients with stroke

The rehabilitation includes all measures aimed at reducing the impact of disability for an individual, enabling him or her to achieve independence, social integration, a better quality of life and self-actualisation (Helander, 1999). Rehabilitation is an inter and multidisciplinary approach to the management of person's health and functioning (Stucki, Ewert and Cieza, 2002). A team of professionals often provides rehabilitation. The health professionals involved in stroke rehabilitation include physiotherapist, occupational therapist and speech therapist mainly.

2.7.1 Rehabilitation setting

Rehabilitation can be organized as an in or outpatient bases. Usually an acute stroke patient is managed in an inpatient facility. The primary goal of acute inpatient stroke care is to stabilize the patient and prevent further brain damage. A stroke unit is a dedicated and geographically defined part of a hospital that takes care of stroke patients in both the acute and immediate post-acute phase as defined by Bryer, et al. (2010). Stroke unit comprises of core disciplines such as medical, nursing, physiotherapy, occupational therapy, speech and language therapy, and social work.

Evans (1995) noted that inpatient rehabilitation services are effective in improving short-term survival, functional ability, and the most independent discharge location. However, the author found a lack of long-term benefits and suggested that therapy be extended to home or other settings, rather than being discontinued at discharge. Similarly, the Stroke Unit Trialists' Collaboration review (2000) concluded that patients receiving organized inpatient stroke unit care were more likely to survive, regain independence, and return home than those receiving a less organized service. In South Africa, the stroke unit model of care has not been widely implemented despite robust evidence of efficacy (Bryer, et al. 2010). Stroke is usually managed as part of general medical service where there are no dedicated beds or service assigned to stroke. Because of lack of human resources, stroke is not seen as a strategic priority. Moreover, neurorehabilitation centers are also in short supply.

With an increasing number of stroke survivors, there is growing interest in outpatient rehabilitation as a less expensive alternative to hospital-based programs. There are three forms of outpatient rehabilitation approaches that have been reported in the literature. They are a) hospital-based, b) home-based and c) Early Supported Discharge (ESD).

a) Hospital-based stroke rehabilitation therapies are provided in day hospitals and geriatric day care centers. The outcome of rehabilitation of stroke patients at day hospitals have been found to be effective in improving health related quality of life (Olsson and Sunnerhagen, 2006) and reduce handicap (Hershkovitz, Beloosesky, Brill and Gottlieb, 2004). Hershkovitz, et al, (2004) concluded that a day hospital programme affected patient participation and improved extended activities of daily living more than basic activities of daily living.

b) Home-based rehabilitation is considered as a setting for continuing rehabilitation of patients after discharge from hospital. Studies were investigating the effectiveness of hospital-based compared to home-based rehabilitation and much conflicting results were reported. A study of Gladman, Lincoln and Barer (1993) reported that patients who were treated in stroke unit in acute stage and then received rehabilitation at home-based setting showed better outcomes. Roderick, Low, Day, Peasgood, Mullee, et al. (2001) found no significant differences between home and day hospital groups with regard to costs or other outcomes. Further research is required to state whether hospital-based or home-based rehabilitation is more effective.

c) Early Supported Discharge is defined as *"interdisciplinary rehabilitation, which is provided at home or in the community during a period of time when the patient would normally be in an inpatient stroke rehabilitation unit"* (Teasall, et al. 2008). The Early Supported Discharge Trialists' study (2005) has shown that if a multidisciplinary team exists in the community rehabilitation, services may be successfully provided in outpatient settings and patients can be discharged from the inpatient setting early. A meta-analysis conducted by Anderson, Ni Mhurchu, Brown and Carter (2002), reported that programs of early supported discharge reduced hospital lengths of stays by an average of 13 days and were associated with an average of 15% cost savings compared to inpatient rehabilitation.

2.7.2 Starting time of rehabilitation after stroke

Stroke rehabilitation should begin during the acute hospitalization, as soon as the diagnosis of stroke is established and life-threatening problems are under control. Early rehabilitation and improved functional outcomes have positive association. Paolucci, et al. (2000) assessed the specific influence of onset-admission interval on rehabilitation outcomes. They studied 145 participants with sequel of first stroke. All the participants were divided in three groups according to the starting of rehabilitation from within 20 days of stroke to maximum 60 days of stroke. The group, whose treatment started within the first 20 days of stroke, showed excellent therapeutic response in terms of basic activities of daily living than those whose treatment began later. Another study aimed to find out association between days from stroke symptom onset to rehabilitation admission and rehabilitation outcomes (Maulden, Gassaway, Horn, Smout and DeJong, 2005). There was found to be strongest positive

correlation between onset of stroke symptoms and admission to inpatient rehabilitation for severe strokes followed by moderately severe stokes.

2.7.3 Some rehabilitation interventions

Amongst others, physiotherapy and occupational therapy are important components of rehabilitation. However, Speech Therapy is also an important component for stroke patients who have dysphagia, dysarthria or aphasia. Physiotherapy as defined by World Confederation of Physiotherapy (2007) as providing services to individuals and populations to develop, maintain and restore maximum movement. The goal of occupational therapy is to enable people to participate in the activities of everyday life (World Confederation of Occupational Therapists, 2007).

The primary goal of Physiotherapy is to achieve maximum available movement and improve functional level. The treatment of physiotherapy for stroke commonly includes task oriented exercise training. These training are given to re-educate the limb functions, normalise the tone, sensory function, re-educate basic functional activities and balance training. Various electrotherapies and positioning for the management of oedema and pain, certain activities to maintain cardiovascular function, specific proposed approaches for neuromuscular function and orthotics and assistive devices for musculoskeletal function are applied accordingly. Apart from these, providing education to patients and caregivers is also an important thing (Ballinger, Ashburn, Low and Roderick, 1999). A systematic review by Van Peppen et al. (2004) was conducted to determine the evidence of physical therapy interventions aiming to improve functional outcome after stroke. A total of 151 studies were included in this study. Strong evidence was found for task-orientated exercise training, particularly when applied intensely and early after stroke onset.

The goal of occupational therapy is to re-educate physical functioning, perception cognition and mood, home visits, social activities, social and leisure activities, education of patient and carer and provision of wheelchairs, assistive devices and equipment (Ballinger, et al. 1999; De Wit, Putman, Baert, Lincoln, Beart, et al. 2006). A systematic review included 32 studies, identified small but significant association between occupational therapy and primary ADL, extended ADL and social participation (Steultjens, et al. 2003).

Speech and Language therapy plays an important role in early intervention in assessment of swallowing safety (Bryer, et al. 2010). Failure to identify appropriate measures of swallowing safety may result in extreme form of morbidity or mortality. In patients who have language difficulties, early intervention of speech or language therapist from the onset plays an important role.

2.7.4 Intensity of rehabilitation

Teasell, et al. (2005b) found strong evidence that greater intensity of physiotherapy and occupational therapy result in an improved outcome of stroke patients. Intensity and time of rehabilitation were also found important predictors of functional outcome of stroke by Hu, Hsu, Yip, Jeng and Wang (2010) after adjusting admission functional status and severity at onset. An observational study was conducted in Australia on 64 stroke patients admitted to a stroke unit. In that study, the researchers found that patients were involved in therapeutic activities for only 12.8% of the time and 53% of their time was spent resting (Berhardt, Dewey, Thrift and Donnan, 2004). The literature suggests that existing knowledge of intensity of therapy indicates higher intensity results in improved short-term functional outcome (Teasell and Kalra, 2005). Kwakkel, Wagenaar, Koelman, Lankhorst and Koetsier (1997) studied in nine controlled studies involving 1051 patients. They concluded that a small but statistically significant intensity-effect relationship in the rehabilitation of stroke patients were found. However, rehabilitation staff do not provide the intensity and frequency of therapy needed to improve outcome. Yet, information relating to intensity is not known about what should be the ideal intensity (Kwakkel, van Peppen, Wagenaar, Wood-Dauphine, Richards, et al. 2004).

2.8 Stroke rehabilitation in South Africa

In South Africa, there is only one stroke unit at a tertiary academic hospital, which is in Western Cape (Connor, 2006a). Acute care and rehabilitation facilities of stroke in South Africa are limited (Fritz, 2006). The majority of stroke patients in South Africa are treated in the public health care sector where there is currently a shortage or even absence of inpatient rehabilitation beds for stroke patients, especially in rural and remote areas (Bryer, et al. 2010). The Western Cape Re-

habilitation Centre (WCRC), an inpatient facility provides rehabilitation services to patients with various diagnoses living in the Western Cape and surrounding provinces (Provincial Government of the Western Cape, 2007). A study of Rouillard (2006) found a greater degree of impairment for stroke patients who were admitted to WCRC as evidenced by lower mean score on the Rivermead sub-scales (meanRMA-LT=2, meanRMA-LT =0). In a remote rural setting, an inpatient rehabilitation facility is not available and despite significant level of disability, patients are discharged home (Wasserman, de Villers and Bryer, 2009). Stroke is usually managed as part of general medical service where there are no dedicated beds or service assigned to stroke. Shortages and pressure for hospital beds frequently result in stroke patients being discharged too early (Bryer and Connor, 2010). The reason for the large number of disabled stroke survivors in South Africa is not clear among researchers. The explanations include: unwillingness by patients to receive rehabilitation; a lack of transport to attend outpatient rehabilitation sessions for patients travelling long distance; and delays in management of acute stroke (Bryer, et al. 2010). Financial constraints were also found as a reason for patients not attending outpatient appointments (Whitlow, Meyer, Bawa and Jennings, 1994). The authors recommend a development of community based services to gain better outcome of stroke survivors. Therefore, there is a need to improve and increase the acute care rehabilitation facilities for stroke patients in South Africa (Connor, 2006).

2.9 Factors influencing functional outcome of stroke

Various studies identified different factors associated with functional outcome of patients with stroke. Some of the factors are age, severity of stroke, type of stroke, functional level, and rehabilitation.

Stroke is a disease related to aging population (Tu and Porter, 1999). It was reported that patients ≥ 85 years of age had a risk of low response in activity of daily living (ADL) that was $\approx$10 times greater than that of younger patients (Paolucci, et al. 2003). The patients with high admission functional level, age makes no difference in outcome (Randie, Black-Schaffer and Winston, 2004). There is also a wide agreement that admission functional level after stroke tends to be lower in older patients (Falconer, Naughton, Strasser and Sinacore, 1994; Paolucci, et al. 2003). The study of Marini, Totaro,

De Santis, Ciancarelli, Baldassarre, et al. (2001) reported good functional outcome in young adults with ischemic stroke, since most patients were independent and 50% returned to work. Similarly, Varona, Bermejo, Guerra and Molina (2004) found that the prognosis of ischemic stroke in the young is much better than in the elderly, with lower mortality and recurrence and better functional recovery.

Stroke severity is considered the most powerful prognostic factor because disability is a consequence of severity of neurologic impairment (Jorgensen, Nakayama, Raaschou and Olsen, 1999). An urban South African study aimed at determining survival, disability and functional outcome of stroke patients following discharge to community with limited rehabilitative resources and followed up for 6 months (De Villers, et al. 2011). Total 196 patients were recruited from 200-bed urban district hospital in Cape Town. The study reported that stroke severity, especially if swallowing is impaired, is associated with poor outcome.

Functional level measured by Barthel Index evaluated at acute stage can be used to predict post stroke of rehabilitation progress (Poulin and Desrosiers, 2008). A study of Nakao, Takata, Uemura and Kashihara (2010) reported that a Bathel scores $\geq$60 and $\leq$40 has a larger significance in acute stage of stroke. The patients scoring BI $\geq$60 showed no dependences except for controlled items as grooming, bathing, stair climbing and those with BI $\leq$40 had no independence in ADLs. Therefore, patients with BI $\geq$60 could perfrom ADLs with or without someone's help in the hospital.

Systematic research has shown that organized multidisciplinary care and rehabilitation after stroke enhance patient survival and independence as well as reducing length of inpatient stay (Hankey and Warlow, 1999; Langhorne and Duncan, 2001; Stroke Unit Trialists' Collaboration, 2000). Hu, et al. (2010) collected sociodemographic, medical, rehabilitative and functional data of 154 acute stroke patients. They found that rehabilitation commencement time and intensity significantly predicted the Barthel Index score at discharge after adjusting for initial severity (NIHSS) and age. There is evidence that rehabilitation may still be beneficial several years after a stroke; therefore, regular reassessment, even of patients in nursing homes with stroke, is often appropriate (Wade and Collin,1992).

2.10 Summary of Literature Review

In this chapter, the researcher summarizes a review of literature in order of proper understanding and implementation of study. The influence of various factors on outcome of stroke has been discussed elaborately. In the epidemiology section, the researcher described the incidence, prevalence and mortality in the world and South Africa. The studies on population-based incidence in sub-Saharan Africa are limited and are needed to be conducted in those countries.

The various modifiable and non-modifiable risk factors for stroke are described. The potentially of individual risk factor for having stroke is explained. Hypertension is found to be a strong modifiable risk factor for stroke. Apart from physical factors, psychological factors like post-stroke depression are reported to be negatively associated with outcome by number of studies. From the available literature, there are many different factors which affect functional outcome of stroke patients. Age is the most potential non-modifiable factor which influences outcome of stroke at all time periods post-stroke. Increasing age implies to poor functional outcome. Other factors such as severity of stroke and functional level on admission also play an important role. Severity is more influencing at acute and sub acute stages. Concerning type of stroke, ischemic stroke has poor outcome compared to haemorrhagic. Hemorrhagic stroke survivors have found to show faster recovery in terms of functions.

The second area of concern is inpatient rehabilitation and its outcome on stroke patients. The importance of early rehabilitation is explained with review of various studies. Content of rehabilitation includes different components such as physiotherapy, occupational therapy and speech language therapy. Their aims for stroke patients are described with the effect on outcome. Hence, it is recommended that rehabilitation for stroke patients should be started as early as possible to achieve better outcome.

The third area of concern is acute care and rehabilitation facilities in South Africa. Limited literature is, however, available. The available literature says that the acute inpatient rehabilitation facilities are insufficient to meet the demand of stroke patients.

3 METHODOLOGY

3.1 Introduction

This chapter explores methods utilized in the study, in which data collection was done using self-developed questionnaire and three other research instruments. Included in the chapter are description of research setting, design and sampling. Description of pilot study and procedure of data analysis is also explained. Finally issues of ethical considerations regarding the study are reported.

3.2 Research setting

The study was conducted at the Groote Schuur Tertiary Hospital. Groote Schuur is a large, government funded, teaching hospital operating in the Cape Town Central Health District of the Metro Region. The hospital has a total number of 893 beds (Provincial Government of the Western Cape, 2009). It is the chief academic hospital of the University of Cape Town's medical school, providing tertiary care and instruction in all the major branches of medicine. The department of medicine has total 18 clinical divisions and ten major research units. Among which, division of neurology includes in-patients, outpatients, an acute stroke unit, a clinical neurophysiology laboratory and a referral and emergency service. Tertiary services include staffing and operation of a busy Emergency Unit, which serves largely as receiving area for referrals from the district hospitals. Patients are admitted from district hospitals into an emergency ward for short-term stay, or transferred directly to medical wards or to medical wards staff by subspecialist divisions. On an average, around 60 stroke patients are admitted to the Groote Schuur hospital per month. They are either admitted to a six bed stroke unit or general medical wards based on the condition of the patient as well as availability of the beds. The hospital stay of stroke patients ranges between one to two weeks. Stroke patients admitted to this hospital are managed by a multidisciplinary team, which includes physiotherapists, occupational therapists, speech therapists, social workers, psychologists and medical officers. A community liaison service is also provided for those who require further rehabilitation. Patients are either discharged home for outpatient rehabilitation or referred for inpatient rehabilitation to rehabilitation centers or

Community Health Centers.

3.3 Research design

A descriptive, observational, longitudinal, quantitative design was used to collect data in the present study. Quantitative research aims to measure information numerically (Gilbert, 2008). The information about a social phenomenon is expressed in numeric terms that can be analyzed using statistical methods. The observations can be direct numeric information or can be classified into numeric variables. The advantage of quantitative research is relative precision and lack of ambiguity. While quantitative data can be used to discover associations, quite complex designs have to be used to shed light on the cause and effect (Gilbert, 2008). As this study aims to determine the association between different factors and functional outcome, quantitative research design suits best. The quantitative research design is structured and can be classified into Descriptive, Quasi-experimental and Experimental. This study is a descriptive observational study and interviews were used to obtain the data. This non-experimental design is used to find out correlation between dependent and independent variables. A longitudinal study is a correlation research study that involves repeated observations of the same variables over long periods of time. There are three types of longitudinal design: trend studies, cohort studies and panel studies (Trochim, 2002). This study is a cohort study that measures same samples at different points of time. Panel study can reveal both net changes and gross changes in dependent variable. The longitudinal design has a drawback of drop out or 'attrition', when some participants withdraw from the study, die or move away. So this becomes an important problem in quantitative research because a sample that had a right composition at the start of the study may become biased due to attrition (Gilbert, 2008). However, drop out could be addressed with the intention to treat analysis which significantly measure whether any difference exists between drop out and non-drop out groups. Despite such problems, the major advantage of longitudinal design is that one can directly study process and mechanism: that is, how one thing is affected by or depends on another. This study design suits best for the study as it allows researcher to examine the functional outcome on admission, discharge and two months post stroke.

3.4 Study population and sampling

A convenience non-probability sampling method was used in the study (Gravetter and Forzano, 2009). The convenience sampling method involves non-random selection of samples. Gravetter and Forzano, (2009) stated that in the non-probability sampling method not all the patients possess equal opportunity to be included in the study. This study involved a consecutive convenient sampling, a strict version of convenience sampling, where all the stroke patients consecutively admitted in the hospital meeting inclusion criteria were selected for the study. This means a complete study of accessible population was done. This is considered as a best non-probability sampling method as by studying all available, a good representation of overall population is done in a reasonable period of time (Lunsford and Lunsford, 1995).

3.4.1 Inclusion Criteria: patients were included in the study if they

1. Have documented history and definite diagnosis of stroke made by either medical officer or CT scan as defined by the WHO
2. Had their first ever occurrence of stroke
3. Had their stroke $\leq$4 weeks prior to admission
4. Provided informed consent

3.4.2 Exclusion Criteria: patients were excluded if

1. They have other neurologic conditions such as spinal cord injury, head injury, dementia or history of seizures prior to stroke.

3.5 Research instruments

The research instruments used included National Institute of Health Stroke Scale (NIHSS), Hospital Anxiety and Depression Scale (HADS) and Barthel Index after completing the Socio-demographic and medical data form.

3.5.1 Socio-demographic and medical data form

A self-developed socio-demographic and medical profile data form (see Appendix E) was used to capture the socio-demographic and medical profile data from the medical records of the patients. The socio-demographic and medical profile data form consisted of three sections.

Section A included socio-demographic data such as age, date of birth, gender, date of admission and onset, language and employment status. These data were collected from patients' folders and verified again with patients as well. Date of admission and date of onset were collected in order to follow the inclusion criteria of the study. Section A addressed the first objective of the current study. The first objective was to determine socio demographic profile that influence functional outcome of stroke patients.

Section B consisted of medical profile that included investigations and diagnosis, type of stroke, impairment and side of lesion, associated risk factors and baseline condition. The data were obtained from patients' folders. Stuifbergen and Rogers (1997) stated that disease or disability related characteristics are believed to have a potential influence on the quality of life of the victimized individuals. Thus this section addressed the further important point of the first objective, which aimed to identify medical profile of the participants. This section was completed at admission.

Section C focused on the management aspect, which included services received (medical, physiotherapy, occupational therapy and speech therapy), frequency of inpatient rehabilitation sessions, length of stay and discharge destination. This section was completed at the time of discharge. Numerous studies suggest that rehabilitation has a strong influence on functional outcome of stroke patients (Paolluci, et al. 2000; Maulden et al. 2005, Van Peppen, et al. 2004). This section addressed the first objective of identifying influence of rehabilitation on functional outcome of stroke patients. Again these data were collected from patients' folders specifically from rehabilitation professionals' notes.

a) Data collected on Admission

On admission age, gender, date of birth, date of admission and onset were obtained from patient's folder. Date of birth and onset were confirmed with patients to avoid variation. Medical profile

included Glasgow Coma Scale if documented, investigations and diagnosis, side of lesion and impairment and type of stroke. The risk factors such as hypertension, diabetes, cardiac condition, high cholesterol, peripheral venous disease and pulmonary condition were obtained from folder as well as confirmed with patients. Such factors were documented in a template as associated risk factors and documented by a researcher if present. Level of education, employment status, and contact details were asked to patients.

b) Data collected at Discharge

The variables captured from participants' folders on discharge were frequency and type of rehabilitation and length of hospital stay. Also if participants were discharged or referred to rehabilitation facility was noted. Their contact details were obtained from folders or with patients were determined using the test-retest method. Reliability is the "consistency" or "repeatability" of the measures (Trochim, 2006b). The test-retest reliability used here evaluates reliability across the time. However, a problem with this type is as the time between two tests increases, the chances of getting lower reliability increase. The reliability of the study was determined using the by EXACT method in SAS v9 through compare procedure.

3.5.2 The National Institute of Health Stroke Scale (NIHSS)

The National Institute of Health Stroke Scale (NIHSS) (See Appendix F) is used to assess the severity of stroke. The NIHSS was originally designed as a research tool to measure baseline data on patients in acute clinical trials. Now the scale is also widely used as a clinical assessment tool to evaluate acuity of stroke patients, determine appropriate treatment and to predict patient outcome. It is a 15-item scale developed by National Institute of Health (NIH) (Brott, Adams Jr, Olinger, Marler, Barsan, et al. 1989). The score assesses level of consciousness, extraocular movements, visual fields, facial muscle function, motor arm and leg, ataxia, sensory function, aphasia, dysarthria and neglect (NIHSS). The ratings for each item are scored with 1 to 4 grades, with 0 as normal and untestable items also have an allowance for description in the scoring sheet. The scores ranges from 0-42 with the higher score indicating more severity (Walter, 2004).

Interrater reliability was found to be excellent with ICC of 0.95 (Goldstein and Samsa, 1997). But a recent study of Martin-Schild, Albright, Tanksley, Pandav, Jones, et al. (2011) says that zero on NIHSS does not equal the absence of stroke. Posterior circulation stroke with symptoms of headache, nausea and vertigo; and signs of truncal ataxia may have score of zero in NIHSS. Correlation coefficients between the NIHSS and the Barthel Index, the Rankin Scale, and the Glasgow Outcome Scale were significant, but modest in magnitude both at baseline and two hours after stroke (Lyden, Mei, Jackson, Marler, Kothari, et al. 1999). Comparison of the score with three-month clinical outcome shows high validity (r=0.79). It states that the predictive validity of the NIHSS three months after stroke is also high.

3.5.3 Hospital Anxiety and Depression Scale (HADS)

The Hospital Anxiety and Depression Scale (HADS) (see Appendix G) was developed in 1983 to assess psychological symptoms of anxiety and depression. HADS is not a diagnostic tool but measures the syndromes of depression and anxiety (Zigmond and Sneith, 1983). The fourteen statements are relevant to either generalized anxiety or depression. In the questionnairee, even-numbered questions relate to anxiety and odd-numbered questions relate to depression. The patients are asked to choose one response from the four given for every question. They should give an immediate response and be dissuaded from thinking too long about their answers. Responses are scored on a scale from 0 to 3. The score for each answer is given in the right column. The patients are requested to answer according to how they are currently feeling. The scoring of 0-7 is normal, 8-10 is borderline abnormal and 11-21 is abnormal. Both anxiety and depression are scored separately. In other words, score between 0-7 regarded as being in the normal range where there are no apparent psychological symptoms. Scores between 8-10 is just suggestive of presence of respective state and 11 or higher indicating probable presence of mood disorder.

Correlation between anxiety and depression varied from 0.40-0.74. Cronbach's α (used to measure reliability) for HADS-A varied from 0.68-0.93 (mean 0.83) and for HADS-D from 0.68-0.90 (mean 0.82). HADS found to perform well in assessing symptom severity of anxiety and depression in somatic, psychiatric and primary care patient and in general population. Concurrent validity of HADS

with Beck Depression Inventory was found 0.64 and 0.71 for HADS Anxiety and Depression sub-scale respectively, which is considered to be excellent correlation (Savard, Laberge, Gauthier, Ivers, Bergeron, 1998).

3.5.4 The Barthel Index (BI)

The Barthel Index (BI) (see Appendix J) is a scale used to measure performance in Activities of Daily Living (ADLs). It was introduced in 1965 by Mahoney and Barthel (Mahoney and Barthel, 1965). The scale comprises of ten different items scoring 0-15. The items included are: feeding, bathing, grooming, dressing, bowel, bladder, toilet use, transfer, mobility and stairs. The score can be obtained either by direct interview of the patient or caregiver or nurse. The minimum score obtained is zero while maximum score is hundred. Full credit is not given for any activity if patient requires even minimal assistance or supervision. The recording of BI should only be what the patient can do at time of grading. In a study of Dromerick, Edwards and Diringer (2003), it has been suggested that key scores are BI <40 (representing complete dependence on others), BI >60 (transition from complete dependence to assisted independence) and BI >85 (representing independence with minor assistance as could be reasonably provided in a community setting). The higher score shows more independence level.

For BI, internal consistency has been described as good (α=0.80-0.89) (Shah, Vanclay and Cooper, 1989) to excellent (α=0.93) (Leung, Cha and Shah, 2007). The advantage of BI is simplicity. It is easy to administer and shows consistency with repeated use. It detects small changes over time (Wade and Collin, 1988). A review of several tests suggested BI had better test-retest reliability than scales measuring extended ADL (Green and Young, 2001). There was found to be no significant difference in ratings by patient or proxy and whether interview was done by trained layperson or health-care professionals (Korner-Bitensky and Wood-Dauphinee, 1995). Therefore, the high reliability, even indirectly by telephone assessment makes it very useful tool. The concurrent validity of Barthel Index is good with Modified Rankin Scale (r=-0.81) (Cup, Reimer, Thijssin and van Kuyk-minic, 2003). But at the same time, BI suffers from “ceiling effect” as maximum score can be achieved by disabled patients and therefore it does not differentiate disability well in patients with higher level of

functioning (Dromerick, et al. 2003). In the setting of an acute stroke, most patients, even those with minor stroke, are bed-bound in the first few hours after stroke, either by their deficit or by medical directive (Adams, Adams, Brott, del Zoppo, Furlan, et al. 2003) and therefore achieve low scores. Thus, BI is also highly susceptible to a "floor effect".

3.6 Methods of data collection

3.6.1 Pilot study

In the pilot study, the researcher collected data from 15 folders and completed the socio-demographic and medical data form. Two weeks later data was obtained from the same 15 folders irrespective of patient's discharge and captured on SPSS. The researcher noticed a subjective difference in mentioning about diagnostic investigation between CT and CTB. However, both indicate the same CT Scan. Therefore, the researcher captured investigation as CT scan only. While conducting the first pilot study, two patients were yet to be diagnosed with investigative procedures so they were left blank. After two weeks, those blank spaces were filled with investigation, location of lesion and type of stroke. One patient was found to have a cardiac condition at the two weeks' pilot study. To correct this, the researcher confirmed it again with concerned medical professional. There were some modifications found to be done in socio demographic data such as age and employment. Looking at the age for one patient, the documented age by medical professional was 70 years. But, the researcher found from patient's date of birth that the actual age till date was 69 years. For each patient, there were two folders; one for the doctor's notes and another for the other health care professionals and the admission details sheet. The dissimilarity was also found in the employment. Two patients were noted as pensioners in the first study from doctor's folder. Two weeks later, the researcher noticed them in patient's bedside folder as unemployed. The similar kind of difference found in one more patient as informally employed at one time and employed at another time. The pilot study brought into the researcher's attention that to avoid such inaccurate data in the original study, verification was necessary in the socio-demographic details with patients as well. Those 15 patients were not included in the original study.

3.6.2 Procedure

Before commencement of the study, the necessary permission and clearance was obtained as mentioned in section 3.7. At first, the researcher used to visit Stroke unit and the medical wards to view a daily list of patients. The researcher then used to approach all the stroke patients who were matching the inclusion criteria, after viewing patients' folders. The researcher introduced her and then explained about the research. They were assured of harmfulness from the study and confidentiality about their identity. According to the consent form, participants were free to withdraw from the study at any time without giving any reason and that it would not negatively affect the participant anyways. Should the participant have any questions about the study or wish to report any problems experienced during study, they were provided with research coordinator's contact details on the consent form. The same was explained to the family members or relatives when patient was not able to respond. Following this procedure, on patients' agreement, the consent was taken on a consent form to confirm their participation. Before the interview, patients were asked for their preferable language. The researcher interviewed all the patients at their bedside. The socio-demographic details were confirmed with patient and added to the socio-demographic and medical data form. The research instruments were used in an order of National Institute of Health Stroke Scale (NIHSS), Hospital Anxiety and Depression Scale (HADS) and Barthel Index with socio-demographic and medical data form being completed at first. There were two different research assistants for Afrikaans and Isi-Xhosa. The research assistants were given translations of the HADS and BI. NIHSS was implemented by asking the participant to perform the item so no translated copies were there for NIHSS. Patients with cognitive impairments were included and scored in NIHSS accordingly. But the responses of those patients on HADS were incomplete and were not reliable and so the researcher considered them as unable to complete the questionnaire. The BI for such patients was scored according to the patients' folder and also by confirming with nursing staff. The duration of interview was 15-20 minutes. The same interview was repeated at discharge with a window period of two days.

3.7 Data Analysis

The data were coded and captured using SPSS version 18 while analyzed using SPSS and SAS version 9 (SAS Institute Incorporation). Descriptive statistics such as mean, median, mode and standard deviation were calculated using SPSS to study various factors. Spearman's correlation was used to find the correlation between the outcome variable i.e. Barthel score at two different time periods and each potential predictor (age, frequency of rehabilitation, severity at admission and admission functional score). In view of possible non-normality of variables, it was appropriate to use Spearman's correlation (O'Rourke, 2005). Due to heterogeneity of the variances, Mixed procedure in SAS v9 was used. The analysis showed that the data were somewhat skewed so the alternate analysis was done to account for Ceiling and Floor effects of the outcome variable. The ceiling and floor effect result in 'censored' values for the outcome variable and the method of analysis used for this type of data was Tobit analysis. The tobit model is also called as a censored regression model (Joreskog, 2002). Having seen that the data were not normally distributed, simple linear regression was not used for analysis. The heterogeneity of variances can be accounted for by fitting more complex models that allow for heterogeneity. The Mixed procedure in SAS v9 was used to fit these models. The alternate analysis was done for ceiling and floor effects of the outcome variables. The ceiling and floor effect result in 'censored' values for the outcome variable and the method of analysis used for that is called Tobit analysis.

3.8 Ethical Considerations

Ethical clearance to conduct the study was obtained from the Senate Higher Degrees Committee of the University of the Western Cape and the Senate research grants and study leave committee of UWC. Permission was also obtained from the Medical Superintendent of Groote Schuur Hospital and the Chairperson of Health Science Faculty Research Ethics Committee at University of Cape Town. The aims, objectives and nature of the study were explained to all the participants. The participants were assured of confidentiality and anonymity of their identity. They were also allowed to withdraw from the study at any stage. If they agreed to partake in the study then written informed consent was

obtained from them or a primary caregiver. The results will be made available to the participants, hospital authorities and other interested parties.

3.9 Summary of the chapter

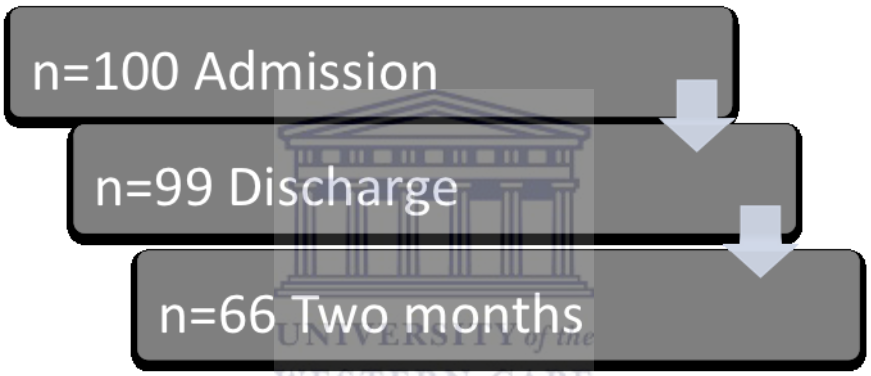
In this chapter, the researcher explains the methodology used in the study. A quantitative, observational, longitudinal study approach was employed. Standardized outcome measures were used to accomplish the study. Included are sampling method and statistical tests employed. To explain the process of research, the methods of data collection and statistical analysis were included. The chapter concludes with ethical considerations obtained to conduct the study.

4 RESULTS

4.1 Introduction

In this chapter, the quantitative results of socio-demographic and medical profile data of the study population are described. The results of severity of stroke, psychological symptoms of anxiety and depression and functional level are also presented. The later factors are described for all the three time periods for which data was collected were taken.

Figure 4.1: Total number of participants at admission, discharge and two months



At discharge, the data of one patient was missing as the patient was discharged during weekend. For two months, 34 participants were unable to contact and so the total available data were of 66 participants.

4.2 Socio-demographic characteristics of the participants

The socio-demographic data includes age, gender, employment status and language spoken.

4.2.1 Age and Gender

The mean age of the participants was 59.83 years with ages ranging from 20 to 97 years. The standard deviation was calculated to be 15.71. Fifty-one participants were females (51%) and forty-nine were (49%) males in the present study.

4.2.2 Employment status and language spoken

Table 4.1: Employment status and preferred language for an interview (n=100)

Variables	Characteristics	N
Employment Status	Employed	19
	Informally unemployed	3
	Unemployed	30
	Pensioner	46
	Disability grant	1
Language spoken	English	91
	Afrikaans	6
	Xhosa	3

Majority of participants i.e. 46 (46%) were pensioners. Only 18 (18%) were employed while 30 (30%) were unemployed. Ninety one per cent (91%) participants preferred English for interview while 6% preferred Afrikaans and remaining 3% Xhosa.

4.3 Medical profile of the participants

This sub-section includes associated risk factors and characteristics of stroke.

4.3.1 Associated risk factors

The risk factors and associated medical conditions are presented in the table below. Table 4.2 illustrates percentages of participants having risk factors and associated illnesses

Table 4.2: Risk factors and associated illnesses (n=100)

Risk factors	Number of participants
Hypertension	79
Smoking (current)	46
Cardiac conditons	33
Diabetes	27
Thrombosis	16
Alcohol use (regular)	17
Associated illnesses	
Cholesterolaemia	14
Musculoskeletal conditions	10
Pulmonary conditions	8
Peripheral Vascular Diseases	4

Hypertension was found to be the most common condition among 79% patients followed by current smoking in 47% patients. Thirty three percent had cardiac conditions followed by diabetes in 27%.

4.3.2 Characteristics of stroke

This sub-section includes type of stroke, side of lesion, side of impairment and diagnostic investigations.

a) Type of Stroke, side of lesion and side of impairment

CT scan and MRI were the investigative procedures used for the diagnosis of stroke. Majority of participants i.e. 82% were diagnosed using CT scan. Only 2% were diagnosed with MRI and 15% were confirmed by clinical diagnosis alone. One patient (1%) was diagnosed using all three.

Table 4.3: Type of stroke, side of lesion and side of impairment (n=100)

VAriables	Characteristics	N (%)
Type of stroke	Ischemic	89 (89%)
	Hemorrhagic	10 (10%)
	Indeterminate	1 (1%)
Side of lesion	Left	58 (58%)
	Right	36 (36%)
	Both	6 (6%)
Side of impairment	Left	35 (35%)
	Right	56 (56%)
	Both	3 (3%)

Ischemic stroke was found to be most common type in 89% patients while hemorrhagic stroke type was diagnosed in 10%. Majority of participants had left sided lesion (58%) and right-sided impairment (56%). Here shows only 94% having either right, left or both sided impairment. This implies that remaining 6% did not have any sided impairment, which was visual deficit or speech problems. However, individual impairments were not studied.

b) Mortality

Mortality has been presented in the below table by characteristics such as period of death, gender and cause of death.

Table 4.4: Period of death, gender and documented cause of death

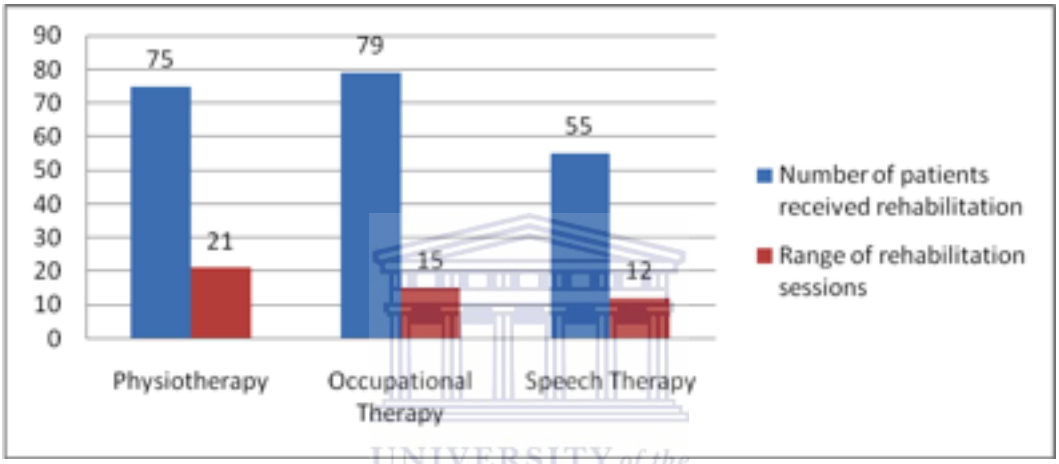
Mortality	Characteristics	N (%)
Period of death	Before discharge	6 (6%)
	After discharge (before two months)	6 (6%)
Gender	Females	8 (8%)
	Males	4 (4%)
Documented cause of death	Stroke	11 (11%)
	Other than stroke	1 (1%)

It is clear from the above table that mortality rates before and after discharge are same i.e. 6% with females more (8%) than males (4%).

4.4 Rehabilitation process

This sub-section includes number of patients received different types of rehabilitation facilities and total rehabilitation sessions. The range which is maximum number of treatment sessions given to any patient was more in Physiotherapy (21) than Occupational Therapy (15). Therefore, the mean was 3.89 (SD=3.89) and 3 (SD=2.98) accordingly.

Figure 4.2: Number of participants received different rehabilitation and Range of rehabilitation



The number of patients received Physiotherapy (75%) and Occupational Therapy (79%) was nearly similar. Fifty-five percent patients received Speech Therapy.

4.5 Length of stay, Referral and discharge

The mean length of stay of patients was 10.4 days with standard deviation of 5.80. Minimum stay was three days and maximum was 35 days.

More than half of the patients i.e. 53.19% (n=50) were referred to inpatient rehabilitation centers and 7.4% (n=7) were referred to day hospital for outpatient rehabilitation while 39.3% (n=37) were discharged home.

4.6 Rehabilitation outcomes

The results of stroke severity, anxiety and depression and functional levels are described here in this sub-section at different time periods.

4.6.1 Severity of stroke (NIHSS)

The severity of stroke experienced by the participants was assessed using NIHSS.

Table 4.5: Severity of stroke of the participants using NIHSS on admission and discharge

Characteristics	Admission (n=100)	Discharge (n=93)
Mean	12.49	8.76
Standard Deviation (SD)	10.11	8.60
Range	39.37	37
Severity	N	N (N%)
Minor (1-4)	22	30 (32.2%)
Moderate (5-15)	52	41 (44.0%)
Moderate to Severe (16-20)	5	7 (7.5%)
Severe (21-42)	21	9 (9.6%)
Score 'zero'	0	6 (6.4%)

The mean of NIHSS is 12.49 and 8.76 on admission and discharge respectively. The range of scores was nearly similar on admission (39) and discharge (37). Severe stroke indicates presence of sensory, motor, speech and cognitive impairments based on NIHSS. The moderate stroke is any of these impairments but not all while minor stroke implies any one or two impairments with reduced severity.

The missing data of one participant and demise of six participants reduced the total number of patients as ninety-three for the discharge NIHSS. On admission, 21% patients had severe stroke, which reduced at discharge and remained severe for 9.6% (n=9) participants excluding those who died. The number of participants with minor stroke had increased from 22% on admission to 30.2% (n=30) at discharge. Still majority of patients were with moderate stroke i.e. 52% on admission and 44.0% (n=41) at discharge. Six patients (6.0%) scored 'zero' at discharge indicating no impairment.

4.6.2 Anxiety and Depression (HADS)

The psychological symptoms of anxiety and depression are presented for admission and discharge using HADS in the table below.

Table 4.6: Scoring of Anxiety and Depression through HADS

Scoring	Admission (n=100)		Discharge (n=93)	
	Anxiety	Depression	Anxiety	Depression
Normal (0-7)	41	46	52	55
Mild (8-10)	6	2	3	2
Moderate (11-15)	3	2	3	1
Severe (16-21)	0	1	0	0

The participants who could not complete the questionnairee or were unable to assess, were not included for admission and discharge data. However, from the above table it is clear that more number of patients could complete the HADS at discharge.

On admission, 50% patients for anxiety and 49% for depression were unable to complete the questionnairee or were not able to assess for HADS. There were normal symptoms of anxiety and depression in 41% and 46% patients respectively. Only one patient had symptoms of severe depression with normal symptoms of anxiety.

At discharge, the total number of patients attended was 93. There were more patients with normal symptoms of anxiety (52%) and depression (55%) compared to that of admission. There were 35% of patients could not complete the questionnairee or were unable to be assessed for both anxiety and depression.

As shown in table 4.6, there was only one patient on admission and no patient on discharge who showed symptoms of depression. There is an insufficient number of patients that can be correlated for further analysis. So the scores of HADS are not included for its correlation with functional outcome.

4.6.3 Functional levels (Barthel Index)

The below table presents the functional levels at admission, discharge and two months through Barthel Index scores.

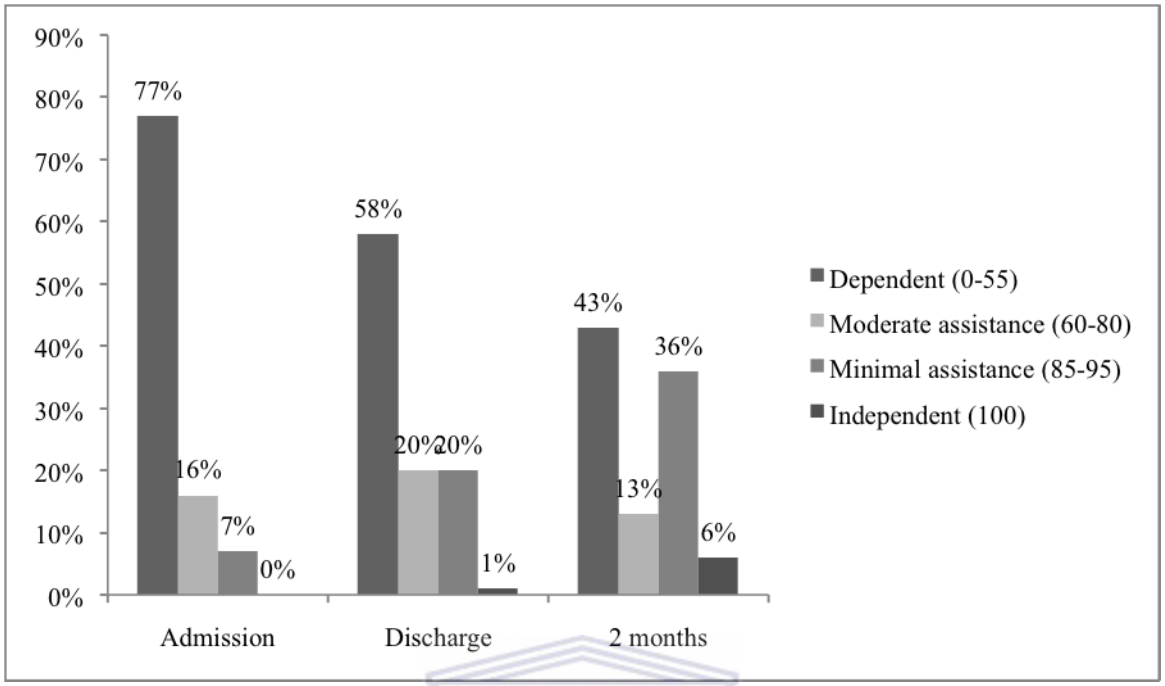
Table 4.7: Descriptive statistics of the Barthel Index scores

Individual items	Admission (n=100)	Discharge (n=99)	Two months (n=66)
Feeding	61	77 (77.7%)	51 (77.2%)
Bathing	57	69 (69.6%)	48 (72.7%)
Grooming	53	65 (65.6%)	46 (69.6%)
Dressing	42	57 (57.5%)	43 (65.1%)
Bowel	33	48 (48.4%)	41 (62.1%)
Bladder	25	42 (42.4%)	39 (59.0%)
Toilet	23	39 (39.3%)	38 (57.5%)
Transfers	13	29 (29.2%)	35 (53.0%)
Mobility	2	9 (9.0%)	26 (39.3%)
Stairs	0	1 (1.0%)	4 (6.0%)

The mean score of Barthel Index was greater at two months (55.44) than on discharge (35) and admission (29.58).

From admission to two months, the mean of Barthel scores increased from 28 (SD=29.5) on admission and 43.08 (SD=35) at discharge to 55.44 (SD=40.3) at two months. The range of scores was slightly lower (90) on admission and similar (100) at other two time periods. The patients who died were also included in the scores in discharge and follow up data and the patients unable to contact at two months were excluded. In the follow up, 33 patients were unable to contact.

Figure 4.3: Functional outcome of patients at three points of time as measured by Barthel Index



The above results indicate that majority of participants (77%) were dependent on admission which improved with time until two months (43.9%). Only 6% were independent at the end of two months. Although the graph shows increment in the minimal assistance from 7% to 36.3%, still majority of patients (43.9%) were dependent at two months.

4.7 Correlation between outcome variables and each potential variable

For functional level, BI was a dependent variable while age, total number of rehabilitation sessions, severity at admission and discharge and Barthel scores at admission and discharge were independent variables. Severity at discharge was not included as a predictor variable for functional level at discharge as its value was not known until the time of discharge. Similarly, severity at admission was not included for functional level at two months. In view of possible non-normality of variables, the non-parametric Spearman's correlation was used to determine the correlation. The below table illustrates correlation between functional outcome at two different points of time with other variables.

Table 4.8: Correlation between dependent and independent variables
Spearman's correlation coefficients
Probability > | r | under H0: Rho=0
Number of observations

	Age	Rehabilitation	Severity Admis-sion	Severity Dischage	Function Admission	Function Dis-charge
Function Dischage	-0.5471	-0.1588	-0.7569		0.8084	
	<0.0001		<0.0001		<0.0001	
	99					
Function two months	-0.4793	-0.2125		-0.7572	0.6741	
	<0.0001	0.0842		<0.0001	<0.0001	<0.0001
	67	67		60	67	67

At two months, 33 patients were dropped out and not included in the analysis. The patients who died i.e. 12% were included and were scored zero on Barthel Index. As can be seen from the above table, total number of rehabilitation sessions was not a significant variable with p-value (0.0842) greater than 0.0001. Age, severity at discharge and functional level at admission and discharge were all significant (p-value<0.0001).

4.7.1 Variables affecting functional outcome at discharge

Accounting for Barthel scores at discharge, four variables were included as predictors, which are age, functional outcome at admission, severity at admission and total number of rehabilitation sessions.

Table 4.9: Analysis of maximum likelihood parameter estimates

Parameter	df	Estimate	Standard Error	Chi-square	Pr>Chi-square
Intercept	1	70.7070	11.5497	37.48	<0.0001
Age	1	-0.4598	0.1451	10.04	0.0015
Functional level at admission	1	0.5760	0.0960	36.01	<0.0001
Severity at admission	1	-1.7894	0.3249	30.33	<0.0001
Rehabilitation sessions	1	0.3375	0.2843	1.41	0.2353

As can be seen from the above table that total number of rehabilitation sessions are not significant with p=0.2353, it was not included in the further analysis of maximum likelihood parameters. So the below table includes three parameters namely age, functional level at admission and severity at admission with Chi-square values of 10.04, 36.01 and 30.33 respectively.

Table 4.10: Analysis of maximum likelihood parameter estimates

Parameter	df	Estimate	Standard Error	Chi-square	Pr>Chi-square
Intercept	1	76.5322	10.5161	52.96	<0.0001
Age	1	-0.5039	0.1410	12.78	0.0004
Functional level at admission	1	0.5492	0.0937	34.39	<0.0001
Severity at admission	1	-1.7531	-1.7531	30.17	<0.0001

From the above estimate, it is evident that Age (p=0.0004), Admission function (p<0.0001) and Severity at admission (p<0.0001) are all significant for discharge functional outcome.

The coefficient for Age is -0.50. For each year increase in age, the estimated mean would decrease by 0.50. For every ten-year increase in age, the discharge functional score would decrease by 5 points. The coefficient for functional level at admission is 0.55. A 1-point increase in admission functional score, the discharge functional score would increase by 0.5. The coefficient for severity at admission is -1.75. A 1-point increase in severity would correspond to -1.75 point decrease in discharge functional score.

4.7.2 Variables affecting functional outcome at two months

Comparison of drop-out versus non-drop out group using different tests

The final sample (n=66) analyzed to determine if there is any significant difference exists between drop out group and samples within the study.

Finally, 66 participants were analyzed for the inclusion to determine factors influencing functional outcome. The drop out group consisted of 34 participants who were lost to follow up. The below table indicates whether drop out group (n=34) differ significantly from non-drop out group (n=66).

Table 4.11: Comparison of drop out versus non-drop out group by different tests

Variable	Test
Age (p=0.000)	T-test
Severity at admission (p=0.828)	Chi-Square test

From the above table it becomes evident that drop out group did not differ significantly from non-drop out group for the variables severity and functional outcome at admission. The p-values exceeded 0.05 alpha level for severity and functional outcome at admission. While the p-value for age (0.000) is less than 0.05 that indicates that the age differs significantly between two groups.

4.7.3 Factors influencing functional outcome at two months

Table 4.12: Analysis of maximum likelihood parameter estimates (n=66)

Parameter	df	Estimate	Standard Error	Chi-square	Pr>Chi-square
Intercept	1	137.91	22.3157	38.19	<0.0001
Age	1	-0.6357	0.2657	5.72	0.0167
Functional outcome at admission	1	0.0301	0.1778	0.03	0.8655
Severity at admission	1	-3.3705	0.5490	37.69	<0.0001
Rehabilitation	1	-0.3855	0.5444	0.50	0.4788

In the above table, it is evident that functional level at admission is not significant having p=0.8655 value. It is because of severity at admission in the model. Age (p=0.0167) and severity at admission (p<0.0001) are significant independently.

Table 4.13: Analysis of maximum likelihood parameter estimates (n=66)

Parameter	df	Estimate	Standard Error	Chi-square	Pr>Chi-square
Intercept	1	140.54	16.084	76.35	<0.0001
Age	1	-0.6496	0.2530	6.59	0.0102
Severity at admission	1	-3.4267	0.4395	60.79	<0.0001
Rehabilitation	1	-0.4136	0.5195	0.63	0.4260

The coefficient for severity at admission is -3.50. A 1-point increase in severity at admission would correspond to an estimated 3.50-point decrease in functional outcome at two months. In this case, functional level at admission is not included in the model. This is due to the fact that severity at admission and functional level at admission contain similar information. The p-value for rehabilitation sessions is 0.42 that is not significant once again.

Table 4.14: Analysis of maximum likelihood parameter estimates (n=66)

Parameter	df	Estimate	Standard Error	Chi-square	Pr>Chi-square
Intercept	1	135.69	14.9220	82.69	<0.0001
Age	1	-0.6130	0.2502	6.00	0.0143
Severity at admission	1	-3.5007	0.4389	63.61	<0.0001

From the above table, we can see that Age (p=0.0143) and Severity at admission (p<0.0001) are both significant together for functional outcome at two months.

The coefficient for Age is -0.61. Each one-year increase in age would decrease the functional score by 0.61. Each ten-year increase in age would decrease it by 6 points. The coefficient for severity at admission is -3.50. That means each 1-point increase in severity at admission corresponds to an estimated 3.50 decrease in functional outcome at two months.

4.8 Summary of the results

The participants in the present study were aged 20 to 97 years with almost equal number of males and females. At the tertiary hospital, the diagnosis of stroke patients was based on diagnostic investigations (CT scan and MRI) as well as clinical bases. Majority of them were having hypertension followed by current smoking as risk factors. There was a considerable mortality rate with most of them were ischemic stroke. During the hospital stay, majority of the patients were provided with physiotherapy and occupational therapy and more than half of them received speech therapy. More than half of the participants were referred to different in-patient rehabilitation facilities. The patients

with moderate stroke were more followed by minor and severe stroke as assessed by NIHSS. Almost all the participants who completed the HADS showed normal symptoms of anxiety and depression with very few of them had minor and moderate symptoms on admission, which improved at discharge. A significant improvement was noted in functional level from admission to two months as measured by Barthel Index. A significant correlation was found between Age, Functional level at admission and Severity at admission with Functional outcome at discharge. At two months, Age and Severity at admission were found to be most significant factors for functional outcome. The discussion of these results will follow in the proceeding chapter.

5 DISCUSSION

5.1 Introduction

The aim of this study was to identify factors influencing functional outcome of stroke patients admitted to a tertiary hospital. The findings of the study are discussed in this chapter and are presented in four sections: demographic factors, comorbid medical factors, psychological factors and factors influencing functional outcome of stroke. Each factor has been discussed along with the existing literature. The researcher tries to highlight the implications of the study findings to improve further management of stroke patients.

5.2 Demographic factors

The mean age of the participants in the study was 59.83 years. Similar results found by De Villers, et al. (2006) where a mean age of participants with stroke was 59.6 years. Hospital-based studies suggest a higher age-specific stroke incidence in young age (35-54 years) group in South Africa than high-income countries (Matenga, 1997). These findings are quite similar to the present study, in which acute stroke unit is a common factor. The findings suggest that patients receiving inpatients rehabilitation are considerably younger than those receiving outpatient rehabilitation. Younger patients are known to have better outcomes than older ones (Sturm, Donnan, Dewey, Macdonell, Gilligan, et al. 2004). It is not clear from the literature why the mean age of stroke survivors is so much lower in sub-Saharan African countries than in other countries. Stroke in young age has financial as well as social impact. However, these impacts are not focused in the present study. Activity restriction is correlated significantly with symptoms of depression post stroke (Landreville, Desrosiers, Vincent, Verreault and Boudreault, 2009).

In South African studies, it was documented that the patients receiving outpatient rehabilitation at community health centers (CHCs) were older than those admitted to inpatient rehabilitation facilities in Western Cape. This can be explained by the studies of Ruillard (2006) and Bryer (2009) that reported the age of stroke patients admitted to the Western Cape Rehabilitation Center (WCRC) and

in acute stroke unit as 51.3 years and 59 years respectively. Similarly, considerably older age stroke incidence was recorded between 65 years to 84 years in a community-based South African study conducted in Limpopo province (Southern Africa Stroke Prevention Initiative, 2004). In the CERISE study also the patients were noticeably older than the present study. In that study, the mean age of the patients admitted to rehabilitation centres in the United Kingdom was 72 years and in Switzerland 71.7 years (De Wit, et al. 2006).

Females were slightly more (51%) than males (49%) in the present study. This may be due to a response bias as the convenience sampling method was used to obtain the samples. Almost similar results were found by Hoffman (2000) where female to male ratio was equal in young stroke clients in a South African study. A recent age related study reported that men consistently have higher hospitalization rates than women aged 45-64 years in United States (Towfighi, Markovic and Ovbiagele, 2011). Various international studies of Bonita, Broad and Beaglehole (1997); Bonita (1992); Bruno and Engin (2000) and Stewart (1999) recorded slightly higher incidence in males than in females. This higher incidence in males is due to the fact that they involve more in smoking and alcohol use, which predispose to occurrence of stroke. The findings of current study also suggests that rate of hospitalization in both the sexes were almost similar. It is known that lifetime risk for stroke was found higher in women than men (Seshadri, et al. 2006). A longer life expectency in women could be the explanation for this finding. A number of studies found that functional outcome and quality of life after stroke are consistently poorer in women than men (Reeves, Bushnell, Howard, Gargano, Duncan, et al. 2008; Wyller, Sødring, Sveen, Ljunggren and Bautz-Holter, 1997; Petrea, et al. 2009). Thus, the lifetyme risk of stroke, post stroke disability and institutionalization could influence new gender-specific stroke prevention and rehabilitation strategies, targetting women for enrolment in stroke preventive clinical trials. A better understanding of social and medical factors explaining gender-specific disability related issues in people with stroke could help reduce stroke related declines in quality of life (Petrea, et al. 2009).

5.3 Comorbid medical factors

Hypertension (79%) was the most prevalent risk factor followed by smoking (46%) and cardiac conditions (33%). Similar findings were suggested in previous studies conducted in Western Cape by Rhoda and Hendry (2003) and Rouillard (2006) where hypertension and smoking were found as two most prevalent risk factors for stroke. The present findings concur with the most prevalent comorbid risk factors of stroke in Western Cape. This might be attributed to a younger age samples, which is evident by a lower mean age. Bogoshi, Stewart, Hale and Fritz (2003) found that the knowledge of risk factors of stroke was inadequate among the high-risk groups in South African population. Vibo, Korv and Roose (2007) found that patients with untreated hypertension had more severe stroke and tend to have unfavorable outcome than those who were on treatment. It was found that the knowledge of stroke risk factors was inadequate among South African population (Bogoshi, et al. 2003). The low prevalence of awareness, treatment, and control of hypertension poses a serious challenge in sub-Saharan African countries (Lemogoum, Degaute and Bovet, 2005). Improving the management of hypertension at the population level will result in optimum brain protection. Therefore, adequate amount of primary and secondary prevention and management of hypertension, as being the most prevelant risk factor, is essential. Efforts have to be made to educate the people about the adequate knowledge of stroke and its consequences. Pre-stroke treatment of hypertension was, however, not investigated in the present study.

5.4 Rehabilitation

The services received by participants and the influence of rehabilitation on functional outcome is discussed in this section.

5.4.1 Services received

A wide range of services are provided at the tertiary hospital that include medical services, physiotherapy, occupational therapy, speech therapy, dietician, social work and psychological counseling. Almost similar number of patients received physiotherapy and occupational therapy while the fre-

quency of physiotherapy sessions was slightly more. Similar results were found in a study of Jimenez, de Pedro-Cuesta, Almazan and Widen Holmqvist (2000), which noted that physiotherapy was used more than occupational and speech therapy. This is because participant restriction may not be the prior goal of the stroke patient while admitted to hospital which is fulfilled by occupational therapy. The attainment of movement and prevention of structural damage to muscles is the objective while patients are in hospital which is to be achieved by physiotherapy.

The use or provision of services is based on primary goals and outcome of the patients in a tertiary hospital. Acute stage of stroke is more impairment-based where physiotherapy fulfils the primary aims of motor and functional recovery more than occupational therapy that aims to work more on participation restriction (De Wit, et al. 2006).

5.4.2 Influence of rehabilitation on functional outcome

The rehabilitation included number of sessions provided during hospital stay of the participants. In the present study, total rehabilitation session was not found to be a significant factor at discharge and at two months. Almost equal number of participants received physiotherapy and occupational therapy, while number of session provided were more in physiotherapy. It is well documented in the literature that rehabilitation plays an important role in functional recovery of stroke survivors, providing considerable benefits beyond natural recovery that occur without any therapy (Ottenbacher and Jannell, 1993; Cifu and Steward, 1999). More intensive physiotherapy input may enhance the rate of recovery (Langhorne, Wagenaar and Partridge, 1996). Similarly, a systematic review of total 151 studies found strong evidence for task-orientated exercise training, particularly when applied intensely and early after stroke onset (Van Peppen, et al. 2004). The intensity of rehabilitation was not included in the present study that could be the explained. Also sessions and intensity of rehabilitation after discharge were unknown. In acute care tertiary hospital, due to shorter length of stay, rehabilitation provided may not be adequate enough to bring a noticeable change in functional outcome.

It is found that functional recovery, as measured by Barthel scores, is not only greater but also significantly more rapid on a stroke rehabilitation unit compared with general wards (Kalra, 1994). The

possibility of more organized aspect of patient care in stroke unit that results into better coordination and early discharge is supported. Faster rate of recovery has also been noted in the study.

5.5 Factors influencing functional outcome of stroke

Factors such as age, severity of stroke and functional level at admission and discharge were found significant for functional outcome. All these factors are discussed with other studies and where necessary, implications are provided in this section.

5.5.1 Age

Increasing age was found to be significantly associated with poor functional outcome ($p<0.0001$) at discharge and two months. A number of studies found age as a potential predictor for functional outcome after stroke (Ween, Alaxander, D'Esposito and Roberts, 1996; Black-Schaffer and Winston, 2004; Bagg, Pombo and Hopman, 2002 and Nakayama, Jorgensen, Raaschou and Olsen 1994). The reason behind this is explained by additional disabilities and comorbidities, which are associated with increased age (Ween, et al. 1996). Along with these factors, advanced age itself could be associated with lower functional outcome because of lower functional recovery and limited physical tolerance to intense rehabilitation. Nakayama, et al. (1994) stated that age independently influences stroke outcome in ADL-related aspect but not in neurological aspect. It means that in elderly patients there is poor compensatory ability. It is recommended by the Copenhagan Stroke Study (Nakayama, et al. 1994) that rehabilitation of elderly patients should focus more on task oriented activities and compensation rather than on recovery of neurological status.

The younger stroke patients being admitted to inpatient facilities in Western Cape could be the reason as in developing countries resources are limited and younger patients are admitted for intense rehabilitation as they have better outcomes than older ones (Sturm, et al. 2004). Stroke in younger age has a financial implication. The disability grant needs to be provided to those who would be seen as economically active. The participants who are potentially active economically and do not receive any grant from states should be classified. Stroke places an increased financial burden on the state

as managing the health costs that involve diseases are high (Fritz, 2006b). State should also provide grants to those who are disabled as a result of the disease. The South African government provides a disability grant to the persons with disability along with the grants to old people as an old age pension (Woolard, 2003).

The occurance of stroke in younger age has also implication on psychological state. The family needs are more fulfilled by younger population than older stroke population. Inability to return to employment places a state of depression or anxiety (Teasall, et al. 2000). Moreover, difficulty in caring for family as before increases the psychological stress.

5.5.2 Severity of stroke

Severity of stroke was found to be a significant factor affecting functional outcome at discharge and two months. The National Institute of Health Stroke Scale (NIHSS) was used as a tool to measure severity of stroke. On admission and at discharge the majority of participants i.e. 52% and 45.7% respectively, were having moderate stroke, scoring between 5 and 15 on NIHSS. Severity of stroke plays a major role that the outcome could mainly determined by initial severity and other comorbid factors (Vibo, Korv and Roose, 2007). It is also studied in literature that initial stroke severity, measured by National Institute of Health Stroke Scale (NIHSS), predicts three-month mortality and outcome (Yano, Popper, Kagan, Chyon and Grove, 1994). Weimer, Ziegler, Konig and Diener (2002) aimed to develop prognostic model for functional outcome and death after 100 days of ischemic stroke. The researchers identified that NIHSS at admission was a predicting factor for functional outcome as well as for mortality along with other factors. Therefore, initial severity helps clinicians anticipate functional outcome with the help of rehabilitation. Neverthless, this should not be used as a selection criteria for admission to stroke rehabilitation (Lin, Hsio, Chang, Huang and Liu, 2000). Some of the participants in the study scored zero on NIHSS. However, score zero does not mean absence of stroke (Martin-Schild, et al. 2011). This means that the person has no impairments identified by NIHSS.

5.5.3 Functional level at admission and discharge

Stroke patients face a major challenge in limitations in activities (Mayo, Wood-Dauhinee, Ahmed, Gordon, Higgins, et al. 1999). The Barthel Index was used to measure the participants' ability to perform functional activities of daily living. In the present study majority of participants were dependent in daily activities, scoring between 0 and 55 on Barthel Index at the time of admission (Granger, Dewis, Peters, Sherwood and Barret, 1979). Although dependent, the individual item performed by majority of patients was feeding. None of them was able to independently perform mobility and stair climbing. In acute stage the dependent state does not always mean inability of the patients to perform activities of daily living. This can be inferred in two ways. One is because of the acute stage of stroke that the medical professionals made the patient bedridden. Second is the severity of stroke that patient is unable to perform any activity. The current study finds the functional level at admission to be a potential factor ($p<0.0001$) which influences functional outcome at discharge. Although it was not a significant factor at two months. A study of Nakao, et al. (2010) states that Barthel Index scores determined at approximately three weeks were reliable predictors of ADL disabilities at six months.

At discharge also majority of the participants were still dependent. The reason for this is the shorter length of stay (mean length of stay 10.4 days) of participants as the study was conducted in a tertiary hospital. The discharge is not related to the level of function but the medical stability and the patients were referred elsewhere for rehabilitation. So major change in their functional status cannot be expected in every case. However, increased number of participants was shown to be able to perform activities like dressing, toileting, transfer in and out of bed, mobility and stair climbing with or without support. This implies that at discharge many of the participants needed moderate or minimal assistance for functional activities of daily living. However, it is evident that stroke unit model of care reduces mortality and dependency after stroke in developed countries (Rudd, Hoffman, Irwin, Lowe and Pearson, 2005). Similarly, de Villers, et al. (2009) reported that multidisciplinary stroke unit model of care improves early outcome in an under resourced rehabilitation settings in urban South Africa. In the current study, limitations to perform activities independently like bathing, dressing

and toileting could be because of the hospital environment and nursing assistance that might have prevented them to perform up to their ability.

At two months, a significant improvement was noted for individual items on Barthel Index between discharge and two months. There were participants who were independent in all basic activities of daily living. However, still majority of participants needed maximum assistance, Barthel Index scores of 0/100 to 55/100 (Granger, et al. 1979). This implies that they need caring and assistance. Inability of participants to perform bathing or stair climbing could be because of environmental barriers at home. It is also important to understand patients' abilities to perform basic activities so that they can be encouraged more. There is also a concern that early benefits achieved by an acute stroke unit rehabilitation could be eroded by a lack of adequate rehabilitation after discharge (De Villers, et al. 2009).

The two-month follow up of Barthel Index scores was done telephonically. Previous literature finds a telephonic interview of Barthel Index almost as reliable as direct interview (Korner-Bitensky and Wood-Dauphinee, 1995). Although the telephonic interviews are reliable, the results of the present study could have been influenced by a large drop out of 34% due to inability to contact telephonically.

5.6 Limitations of the study

1. The rehabilitation as one of the factors was limited only to total number of sessions provided during hospital stay. The frequency, intensity and process of rehabilitation were not included in the study as the aim of the study was to identify various factors that influence functional outcome. This might have limited the potentiality of rehabilitation factor that could influence functional outcome of stroke patients. Moreover, rehabilitation provided after discharge was also unknown which could be considered at two months.

2. The study had a high drop out rate of 34% at two months. In this case the inferences should be made with caution. The researcher did intention-to-treat analysis to address this condition.

3. The researcher conducted telephonic interview at two months to obtain data through Barthel

Index. Due to telephonic interviews at two months, the researcher could not actually get the information of rehabilitation sessions received after discharge. This is due to the fact that at two months the participants or caregiver may not be expected to give precise information about total number of rehabilitation sessions provided after discharge. The information that could be expected was whether rehabilitation provided or not and for how long.

5.7 Summary of the chapter

In this chapter, the researcher discussed the findings of the study in relevance to the research question. Each factor was discussed and compared with worldwide literature. The results of the current study are similar to the literature that increasing age and severity of stroke are associated with poor functional outcome. The findings about two-month functional level were somewhat differing with the previous literature. However, as the number of obtained data were less at two-months, this could be justified. Influence of rehabilitation on functional outcome was in contrast with the existing literature. Further conclusion and recommendations are presented in the following chapter.

6 SUMMARY, CONCLUSION, SIGNIFICANCE AND RECOMMENDATIONS

6.1 Introduction

In this chapter, the researcher provides a summary of the study, concludes the findings of the study and provides recommendations that arose from the study. The significance and limitations of the study are also highlighted.

6.2 Summary

Paucity of information was available in South Africa on functional outcome of stroke patients admitted to a tertiary hospital and in acute stage. Stroke as one of the leading causes of death and disability necessitated identifying factors influencing functional outcome. For a stroke victim functional recovery holds a prior objective. Early identification of factors influencing functional outcome for stroke patients is important to establish effective management. This study aimed to identify the factors influencing functional outcome of stroke patients admitted to a tertiary hospital.

The researcher was motivated to conduct the study after reviewing literature that very little information is available concerning factors influencing functional outcome of stroke in South Africa. All types of stroke patients benefit from treatment and rehabilitation in the stroke unit. The South African Stroke Society (SASS) and the SASS writing committee (Bryer, et al. 2010) has recommended every stroke patient to be admitted in a stroke unit. Conversely, no such research has done that is based in tertiary care hospital in Western Cape.

The Barthel Index was a tool used to determine the functional outcome. Various factors influencing functional outcome were measured using different tools such as National Institute of Health Stroke Scale (NIHSS), Hospital Anxiety and Depression Scale (HADS) and a socio-demographic and medical profile data form. A longitudinal, quantitative, observational study assessed the functional outcome of the participants at discharge and two months post-stroke.

The study found the following factors to be potential in influencing functional outcome at two dif-

ferent points of time: age, severity of stroke, functional level at admission and rehabilitation. Age, severity of stroke and functional level at admission were found to be influencing functional outcome significantly at discharge. While at two months the factors influencing functional outcome were only age and severity of stroke. Both these factors were associated with poor functional outcome. Total number of rehabilitation sessions was not significant at either discharge or two months. During the two months period, significant improvement was observed in the individual basic activities of daily living of Barthel Index including total independence. However, majority of them were living with maximal assistance at discharge and two months. Hypertension and smoking were most common risk factors among participants.

6.3 Conclusion

The study revealed that age and severity of stroke are the two factors that affect functional outcome at discharge and two months post stroke. The findings indicate that increasing age and severe stroke are associated with decreased functional outcome. Functional level at admission was influencing functional level at discharge from hospital. The higher the functional level at admission, more the functional outcome at discharge post stroke. Also hypertension and smoking were the two most common risk factors associated with stroke. The study found younger stroke patients admitted to a tertiary set up. In addition, number of rehabilitation sessions was not found significant for functional outcome at discharge or two months post stroke.

It can therefore be concluded that in an acute stage of stroke, age and severity of stroke at onset are the two major factors to be given importance for the concern of later functional outcome. Study on rehabilitation factors such as intensity, duration and different types of rehabilitation need to be elaborated for better outcomes. This will provide rehabilitation professionals to be more attentive towards the above-mentioned factors to achieve better outcome. The study emphasizes to promote stroke unit admissions and care for stroke patients and development of awareness among population about stroke and associated factors.

6.4 Significance of the study findings

The results from the study suggest that age should be used in combination with severity of stroke to anticipate functional outcome after receiving rehabilitation. This will also assist the health care team in referring the patients to appropriate rehabilitation facility after earlier rehabilitation. Much of the South African population is rapidly undergoing epidemiological transition with increase exposure to stroke risk factors. This will result in to increase in the burden of stroke. At this point, identifying such factors that influence functional outcome will prove beneficial to prevent a long-term burden of stroke among population.

6.5 Recommendations

6.5.1 Recommendations to the rehabilitation professionals

The mean age was found to be low in the study population. The researcher would like to recommend the rehabilitation professionals to set up a health promotion intervention that aims to increase awareness about the risk factors of stroke and its outcome. The individuals who have suffered a stroke should be encouraged about the control of hypertension and refrain from smoking and alcohol. This would help preventing long-term burden of stroke in young victims.

6.5.2 Recommendations for further research

The questions arose from the current study could be considered in further studies. Further research should be conducted to study the intensity, frequency and process of different rehabilitation therapies provided in a tertiary hospital and their effect on functional outcome of stroke patients. At the same time, follow up study could be conducted to gain knowledge or keep track of patients' rehabilitation after discharge. The outcome is required to be studied in a broader aspect of sensory, motor and cognitive recovery.

There is a need to identify the influence of psychological factors after acute stage of stroke is over, which might provide better idea on how these factors actually affect lifestyle behavior and what

implementations are required to address them.

It is recommended by the researcher that the same study should be replicated in other provinces of South Africa to have a generalized view about the factors and functional outcome of stroke and provision of rehabilitation over the country.

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APPENDIX A

OFFICE OF THE DEAN
DEPARTMENT OF RESEARCH DEVELOPMENT

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2 July 2010

To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape has approved the methodology and the ethics of the following research project by: Ms I Parekh (Physiotherapy)

Research Project: The factors influencing functional outcome of stroke patients admitted to a Tertiary Hospital

Registration no: 10/5/6

Peter Syster
Manager: Research Development Office
University of the Western Cape

APPENDIX B

Enquiries : Dr B Patel
Telephone : (021) 404-4469
Fax : (021) 404-4304
E-mail : Bpatel@pgwc.gov.za
Reference : Research
Date : 12 August 2010

Departement van Gesondheid
Department of Health
ISebe IezeMoilo

Ms I Parekh
Physiotherapy
UNIVERSITY OF WESTERN CAPE

Dear Ms A Truter

RESEARCH: **THE FACTORS INFLUENCING FUNCTIONAL OUTCOME OF STROKE PATIENTS ADMITTED TO A TERTIARY HOSPITAL**

Your recent letter to the hospital refers.

You are hereby granted permission to proceed with your research.

Please note the following:-

a) Your research may not interfere with normal patient care.
b) Hospital staff may not be asked to assist in the research.
c) No hospital consumables and stationery may be used.
d) Please introduce yourself to the person in charge of an area before commencing.

I would like to wish you every success with your project.

Thanking you

Batel

DR B PATEL
SENIOR MEDICAL SUPERINTENDENT

BP/em 12/08/2010

Groote Schuur Hospital
Private Bag,
Observatory, 7935
Telephone: 404-9111

APPENDIX C

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959, Fax: 27 21-959

E-mail:

CONSENT FORM

Title of Research Project:

The study has been described to me in language that I understand and I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Participant's name…….. Witness……

Participant's signature……

Date……

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

Study Coordinator's Name: Anthea Rhoda

University of the Western Cape

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APPENDIX D

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INFORMATION SHEET

[Instructions: This template can be used to assist you in preparing your information sheet. Please ensure that your information sheet addresses any of the ethical issues that you feel participants of your study should be aware of. Bolded, italicized text found throughout this document offers guidance and suggestions. Replace this text with the appropriate wording for your study.]

Project Title: The factors influencing functional outcome of stroke patients admitted to a Tertiary hospital

What is this study about?

This is a research project being conducted by PAREKH ISHITA at the University of the Western Cape.

We are inviting you to participate in this research project because you have a stroke and you are admitted to a Groote Schuur Tertiary Hospital. The purpose of this research project is to determine the factors influencing functional outcome of the stroke patient.

What will I be asked to do if I agree to participate?

You will be asked to answer some questionnaires related to describe your feelings, your daily life activities and your vision, speech and attention. You will have to answer those questions truly. For some questions, you will be given options. You will have to choose any one of them which you feel is matching your condition. This study will be conducted at Groote Schuur Tertiary Hospital in stroke unit and medical ward. The first questionnaire will take around 10-15 minutes. The second one will take 20-30 minutes. The third one will be of around 5 minutes. The last questionnaire will be asked to you or your caregiver or some of the information will be obtained from your folder. The questions will be about your education, socio economic status, your satisfaction and home environment. The whole duration of questionnaire would be of around 30-40 minutes.

Would my participation in this study be kept confidential?

We will do our best to keep your personal information confidential. To help protect your confidentiality, I will keep the data in a password protected computer files and you will be recognised by code and not names. Only I will be having an access to the identification key.

If we write a report or article about this research project, your identity will be protected to the maximum extent possible. Audiotapes will be used for the ease of verification of your answers. You are free to deny if you are not agreeing for audiotape.

What are the risks of this research?

There are no known risks from participating in this research study.

What are the benefits of this research?
The research might not benefit you directly. But the results could be used to improve the services provided to stroke patients admitted to Groote Schuur Hospital.

Do I have to be in this research and may I stop participating at any time?
Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify. Your decision to participate or not participate in this research project will not affect your treatment at the hospital in any way

Is any assistance available if I am negatively affected by participating in this study?
If you are Non-English speaking then you will be asked questions in your home language.

What if I have questions?
This research is being conducted by ***PAREKH ISHITA, Department of Physiotherapy*** at the University of the Western Cape. If you have any questions about the research study itself, please contact PAREKH ISHITA at: Cell No.0786 254 608.
My email id is iparekh87@gmail.com.

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Prof. A Rhoda
University of the Western Cape
Private Bag X17
Bellville 7535
Email: arhoda@uwc.ac.za

This research has been approved by the University of the Western Cape's Senate Research Committee and Ethics Committee.

APPENDIX E

Socio-demographic and medical data form

Patient Code:
Folder No.

DEMOGRAPHIC DATA

Name

Age **Gender** Male=1
Female=2 [ ]

DOB:

MEDICAL DATA

DOA:

Date of Stroke Onset:

Conciousness on Admission (GCS)

Side of Lesion Left=1
Right=2
both=3 [ ]

Side of Impairment Left=1
Right=2
both=3 [ ]

Diagnosis based on CT=1
MRI=2
Clinical Assessment=3
Both=4 [ ]

Location of lesion

Type of Stroke Ischemic=1
Hemorrhagic=2
Indeterminate=3 [ ]

CT or MRI Results: [ ]

Patient Code:
Folder No.

RISK FACTORS

NO = 0 YES = 1

Hypertention ☐

(systolic bolood pressure > 160 mmHg and/or diastolic blood pressure > 95 mmHg based on several measurements or on a 24-hours registration)

Diabetes Mellitus ☐
(repeated fasting glucose level of more than 7.8 mmol/L according to wHO diagnostic criteria or a recorded history o diabetes treated or untreated

Heart disease ☐

Hyperlipidemia ☐
(WHO-def cholesterol > 200mg/100ml)

Oral Contraception ☐
(Only current use is documented)

Peripheral vascular disease ☐

Previous thrombosis ☐

CO-EXISTING ILLNESSES

1. Pulmonary disease

Specify_____

2. Musculoskeletal disorder

Specify_____

3. Other
Specify:

HIV/AIDS STATUS (CD4 count)

1 = Documented Positive ☐
2 = Documented Negative
3 = Unknown (not documented in medical records)

Patient Code:
Folder No.

QUESTIONNAIRE COMPLETED AT DISCHARGE

Education level:

Employment:

Smoking NO = 0 YES = 1 ☐

Alcohol NO = 0 YES = 1 ☐

Language English = 1 ☐
Afrikaans = 2
Isi-Xhosa = 3

Address

Treatment given MEDICAL
PT ☐ OT ☐ SLT ☐ PSYCHOLOGICAL COUNSELLING ☐

Treatment sessions per day (frequency)

Length of stay

THE FOLLOWING QUESTIONS ARE RELATED TO THE REFERRAL:

REFERRAL AGENCY:

1	Tertiary Hospital	☐
2	Secondary Hospital	☐
3	Local CHC	☐
4	Other CHC	☐
5	Community based organisation	☐
6	NGO	☐
7	Other CHC	☐

Specify other _____

Name of referral Institution _____

DATE OF REFERRAL TO COMMUNITY HEALTH CENTRE _____

Patient Code:_____

QUESTIONNAIRE COMPLETED ON ADMISSION TO CHC

GENERAL DEMOGRAPHIC DATA

STRICTLY CONFIDENTIAL !!!!

PATIENT NAME:	
GENDER:	
ADDRESS:	
TELEPHONE NUMBER:	
DATE OF BIRTH:	
DATE OF STROKE:	
DATE OF INTAKE AT CHC:	

APPENDIX F

NIH STROKE SCALE

Patient Identification. ___ ___-___ ___ ___-___ ___

Pt. Date of Birth ___ ___/___ ___/___

Hospital _____(___ ___-___

Date of Exam ___ ___/___ ___/___

Interval: [ ] Baseline [ ] 2 hours post treatment [ ] 24 hours post onset of symptoms ±20 minutes [ ] 7-10 days
[ ] 3 months [ ] Other _____(___ ___)

Time: ___ ___:___ ___ [ ]am [ ]pm

Person Administering Scale _____

Administer stroke scale items in the order listed. Record performance in each category after each subscale exam. Do not g
back and change scores. Follow directions provided for each exam technique. Scores should reflect what the patient does, n
what the clinician thinks the patient can do. The clinician should record answers while administering the exam and work quick
Except where indicated, the patient should not be coached (i.e., repeated requests to patient to make a special effort).

Instructions	Scale Definition	Score
1a. Level of Consciousness: The investigator must choose a response if a full evaluation is prevented by such obstacles as an endotracheal tube, language barrier, orotracheal trauma/bandages. A 3 is scored only if the patient makes no movement (other than reflexive posturing) in response to noxious stimulation.	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 and requires strong or painful stimulation to make movements (not stereotyped). 3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and areflexic.	_____
1b. LOC Questions: The patient is asked the month and his/her age. The answer must be correct - there is no partial credit for being close. Aphasic and stuporous patients who do not comprehend the questions will score 2. Patients unable to speak because of endotracheal intubation, orotracheal trauma, severe dysarthria from any cause, language barrier, or any other problem not secondary to aphasia are given a 1. It is important that only the initial answer be graded and that the examiner not "help" the patient with verbal or non-verbal cues.	0 = **Answers** both questions correctly. 1 = **Answers** one question correctly. 2 = **Answers** neither question correctly.	_____
1c. LOC Commands: The patient is asked to open and close the eyes and then to grip and release the non-paretic hand. Substitute another one step command if the hands cannot be used. Credit is given if an unequivocal attempt is made but not completed due to weakness. If the patient does not respond to command, the task should be demonstrated to him or her (pantomime), and the result scored (i.e., follows none, one or two commands). Patients with trauma, amputation, or other physical impediments should be given suitable one-step commands. Only the first attempt is scored.	0 = **Performs** both tasks correctly. 1 = **Performs** one task correctly. 2 = **Performs** neither task correctly.	_____
2. Best Gaze: Only horizontal eye movements will be tested. Voluntary or reflexive (oculocephalic) eye movements will be scored, but caloric testing is not done. If the patient has a conjugate deviation of the eyes that can be overcome by voluntary or reflexive activity, the score will be 1. If a patient has an isolated peripheral nerve paresis (CN III, IV or VI), score a 1. Gaze is testable in all aphasic patients. Patients with ocular trauma, bandages, pre-existing blindness, or other disorder of visual acuity or fields should be tested with reflexive movements, and a choice made by the investigator. Establishing eye contact and then moving about the patient from side to side will occasionally clarify the presence of a partial gaze palsy.	0 = **Normal.** 1 = **Partial gaze palsy;** gaze is abnormal in one or both eyes, but forced deviation or total gaze paresis is not present. 2 = **Forced deviation,** or total gaze paresis not overcome by the oculocephalic maneuver.	_____

NIH STROKE SCALE

Patient Identification. ___ ___-___ ___ ___-___ ___ ___

Pt. Date of Birth ___ ___/___ ___/___ ___

Hospital _____(___ ___-___ ___)

Date of Exam ___ ___/___ ___/___ ___

Interval: [ ] Baseline [ ] 2 hours post treatment [ ] 24 hours post onset of symptoms ±20 minutes [ ] 7-10 days
[ ] 3 months [ ] Other _____(___ ___)

3. Visual: Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting or visual threat, as appropriate. Patients may be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal. If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia, is found. If patient is blind from any cause, score 3. Double simultaneous stimulation is performed at this point. If there is extinction, patient receives a 1, and the results are used to respond to item 11.	0 = **No visual loss.** 1 = **Partial hemianopia.** 2 = **Complete hemianopia.** 3 = **Bilateral hemianopia** (blind including cortical blindness).	_____
4. Facial Palsy: Ask – or use pantomime to encourage – the patient to show teeth or raise eyebrows and close eyes. Score symmetry of grimace in response to noxious stimuli in the poorly responsive or non-comprehending patient. If facial trauma/bandages, orotracheal tube, tape or other physical barriers obscure the face, these should be removed to the extent possible.	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 (absence of facial movement in the upper and lower face).	_____
5. Motor Arm: The limb is placed in the appropriate position: extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine). Drift is scored if the arm falls before 10 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic arm. Only in the case of amputation or joint fusion at the shoulder, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.	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; does not hit bed or other support. 2 = **Some effort against gravity;** limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity. 3 = **No effort against gravity;** limb falls. 4 = **No movement.** UN = **Amputation** or joint fusion, explain: _____ **5a. Left Arm** **5b. Right Arm**	_____ _____
6. Motor Leg: The limb is placed in the appropriate position: hold the leg at 30 degrees (always tested supine). Drift is scored if the leg falls before 5 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic leg. Only in the case of amputation or joint fusion at the hip, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.	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;** leg falls to bed by 5 seconds, but has some effort against gravity. 3 = **No effort against gravity;** leg falls to bed immediately. 4 = **No movement.** UN = **Amputation** or joint fusion, explain: _____ **6a. Left Leg** **6b. Right Leg**	_____

NIH STROKE SCALE

Patient Identification. ___ ___-___ ___ ___-___ ___ ___

Pt. Date of Birth ___ ___/___ ___/___ ___

Hospital _____(___ ___-___ ___)

Date of Exam ___ ___/___ ___/___ ___

Interval: [ ] Baseline [ ] 2 hours post treatment [ ] 24 hours post onset of symptoms ±20 minutes [ ] 7-10 days
[ ] 3 months [ ] Other _____(___ ___)

7. Limb Ataxia: This item is aimed at finding evidence of a unilateral cerebellar lesion. Test with eyes open. In case of visual defect, ensure testing is done in intact visual field. The finger-nose-finger and heel-shin tests are performed on both sides, and ataxia is scored only if present out of proportion to weakness. Ataxia is absent in the patient who cannot understand or is paralyzed. Only in the case of amputation or joint fusion, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice. In case of blindness, test by having the patient touch nose from extended arm position.	0 = **Absent.** 1 = **Present in one limb.** 2 = **Present in two limbs.** UN = **Amputation** or joint fusion, explain: _____	_____
8. Sensory: Sensation or grimace to pinprick when tested, or withdrawal from noxious stimulus in the obtunded or aphasic patient. Only sensory loss attributed to stroke is scored as abnormal and the examiner should test as many body areas (arms [not hands], legs, trunk, face) as needed to accurately check for hemisensory loss. A score of 2, "severe or total sensory loss," should only be given when a severe or total loss of sensation can be clearly demonstrated. Stuporous and aphasic patients will, therefore, probably score 1 or 0. The patient with brainstem stroke who has bilateral loss of sensation is scored 2. If the patient does not respond and is quadriplegic, score 2. Patients in a coma (item 1a=3) are automatically given a 2 on this item.	0 = **Normal;** no sensory loss. 1 = **Mild-to-moderate sensory loss;** patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick, but patient is aware of being touched. 2 = **Severe to total sensory loss;** patient is not aware of being touched in the face, arm, and leg.	_____
9. Best Language: A great deal of information about comprehension will be obtained during the preceding sections of the examination. For this scale item, the patient is asked to describe what is happening in the attached picture, to name the items on the attached naming sheet and to read from the attached list of sentences. Comprehension is judged from responses here, as well as to all of the commands in the preceding general neurological exam. If visual loss interferes with the tests, ask the patient to identify objects placed in the hand, repeat, and produce speech. The intubated patient should be asked to write. The patient in a coma (item 1a=3) will automatically score 3 on this item. The examiner must choose a score for the patient with stupor or limited cooperation, but a score of 3 should be used only if the patient is mute and follows no one-step commands.	0 = **No aphasia;** normal. 1 = **Mild-to-moderate aphasia;** some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension, however, makes conversation about provided materials difficult or impossible. For example, in conversation about provided materials, examiner can identify picture or naming card content from patient's response. 2 = **Severe aphasia;** all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden of communication. Examiner cannot identify materials provided from patient response. 3 = **Mute, global aphasia;** no usable speech or auditory comprehension.	_____
10. Dysarthria: If patient is thought to be normal, an adequate sample of speech must be obtained by asking patient to read or repeat words from the attached list. If the patient has severe aphasia, the clarity of articulation of spontaneous speech can be rated. Only if the patient is intubated or has other physical barriers to producing speech, the examiner should record the score as untestable (UN), and clearly write an explanation for this choice. Do not tell the patient why he or she is being tested.	0 = **Normal.** 1 = **Mild-to-moderate dysarthria;** patient slurs at least some words and, at worst, can be understood with some difficulty. 2 = **Severe dysarthria;** patient's speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute/anarthric. UN = **Intubated** or other physical barrier, explain:_____	_____

NIH STROKE SCALE

Patient Identification. ___ ___-___ ___ ___-___ ___ ___

Pt. Date of Birth ___ ___/___ ___/___ ___

Hospital _____(___ ___-___ ___)

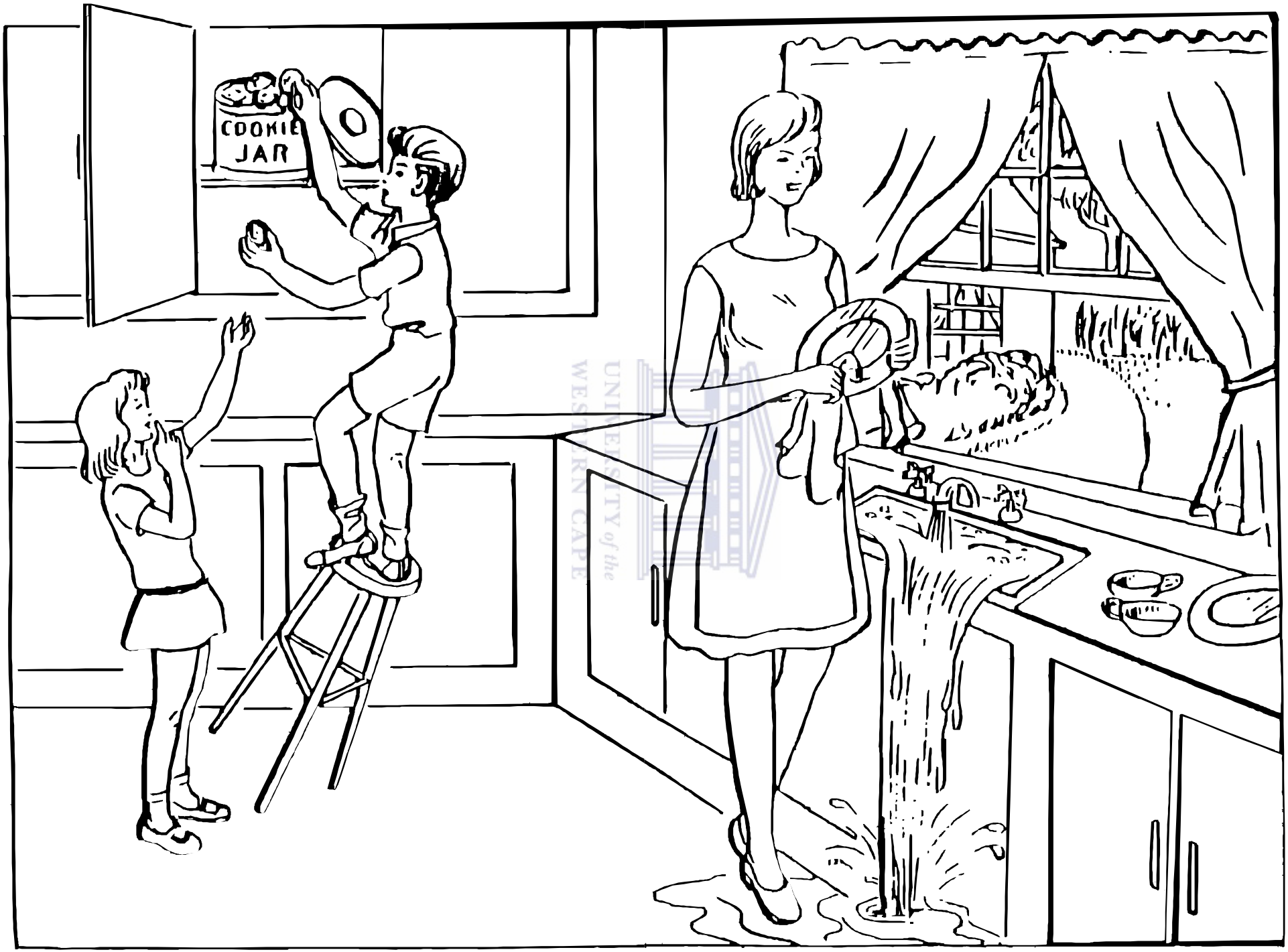
Date of Exam ___ ___/___ ___/___ ___

Interval: [ ] Baseline [ ] 2 hours post treatment [ ] 24 hours post onset of symptoms ±20 minutes [ ] 7-10 days
[ ] 3 months [ ] Other _____(___ ___)

11. Extinction and Inattention (formerly Neglect): Sufficient information to identify neglect may be obtained during the prior testing. If the patient has a severe visual loss preventing visual double simultaneous stimulation, and the cutaneous stimuli are normal, the score is normal. If the patient has aphasia but does appear to attend to both sides, the score is normal. The presence of visual spatial neglect or anosagnosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never untestable.	0 = **No abnormality.** 1 = **Visual, tactile, auditory, spatial, or personal inattention** or extinction to bilateral simultaneous stimulation in one of the sensory modalities. 2 = **Profound hemi-inattention or extinction to more than one modality;** does not recognize own hand or orients to only one side of space.	_____

_____

_____


COOKIE
JAR

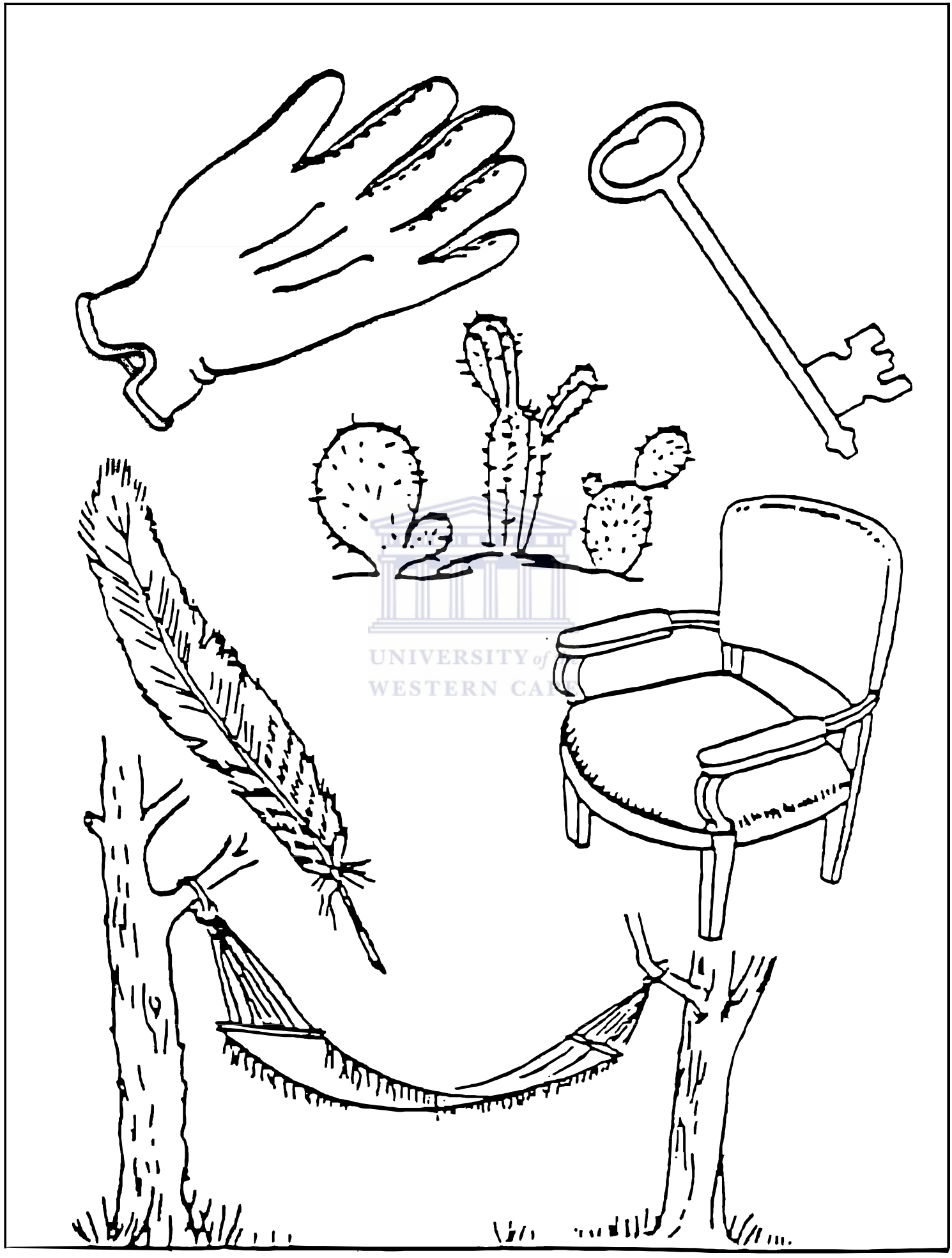
You know how.

Down to earth.

I got home from work.

Near the table in the dining room.

They heard him speak on the radio last night.



MAMA

TIP – TOP

FIFTY – FIFTY

THANKS

HUCKLEBERRY

BASEBALL PLAYER

APPENDIX G

Hospital Anxiety and Depression Score (HADS)

This questionnaire helps your physician to know how you are feeling. Read every sentence. Place an "X" on the answer that best describes how you have been feeling during the LAST WEEK. You do not have to think too much to answer. In this questionnaire, spontaneous answers are more important

A	**I feel tense or 'wound up':**	
	Most of the time	3
	A lot of the time	2
	From time to time (occ.)	1
	Not at all	0
D	**I still enjoy the things I used to enjoy:**	
	Definitely as much	0
	Not quite as much	1
	Only a little	2
	Hardly at all	3
A	**I get a sort of frightened feeling as if something awful is about to happen:**	
	Very definitely and quite badly	3
	Yes, but not too badly	2
	A little, but it doesn't worry me	1
	Not at all	0
D	**I can laugh and see the funny side of things:**	
	As much as I always could	0
	Not quite so much now	1
	Definitely not so much now	2
	Not at all	3
A	**Worrying thoughts go through my mind:**	
	A great deal of the time	3
	A lot of the time	2
	From time to time, but not often	1
	Only occasionally	0
D	**I feel cheerful:**	
	Not at all	3
	Not often	2
	Sometimes	1
	Most of the time	0
A	**I can sit at ease and feel relaxed:**	
	Definitely	0
	Usually	1
	Not often	2
	Not at all	3

D	**I feel as if I am slowed down:**	
	Nearly all the time	3
	Very often	2
	Sometimes	1
	Not at all	0
A	**I get a sort of frightened feeling like "butterflies" in the stomach:**	
	Not at all	0
	Occasionally	1
	Quite often	2
	Very often	3
D	**I have lost interest in my appearance:**	
	Definitely	3
	I don't take as much care as I should	2
	I may not take quite as much care	1
	I take just as much care	0
A	**I feel restless as I have to be on the move:**	
	Very much indeed	3
	Quite a lot	2
	Not very much	1
	Not at all	0
D	**I look forward with enjoyment to things:**	
	As much as I ever did	0
	Rather less than I used to	1
	Definitely less than I used to	2
	Hardly at all	3
A	**I get sudden feelings of panic:**	
	Very often indeed	3
	Quite often	2
	Not very often	1
	Not at all	0
D	**I can enjoy a good book or radio/TV program:**	
	Often	0
	Sometimes	1
	Not often	2
	Very seldom	3

APPENDIX H

HOSPITAAL ONGERUSTHEID EN DEPRESSIESKAAL
(HOSPITAL ANXIETY AND DEPRESSION SCALE)

Dit word erken dat emosies 'n groot rol in die meeste siektes speel. Die doel van hierdie vraelys is om vas te stel hoe jy voel. Lees elke vraag en maak 'n kruisie langs die blokkie wat die naaste beskryf hoe jy in die laaste week gevoel het. Moenie te lank dink voordat jy antwoord nie; dit gaan oor jou eie indruk. Daar is geen verkeerde antwoorde nie; elke antwoord is korrek, so lank dit jou eie mening beskryf.

A. Ek voel gespanne en opgewen:			D. Ek voel asof ek stadiger is:		
(3) Die meeste van die tyd			(3) Amper altyd		
(2) Baie kere			(2) Baie		
(1) Van tyd tot tyd			(1) Soms		
(0) Glad nie			(0) Glad nie		
D. Ek geniet nog steeds die dinge wat my genot verskaf het:			A. Ek kry 'n tipe van bang gevoel soos skoenlappers in my maag		
(0) Definitief			(0) Glad nie		
(1) Nie so baie nie			(1) Soms		
(2) Net 'n bietjie			(2) Gewoonlik		
(3) Byna nooit nie			(3) Baie		
A. Ek voel soms bang, asof iets verskrikliks gaan gebeur:			D. Ek stel nie meer belang in my voorkoms nie:		
(3) Definitief, en baie erg			(3) Definitief		
(2) Ja, maar nie erg nie			(2) Ek sorg nie so veel soos ek moet nie		
(1) 'n Bietjie, maar dit pla my nie			(1) Ek neem nie so veel sorg nie		
(0) Nooit nie			(0) Ek stel net so veel belang soos altyd		
D. Ek kan lag en die snaakse sy van die lewe sien:			A. Ek voel rusteloos asof ek gedurig aan die beweeg moet bly:		
(0) Soos gewoonlik			(3) Baie definitief		
(1) Nie meer so baie nie			(2) Baie dikwels		
(2) Definitief nie meer nie			(1) Nie baie nie		
(3) Glad nie			(0) Amper nooit nie		
A. Kommerwekkende gedagtes gaan deur my verstand:			D. Ek sien met genot uit na dinge:		
(3) Die meeste van die tyd			(0) Soos altyd van tevore		
(2) Baie kere			(1) Minder as gewoonlik		
(1) Van tyd tot tyd, maar nie baie nie			(2) Definitief minder as gewoonlik		
(0) Net soms			(3) Nooit nie		
D. Ek voel opgewek:			A. Ek voel skielik paniekbevange:		
(3) Glad nie			(3) Beslis baie dikwels		
(2) Nie baie nie			(2) Dikwels		
(1) Soms			(1) Nie dikwels nie		
(0) Die meeste van die tyd			(0) Glad nie		
A. Ek kan rustig sit en voel ontspanne:			D. Ek geniet 'n goeie boek of TV/ radioprogram:		
(0) Definitief			(0) Dikwels		
(1) Gewoonlik			(1) Soms		
(2) Nie gewoonlik nie			(2) Nie dikwels nie		
(3) Glad nie			(3) Baie min		

APPENDIX I

Indlela yokulinganisa umgangatho wenkxalabo nokudakumba komguli esibhedlele

Kuyazeka ukuba uvakalelo lunendima enkulu oluyidlalayo kuninzi lwezigulo. Eli phepha lemibuzo lijolise ekuvezeni indlela oziva ngayo. Funda yonke imibuzo uze uphendule ngokuthi ubeke uphawu lomnqamlezo kwibhokisi ebonakalisa eyona ndlela othe waziva ngayo kule veki iphelileyo. Musa ukuthabatha ixesha elide ucinga phambi kokuba uphendule umbuzo: Kufunwa nje uluvo lwakho. Akukho zimpendulo zingalunganga, impendulo nganye ichanekile, ukuba nje ibonakalisa uluvo lwakho.

A. Ndiziva ndixhalabile ndenzakele emphefumlweni:		**D. Ndiziva ndityhafile:**
(3) Phantse onke amaxesha		(3) Phantse ngalo lonke ixesha
(2) Ixesha elininzi		(2) Rhoqo
(1) Ngamaxesha athile, ngamanye amaxesha		(1) Ngamanye amaxesha
(0) andixhalabanga kwaphela		(0) Andityhafanga kwaphela
D. Ndisazonwabela izinto ebendikade ndizonwabela:		**A. Ndikholisa ukuba noloyiko ngathi ndinamabhabhathane apha esiswini**
(0) Nqo		(0) Andinalo kwaphela
(1) Hayi kakhulu		(1) Ngamanye amaxesha
(2) Kancinane nje		(2) Rhoqo
(3) Andisazonwabeli kwaphela		(3) Phantse ngalo lonke ixesha
A. Ndiba noloyiko ngathi kukho into embi eza kwenzeka:		**D. Ndiphelelwe ngumdla kwinkangeleko ya**
(3) Ndibanalo rhoqo yaye ngendlela eyoyikekayo		(3) Nqo
(2) Ewe, kodwa hayi kangako		(2) Andisazikhathaleli ngendlela ebekufanele ukuba ndizikhathalele ngayo
(1) Kancinane, kodwa akundihluphi oko		(1) Ndinokungazikhathaleli kangako
(0) Andibi nalo kwaphela		(0) Ndizikhathela kakhulu njengakuqala
D. Ndingahleka ndidizibone ngendlela ehlekisayo/eyonwabisayo izinto:		**A. Andizinzanga, oku ngathi kukho into eth mandihambe:**
(0) Kangangoko ndisoloko ndinakho		(3) Kunjalo kanye

(1) Akusenzeki kakhulu ngoku (2) Ngokuqinisekileyo akusafani nakuqala (3) Andikwazi kwaphela		(2) Kwenzeka amaxesha amaninzi (1) Hayi kakhulu (0) Andizinzanga kwaphela
A. Ndifikelwa ziingcinga ezikhathazayo:		**D. Ndijonge ndinomnqweno wokuzonwabe izinto:**
(3) Phantse onke amaxesha (2) Amaxesha amaninzi (1) Namanye amaxesha, kodwa hayi rhoqo (0) Ngamaxesha athile kuphela		(0) Kangangokuba ndandiqhelile ngaphambili (1) Ngaphantsi kunokuba ndandiqhele ukwenz (2) Ngokuqinisekileyo kancinci kunokuba ndandisenza (3) Andilindelanga nto kwaphela
D. Ndiziva ndonwabile:		**A. Ndimane ndifikelwa kuphaphazela ngesiquphe:**
(3) Andonwabanga kwaphela (2) Hayi ngalo lonke ixesha (1) Ngamanye amaxesha (0) Amaxesha amaninzi		(3) Rhoqo (2) Amaxesha amaninzi (1) Hayi rhoqo (0) Andiphaphazeli nakanye
A. Ndinakho ukuzihlalela nje ndiziphumlele:		**D. Ndingakonwabela ukufunda incwadi emnandi okanye inkqubo ye-TV:**
(0) Ngokuqinisekileyo (1) Rhoqo (2) Hayi rhoqo (3) Andikhe ndikwenze oko nakanye		(0) Rhoqo (1) Ngamanye amaxesha (2) Hayi rhoqo (3) Manqapha-nqapha

Amanqaku okudakumba ewonke: (D)
Amanqaku enkxalabo ewonke: (A)

Abaguli bayacelwa ukuba bakhethe impendulo ibe nye kwezine ezinikiweyo kumbuzo ngamnye. Mabanike impendulo ekhawulezileyo, yaye kufuneka banqandwe ukuba bangathabathi ixesha elide becinga ngeempendulo. Imibuzo ebhekiselele kwinkxalabo iphawulwe ngo "A" yaze ebhekiselele kwindakumbo yaphawulwa ngo "D". Amanqaku ombuzo ngamnye abekwe kwizibiyeli phambi kwempendulo.

APPENDIX J

THE BARTHEL INDEX

Patient Name: _____

Rater Name: _____

Date: _____

Activity	Score
FEEDING 0 = unable 5 = needs help cutting, spreading butter, etc., or requires modified diet 10 = independent	_____
BATHING 0 = dependent 5 = independent (or in shower)	_____
GROOMING 0 = needs to help with personal care 5 = independent face/hair/teeth/shaving (implements provided)	_____
DRESSING 0 = dependent 5 = needs help but can do about half unaided 10 = independent (including buttons, zips, laces, etc.)	_____
BOWELS 0 = incontinent (or needs to be given enemas) 5 = occasional accident 10 = continent	_____
BLADDER 0 = incontinent, or catheterized and unable to manage alone 5 = occasional accident 10 = continent	_____
TOILET USE 0 = dependent 5 = needs some help, but can do something alone 10 = independent (on and off, dressing, wiping)	_____
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	_____
MOBILITY (ON LEVEL SURFACES) 0 = immobile or < 50 yards 5 = wheelchair independent, 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	_____
STAIRS 0 = unable 5 = needs help (verbal, physical, carrying aid) 10 = independent	_____

TOTAL (0–100): _____

APPENDIX K

Riglyne vir die gebruik van die Barthel-Indeks (Voor beroerte)

1. Hierdie indeks moet gebruik word as 'n rekord van wat 'n pasiënt wel gedoen het, **nie** as 'n rekord van wat 'n pasiënt sou kon doen nie.
2. Die hoofdoel is om die mate van afhanklikheid van hulp vas te stel, fisies of verbaal, hoe gering ook al en om watter rede ook al.
3. Die behoefte aan toesig laat 'n pasiënt **nie** onafhanklik nie.
4. 'n Pasiënt se vermoë moet bepaal word deur gebruik te maak van die beste beskikbare getuienis. Die pasiënt, vriende, familie en verpleegkundiges kan gewoonlik ondervra word, maar direkte waarneming en gesonde verstand is ook belangrik. Direkte toetsing is egter nie nodig nie.
5. Middelkategorieë impliseer dat die pasiënt meer as 50 persent van die poging bydra.
6. Die gebruik van hulpmiddele om onafhanklik te wees word toegelaat.
   (Wade, '92)

Barthel

1. Stoelgang (maagwerk) ☐

0 = inkontinent (of benodig 'n lawement)
5 = toevallige ongelukke (een keer per week)
10 = kontinent

2. Blaas

0 = inkontinent, of gekateriseer en kan nie alleen oor die weg kom nie ☐
5 = toevallige ongelukke (maksimum een maal per 24 uur)
10 = kontinent

3. Selfversorging

0 = benodig hulp met persoonlike versorging ☐
5 = onafhanklik met gesig, hare, tande, skeer (gebruiksartikels voorsien)

4. Toiletgebruik

0 = afhanklik ☐
5 = benodig hulp, maar kan iets self doen
10 = onafhanklik (op en af, aantrek, afvee)

5. Eet

0 = kan nie ☐
5 = benodig hulp met sny, botter smeer, ens.
10 = onafhanklik

6. Veplasing (van bed na stoel en terug)

0 = kan nie, geen balans sittend ☐
5 = benodig baie hulp (een of twee persone, fisies), kan sit
10 = benodig min hulp (verbaal of fisies)
15 = onafhanklik

7. Beweeglikheid

0 = onbeweeglik
5 = onafhanklik met rolstoel, ook om draaie
10 = loop met hulp van een persoon (verbaal of fisies)
15 = onafhanklik (kan enige hulpmiddel gebruik, bv, kierie)

8. Aantrek

0 = afhanklik
5 = benodig hulp maar kan omtrent helfte self doen
10 = onafhanklik (insluitend knope, ritssluiters, veters)

9. Trappe klim

0 = kan nie
5 = benodig hulp (verbaal, fisies, dra van hulpmiddels)
10 = onafhanklik

10. Bad

0 = afhanklik
5 = onafhanklik

TOTAAL

APPENDIX L

Isalathiso sika-barth

1. Amathumbu

0 = Akakwazi ukuzibamba (okanye needs to be given enema)
5 = Uyazenzela ngamanye amaxesha (kanye ngeveki)
10 = uyakwazi ukuzibamba

2. Isinyi

0 = Akakwazi ukuzibamba okanye ufuna uncedo ukuze akwazi ukuzilawula
5 = Uyaphulukwa ngamnye amaxesha (ubuninzi kanye ngeeyure ezinggama-24)
10 = Uyakwazi ukuzibamba

3. Grooming

0 = Udinga uncedo ukuzeakkwazi ukuzicoca
5 = Uyaukuzihoya: ukucoca ubuso/ukukama iinwele/ukuhlamba amazinyo/ ukucheba amazinyo/ukucheba iindevu (xa ethe wanikwa izixhobo zokuzicoca ngomnye umntu

4. Ukusebenzisa igummbi langasese

0 = Ufuna ukucediswa
5 = Ufuna uncedo kodwa unakho ukuzenzela eyedwa
10 = Uyakwazi engancedisawanga (ukuzikhulula nokuzinxibisa,nokuzosula akugqiba ukuzinceda)

5. Ukuzityisa

0 = akakwazi
5 = ufuna uncekusikeni nasekuqabeni ibhotolo,njl njl.
10 = Uyakwazi ukuzenzela

6. Ukutshintsha indawo yokuhlala (ukusuka ebhedini ukuya esitulweni Nokuphinda abuye)

0 = akakwazi, ngenxa yokungakwazi ukuzihlalela/ukuchopha

5 = Ufuna uncedo olumandla (anediswe ngumtu omnye okanye ababini)
10 = Ufuna uncedo olungephi (ukuyalelwa ukuba enzeni okanye afunqulwe)
15 = Uyakwazi ukuzitshintshela ngokwakhe

7. Ukuhamba

0 = Akakwazi ukuhambe

5 = Akaxhomekekanga kwisitulo sokuncedisa ukuhmba esinamavili independent,including corners
10 = Uyahamba ngocedo lomnnye umntu (ngokuthi afunqulwe okanye ayalelwe amakakwenze)
15 =Uyakwazi ukuzihambela (kodwa angasebenzisa uncedo, olufana nolwentoga youkusimelela)

8. Ukunxiba

0 = uxhomekeke kuncedo lomnye umntu

5 = Ufuna uncedo kodwa uyakwazi ukuzinxibisa azinye izinto engancediswanga

10 = Akaxhomekekanga mntwini (kuquka ukukhulula nokuqhobosha amaqhosa, ukuvala nokuvula iziphu, ukuqhobosha nokuulula imitya, njl njl.

9. Izitepsi

0 = Akakwazi ukunyuka nokwehla

Ufuna uncedo (ngokuthi ayalelwe okanye afunqulwe)

10 = Akaxhomekekanga mntwini

10. Ukuzihlamba

0 = Uxhomekeke

5 = Akaxhomekekanga mntwini

TOTAAL
