THE OUTCOME FOR UPPER LIMB AND PERSONAL MANAGEMENT DURING THE THREE MONTHS AFTER ONSET OF STROKE IN PATIENTS ATTENDING OCCUPATIONAL THERAPY

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DECLARATION

I, Zukiswa Msengana, declare that this short report is my own work. It is being submitted for the degree of Master of Science in Occupational Therapy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signature:

.....02....day of .February.....2017.

DEDICATION

This research is dedicated to my mother who inspired me and gave me the opportunity to study. She is aware of the debilitating effects of stroke as a result she is very cautious about her blood pressure and sugar levels. She goes for check up on a monthly basis even though she is not suffering from any of these conditions.

PRESENTATIONS ARISING FROM THIS STUDY

Oral presentation at Chris Hani Baragwanath Academic Hospital's annual Occupational Therapy exhibition day: 18 May 2014.

Title: The outcome for upper limb and personal management during the three months after onset of stroke in patients attending occupational therapy.

ABSTRACT

This research project described the outcomes for upper limb motor function (ULMF) and personal management (PM) for patients attending occupational therapy at Chris Hani Baragwanath Academic Hospital post-stroke.

A quantitative, descriptive correlation design was used. A purposive sample of adult patients who met the inclusion criteria was selected. The researcher completed initial assessments of ULMF using the Fugl–Meyer assessment and the South African Data for Functional Measurements: Beta Scale to assess independence in PM. Research participants received rehabilitation as usual. The same measurements were administered on discharge and during out-patient follow up appointments at one, two and three months.

Data was analysed using descriptive statistics. Results indicated that recovery of ULMF was influenced by the site of lesion. Gender and age did not influence recovery of ULMF. Severe motor disability, which resulted in poor recovery of UL and LL, yielded poor independence in PM.

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NOMENCLATURE

Co-morbidities– are defined as the disorders that coexist with the primary condition in a human body. A co-morbid condition is associated with the worse health outcomes, more complex clinical management, and increased health care costs(1).

Functional ability– refers to the ability to perform the required action in a proper and precise manner(2).

Hemiplegia– is defined as paralysis of one side of the body; usually caused by a brain lesion, such as a tumour, or by stroke syndrome. The paralysis occurs on the side opposite the brain disorder. The fibres in these tracts cross to the opposite side; therefore damage to the right cerebral hemisphere affects motor control of the left half of the body (3).

Motor recovery– is the process of regaining the ability to move the part of the body that is weak or paralysed. It relates to: restoration of function in neural tissue that was initially lost; restoration of ability to perform movement in the same way as before injury; and successful task completion as typically done by individuals who are not disabled(4).

Occupational dysfunction – is the inability to perform the activities that are role specific to a person(5).

Occupational performance – is described as dynamic transaction among the client, the context, and the activity. Improving or enabling skills and patterns in occupational performance leads to engagement in occupations or activities(6).

Personal management – is a process a person follows by performing activities that are pertaining to improving self to fulfil own goal/s(5).

Postural control – the ability to maintain balance while changing positions.

Selective control of movement – is the ability to produce isolated movement in parts of the body such as arms, legs and trunk in a selected pattern in response to demands of a voluntary movement or posture(7).

Synergistic movement – contraction of antagonist and agonist muscles simultaneously, causing a stereotyped movement and the functional linkage of

muscles during voluntary motor action. In post stroke hemiparesis, synergistic movements get disorganized in the form of stereotyped behaviours(8).

Upper limb motor function – is the ability to move the arm and hand muscles in a precise manner that is energy efficient to perform a task or act(5).

ABBREVIATIONS

ADL	–Activities of daily living
BP	–Blood pressure
CHBAH	– Chris Hani Baragwanath Academic Hospital
CST	– Corticospinal tract
CVD	– Cardiovascular disease
HIV	– Human Immunodeficiency Virus
IC	– Internal capsule
MCA	– Middle cerebral artery
PLIC	– Posterior limb of internal capsule
PM	– Personal management
PMA	– Premotor area
RST	– Rubrospinal tract
RMM	– Rasch measurement model
SADFM	– South African Database for Functional Medicine
SCOM	– Selective control of movement
SMA	– Supplementary motor area
UL	– Upper limb
ULMF	– Upper limb motor function

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Occupational therapy uses scientifically selected purposeful, meaningful and goal directed activities that aim to restore functioning to individuals or a group of people who experience occupational dysfunction as a result of medical conditions such as strokes(9). Occupational therapy, in addition to prescribing therapeutic occupations, uses specific techniques to treat stroke survivors to prevent disability, promote and maximise independence in functioning in all occupational performance areas including personal management (PM), social participation, work /productivity and leisure. Occupational therapists have expertise in the assessment and treatment of occupational dysfunction and the client factors and performance skills which contribute to this dysfunction. With stroke survivors, Occupational therapists use various methods such as observation during performance of a task, standardised or non-standardised tests of physical, psychosocial and environmental factors, to identify the deficits and set treatment goals(9, 10).

The annual stroke prevalence rate in South Africa has been estimated to be 75 000 new cases per year. A South African study by Bertram, Katzenellenbogen and Bradshaw (2013) estimated the death rate from stroke to be 25 000 per annum and it was estimated that 58 % of stroke survivors would have some residual disability, varying from mild (23 %) to severe (8%)(11). Stroke results from an insult in the brain such as intra-cerebral haemorrhage or infarction, resulting in death of cells caused by circulation problems. Both haemorrhagic and ischemic stroke results in motor impairment on one side of the body. Literature reports that some stroke survivors remain occupationally disabled while others need assistance in PM activities for as much as six months pos t stroke(9).

Personal management refers to those occupations associated with the care of one's own body and are performed daily such as feeding, grooming, bathing, dressing, toileting, transfers and locomotion. These PM tasks are typically affected as a result of a stroke. It is therefore imperative that stroke survivors receive therapy to restore as much function as possible in this critical occupational performance area(5).

According to current literature, stroke survivors should receive rehabilitation that includes mobilisation and PM retraining within 24 hours of the stroke incident regardless of the type of stroke. This early introduction of therapy has been observed to have positive benefits in the clinical trials conducted in stroke units in Norway(12).

However the concept of the right time to start therapy post stroke is controversial. Some authors, including Bernhardt, Thuy, Collier and Legg (2009) as well as Craig, Bernhardt, Langhorne and Wu (2010), did reviews on early mobilisation after stroke. They investigated whether stroke survivors should only be moved out of bed and PM rehabilitation started three days after the onset of stroke(13, 14). However, they found no conclusive evidence that supports early mobilisation as an approach that would yield to successful functional outcomes at three months post stroke. On the other hand, Rohweder, Ellekjær, Salvesen, Naalsund and Indredavik (2015), recommend that stroke survivors should be treated within 24 hours after stroke onset for successful therapy outcomes at 3 months post stroke(15). Early intervention is recommended due to its effectiveness in preventing complications caused by immobility in bed which can be life threatening(15). The success of occupational therapy intervention in the initial stages of recovery is measured by the improvement of upper limb motor functioning (ULMF)and level of independence in PM(9).

Recovery of ULMF after stroke involves a complex process in the brain whereby neural tissue that was damaged during stroke gets restored through rehabilitation and hence the return of movement of the UL(4). Facilitation of recovery of ULMF in acute stroke using functional task practice versus using strength training techniques is a gold standard in rehabilitation and it was found to be beneficial(16).

Recovery of ULMF and PM after stroke are essential factors in the rehabilitation of stroke using the affected UL. The recovery of function in PM is important after stroke to restore self-efficacy of the stroke survivor. Task specific therapy including PM tasks is beneficial in rehabilitation. This was also found by Blennerhassett and Dite (2004) from the randomised controlled trial with 30 stroke participants who received additional task related practice after their usual rehabilitation sessions(17).

At Chris Hani Baragwanath Academic Hospital (CHBAH) in Johannesburg South Africa, where the researcher works, on average eighty stroke survivors are referred to the occupational therapy department every month. These stroke survivors are initially

seen as in-patients for the period of hospitalisation which has been reported to average six days(18). During this period of hospitalisation these stroke survivors are typically only able to attend a minimum of three occupational therapy sessions per week resulting in limited occupational performance gains. Following discharge these stroke survivors are referred for follow-up out-patient occupational therapy, however the return rate of these stroke survivors is concerningly low. Thus the long term gains described in the international literature from routine but more intense occupational therapy programmes are not being achieved in the majority of cases in this service delivery context.

A fairly routine occupational therapy stroke protocol is used in both the in- and out-patient occupational therapy programmes which include various treatment techniques that aim to improve motor mobility and independence in daily functioning. There is uncertainty as to the effectiveness of the occupational therapy stroke survivor intervention programme offered to these stroke survivors at CHBAH as the programme has not been subject to any scientific investigation and critical review.

1.2 RESEARCH PROBLEM

Stroke survivors admitted at CHBAH receive occupational therapy which focuses on addressing resultant problems including physical limitations of the affected side and participation restrictions in activities of daily living (ADL), particularly PM in the immediate period post stroke. Occupational therapists implement various neuro-physiological treatment approaches to improve functioning of motor abilities of the paretic upper limb (UL) and ADL. However, the functional recovery of stroke survivors is not systematically recorded at CHBAH. This is the result of not using a standardised reporting format describing recovery and progress for the affected UL, including arm and hand, as well as PM as an outcome of therapy. Furthermore, this affects the ability of the occupational therapy department to scientifically evaluate the treatment protocol offered and modify the treatment protocol based on evidence.

Currently there are no outcome measures being used by the occupational therapists at CHBAH to record recovery of motor mobility of affected UL and functional outcomes in PM of the stroke survivors that receive therapy. Treatment outcomes are recorded in the stroke survivor's occupational therapy file. However they are not recorded in a standardised manner. Thus, the effectiveness of occupational therapy interventions

with stroke survivors during the first three months of recovery cannot at this stage be confirmed. It was therefore considered important to investigate these aspects to improve services rendered to patients during the critical time for neurological repair(19).

1.3 RESEARCH QUESTION

What functional outcomes can be recorded and achieved in ULMF and PM within the specific cohort of stroke survivors attending an occupational therapy programme at CHBAH during their admission and the first three months post stroke?

1.4 AIM AND PURPOSE OF THE STUDY

Thus, the aim of the study is to describe the ULMF and PM outcomes by recording recovery within hospitalisation and the first three months post incidence of stroke survivors at CHBAH attending occupational therapy using a standardised outcome measure for ULMF and also for PM. The purpose will be to introduce occupational therapists to using a standardized method to record assessment and treatment outcomes. This will provide valid and reliable data which can be used to measure the effectiveness of intervention to this cohort of clients who receive treatment and ultimately improve service delivery.

1.5 OBJECTIVES

Four objectives were set to guide the study:

- To describe the profile of stroke patients treated in the occupational therapy department at CHBAH.
- To determine ULMF on referral, on discharge and at one, two and three months post incidence of stroke survivors attending occupational therapy at CHBAH initially as an in-patient and then as an out -patient.
- To determine the PM dysfunction on referral, on discharge and at one, two and three months post incidence in stroke survivors for patients attending occupational therapy initially as an in-patient and then as an out –patient.
- To determine the association between the outcomes for ULMF and PM of stroke survivors attending occupational therapy at CHBAH on referral, at discharge and at one, two and three months post incidence.

1.6 JUSTIFICATION FOR THE STUDY

This research was conducted in order to develop a uniform and systematic way of recording the progress of all stroke survivors who attend occupational therapy at CHBAH, regardless of the treatment approach used by the individual therapists. This will enable the department to use the records to scientifically review the existing treatment protocol and propose changes to improve service delivery.

As the researcher is a senior occupational therapist employed at CHBAH, and the research is focused on the needs of this context the result of the study will inform practice to routinely use the outcome measure, if the recording tools are found to be useful. Therapists will then be encouraged to use these standardised outcome measures if they are found to be effective in observing the dysfunction of the patient in terms of client factors as well as occupational performance dysfunction.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Literature was reviewed in order to provide the current scientific background for the study. National and international literature published in the period 1995-2015 was reviewed. All literature that reported on the following topics was reviewed: effects of stroke on ULMF and ADL function; recovery of the UL and functioning in PM in the three months after stroke; prevalence and risk factors of stroke, prognostic indicators for each variable being investigated; treatment approaches pertaining to occupational therapy for these two variables and measurement tools to identify if they are suitable for this study. Conclusions were drawn from the available literature on the recovery of ULMF, PM and prognostic indicators that affects recovery in these variables.

When reviewing literature for this study, the researcher used the Wits library data-bases to search for the articles that were relevant to this study: Science direct; Google Scholar, Ebscohost and PubMed were used. The key words that were used were: UL motor recovery after stroke, effects of stroke on motor function, effects of stroke in ADL performance, recovery of function in ADLs after stroke, risk factors for stroke, stroke prevalence in South Africa and worldwide. Articles were downloaded, read and analysed for relevance to the study being conducted.

2.2 STROKE

2.2.1 Stroke in the South African Context

Stroke is defined by the World Health Organization (WHO) as rapidly developing signs of focal and global disturbance of cerebral functioning leading to death or lasting longer than 24 hours with no apparent course other than vascular disorders(20).

In Sub Saharan Africa (SSA), it has been identified that stroke is one of the leading causes of death which occur across all ages including much younger ages such as teenagers. The majority of stroke sufferers have been found to have hypertension as a pre morbid condition which is a risk factor. Stroke can result in premature death or permanent disability and carries a high cost of care. Early rehabilitation after stroke is recommended during the in-patient phase and family education and counselling is vital in maximising PM and social functioning(21).

Stroke incidence in South Africa is mostly based on hospital studies. In a quantitative study conducted by Rosman (1986) all patients presenting with new and old strokes who were admitted to Kalafong, Mamelodi and Atteridgeville Hospitals were identified. The researcher monitored the admissions of acute stroke patients in the hospital over a period of 12 months. This study examined the characteristics of stroke patients admitted including incidence and different types of strokes. These patients' ethnicity was blackand all were aged from 20 years and above. The results revealed that 101 people per 100,000 per year suffered from a stroke, including people over 20 years of age(22).

There are large numbers of stroke patients that get admitted in South African hospitals. Stroke is ranked in the top four diseases that cause death in South Africa. In a recent descriptive quantitative researchstudy on a sample of 200 participants suffering from first-time ischaemic stroke at CHBAH, Mudzi, Stewart and Musenga (2012), found that 25 % of stroke participants died within three months post discharge from hospital and about 38 % died within 12 months post discharge from hospital(18).

A quantitative study conducted by Connor, Rheeder, Bryer, Meredith, Dubb and Fritz at the Charlotte Maxeke Johannesburg Academic Hospital revealed that there were approximately 524 new stroke patients referred over a period of 23 months. Among these new stroke patients, 432 were first time stroke patients and consisted of 308 black patients and 76 white patients. They had various types of strokes, and hypertension was identified as the most common risk factor in approximately 70% of the black ethnic group and 68% of the white ethic group(23). A data review by Maredza, Bertram and Tollman (2015) was conducted in the Agincourt Sub-district to assess the epidemiology of stroke including the incidence, mortality and duration of disability in rural South Africa. They utilised the population based data of 70 000 people from the period of 2007–2011 within Agincourt Sub-district. Their findings revealed that 244 out of 100,000 people suffer from stroke in rural Agincourt sub-district of Mpumalanga province. They identified that people in the rural areas are exposed to the risk factors of stroke and estimated stroke prevalence in South Africa to be about 75000 strokes occurring annually(24). However this study was not considered as representative of the population of South Africa due to its small sample size. Stroke incidence is approximately 412,000 per year in SA according to reviews done in 2008(11).

Connor, Walker, Modi and Warlow (2007) did a systemic review on the burden of stroke in SSA between 1966 and 2006. They found the most relevant information on stroke prevalence in South Africa that was done by the Stroke Prevention Initiative Team during the census in 2001. This study obtained information by asking families they visited if there was a member in the family who had weakness on one side of the body and if the person had suffered a stroke. The individuals who agreed to both questions were visited and followed up by clinicians trained in stroke assessments or a neurologist accompanied by an interpreter to verify if the individual had suffered a stroke in order to eliminate transient ischaemic attacks (TIA). They identified 103 people with stroke resulting in an age standardised to the Segi world population (95 % CI 238–343) people above 15 years of age where male prevalence was 281 per 100 000 and female 315 per 100 000 (243-387(25). Cerrato, Grasso, Imperiale, Priano, Baima, Giraudo, Rizzuto, Azzaro, Lentini and Bergamasco (2004)conducted an empirical observation study on 273 stroke patients with ischaemic stroke. Patients between 16 and 49 years were assessed to determine etiology and risk factors of young stroke sufferers(26). Similarly, Petrea, Beiser, Seshadri, Kelly-Hayes, Kase and Wolf (2009) conducted a longitudinal community based cohort study on a sample of 5393 women. The participants were women aged forty five with no history of stroke. They followed them up until their first ever stroke up to the age of 56 years. They found that stroke was more prevalent in females than males(27). There was no significant data available in systemic reviews on stroke on mortality, prevalence, incidence and case fatality in South Africa during the study on burden of stroke in the black population by Connor, Walker, Modi and Warlow (2007)(25).

The length of hospital stay in South African hospitals was found to be shorter than the length of hospital stay in other countries. A descriptive study on a small sample of 30 stroke patients in a rural village of Ingwavuma in Kwa-Zulu Natalby Wasserman, De Villiers and Bryer (2009) assessed patients on discharge and again at three months post stroke. The study reported that the average hospital stay was 7 days(28). This length of hospitalisation is different from developed countries as noted from the study that was conducted by Zhu, Newcommon, Cooper, Green, Seal, Klein, Weir, Coutts, Watson and Barber (1997). They conducted a retrospective study of two cohorts of patients using the administrative databases of patients admitted in the stroke unit against patients admitted in the hospital general neurology or medical ward. They

compared the length of hospital stay between these two units on a sample of 1567 participants. They found that, 53% of these participants had a longer hospital stay, averaged at 19 days in the medical or neurology wards compared to stroke unit(29). Van Straten, Van der Meulen, Van den Bosand Limburg (1997) conducted a retrospective study in the Netherlands in six hospitals where neurologists were the participants. Each neurologist was interviewed to give report on the reason why 154 patients were retained in hospital. The reasons given were analysed by the authors. These researchers reported that according to the participants, the stay of 15 days is due to hard medical reasons (for 54% of the sample), 3 day stays are due to soft medical reasons (10% of the sample) and “10 days in hospital can be attributed to non-medical reasons which includes waiting for placements” p 3(30).

Compliance to out-patient follow up was found to be influenced by cultural beliefs in an explorative qualitativestudy by Wegner and Rhoda (2015) in rural communities of Kwa-Zulu Natal. The data for this study were conducted focus group discussions with 17 therapists consisting of 8 physiotherapists, 7 occupational therapists, 1 speech therapist and 1 dietician working in a rural district in Kwa-Zulu Natal. They found that patients do not believe that rehabilitation would help them to recover or minimise or prevent disability. Patients have a belief that someone is behind their disability therefore they are being jinxed. In some cases, they found that patients roles prevent them from attending out-patient follow up as married young women are expected to continue with their roles regardless of the disability(31).

The other contributing factor to poor compliance to out-patient follow up had a spiritual origin. They found that there was a belief that stroke is a sign of wrath from the ancestors therefore certain rituals have to be completed, and these patients are less likely to be convinced about therapy and its effectiveness(31).

Access to transport was also identified by Gallagher, Hart, O'Brien, Stevenson and Jackson(2011) as a major barrier in rural villages(32). Disabled people who are wheelchair users experience difficulties in using public transport as they would not be allowed to board the taxi. If they are lucky the taxi would stop for them to embark, but they would have to pay double the taxi fare(31).

2.2.2 Risk Factors for Stroke

Stroke in HIV+ patients was first identified in 1980 through post mortem, but those patients were not diagnosed when they were still alive(33). It was diagnosed in autopsies performed on young people aged between 20 and 55. The new HIV+ secondary complications that have been identified include maculopathy which occurs due to occlusion of medium and large sized arteries(33, 34). Aneurysmal arteriopathy was also identified as another associated condition observed as saccular or fusiform dilatation of cerebral arteries. Introduction of combined Anti-Retroviral Therapy in 1996 reduced neurological infections and tumours of the brain. However, there are negative adverse effects such as an increase in myocardial infarction and ischemic and haemorrhagic stroke. Risk factors of stroke in HIV+ patients were identified in African patients aged<45 years. These risk factors included tobacco smoking, insulin resistance, cardiac disease and obesity. Diabetes is also a risk factor of stroke as it causes elevated risk of atherogenesis and thrombosis, impairment of cerebral blood flow and cerebral auto regulation(35).

South Africa is facing the burden of stroke which occurs as a result of a number of risk factors. Risk factors for stroke in South Africa have been divided into two categories namely those that can be influenced and those that cannot be influenced. The first category is the factors that cannot be controlled including advancing age, female gender, family history, socio–economic status and race. The second category is the risk factors that can be modified including hypertension, diabetes mellitus, HIV, atrial fibrillation, smoking, hypercholesterolemia, excessive alcohol intake, obesity, and physical inactivity and prothrombotic factors. Stroke is a recurrent condition if not controlled. Risk factors for recurrent stroke include having an initial stroke or a transient ischaemic attack with a second stroke likely to occur within 6 months to a year following the first time stroke, and within the first five years of the initial stroke(23).

In the South African urban context, 199 general practitioners participated in a multicentre observational study to tabulate risk factors. Each participant approached 50 consecutive patients aged 30 and above. They completed a questionnaire to record: the patients' blood pressure history, a current reading of a systolic BP ≥ 140 mmHg or a diastolic BP ≥ 90 mmHg; cardiovascular disease (CVD) were also listed, such as if patient was currently suffering from heart failure, ischaemic heart disease, venous thromboembolic event, history of atrial fibrillation (23).

Hypertension is generally a known risk for stroke, however with HIV+ patients hypertension is caused by inflammation of the vascular endothelium. Patients who are HIV+ suffer from cerebral vasculitis which occurs in the absence of systemic infections. Patients tend to suffer from opportunistic infections in the brain which cause stroke in a form of brain lesions or ischemia. Patients also suffer from occlusion of cerebral vessels or carotid arteries. A record review study of 67 South African HIV+ patients with first time stroke between 2000-2006,reported that, 13 (20%) patients had vasculopathy, with seven patients of the 13 presenting with extra cranial non aneurismal vasculitis causing occlusive carotid disease. Carotid vasculopathy was also found in 20 HIV+ patients with 18 of them also presenting with aneurismal vasculopathy(36).

It is not known how the pathology and mechanism occurs as it differs in each vessel. Cerebral infarction was found to be the most common type of stroke in 67 HIV+ patients. In 64 (96%) patients, cerebral infarction was the cause of stroke and 3 (4%) suffered from cerebral haemorrhage(37). Prevalence of brain infarction as a common cause of stroke was also found in other studies such as a review study done by Beal (2010), who found that 87% of 780 000 stroke patients suffered from brain infarction(38).

Participants included individuals from all ethnic groups: Black, White, Asian and Coloured. All these risk factors were unevenly occurring amongst the racial groups. Seventy-six percent of patients had more than one risk factor and 40% presented with two or more risk factors. Those presenting with three or more risk factors were most common in the White, Asian and Coloured populations with only 4% of the Black population falling into this category(23). Hypertension is the most common risk factor across all racial groups but commonest in the black population group. In the white population, the major risk factor was dyslipidaemia. In the Asian group the most common risk factor was diabetes mellitus. Cardiovascular diseases were most common in Whites, then Asian, Coloureds and the least in the Black population by 1% and similarly with previous stroke and TIA. Of this cohort, 24% had no risk factors with the majority of them being black (23).

Hypertension in South Africa was classified by Seedat, Rayner and Veriava (2014) whom provided a guideline that can be used to monitor blood pressure (BP) in order to combat related disease such as cardiovascular disease and stroke. Blood pressure

is one of the vital clinical signs that need to be managed as part of health promotion and prevention(39).

Table 2.1: Blood pressure classification according to Seedatetal.2014

Stage	Systolic BP	Diastolic BP
Normal	< 120	< 80
Optimal	120 – 129	80 – 84
High Normal	130 – 139	85 – 89
Grade 1	140 – 159	90 – 99
Grade 2	160 – 179	100 – 109
Grade 3	≥ 180	≥ 110
Isolated systolic	≥ 140	<90

High BP is a risk factor for stroke and CVD. They also recommended that patients with grade 2 hypertension should commence drug therapy. It has been identified that there is a rise in hypertension, HIV and diabetes mellitus as co–morbidities. Patients who are HIV+ and are on highly active antiretroviral therapy tend to suffer from hypertension with high levels of systolic BP. This is one of the complications that occur when a patient takes anti-hypertensive drugs and drug interactions occur. This results in inhibition or induction of metabolism. Consequently anti-hypertensive drugs enhanced effectiveness or lost its efficacy (39).

Cerrato, Grasso, Imperiale, Priano, Baima, Giraudo, Rizzuto, Azzaro, Lentini andBergamasco (2004) studied risk factors of stroke in young patients between ages 16 and 49 years. They found co-morbid conditions such as hypertension and minor embolic pathologies such as cardiac embolism as risk factors for stroke(26). Qureshi, Safdar, Patel, Janssen and Frankel(1995) also studied black patients and found their main risk factor was hypertension which was poorly controlled(40).

2.3 OCCUPATIONAL THERAPY AND STROKE REHABILITATION

Occupational therapy is a core health discipline that rehabilitates occupational performance in persons affected by stroke. Treatment is aimed at reducing the effects of the loss of motor functioning on one side of the body by using techniques to retrain motor function of UL and lower limbs (LL) in order to facilitate engagement in ADL(41). A longitudinal study by Kwakkel, Kollen and Lindeman (2004a), over a 32 months

period (between 1994–1997) was conducted by collecting data from two cohorts of patients. The first cohort included 102 stroke survivors who participated in another study and were recruited to this study from seven hospitals in Amsterdam in the Netherlands. The second cohort was a single subject design study with a sample of 3 chronic stroke patients who could walk independently for five minutes without a walking aid but had no movement on the UL.According to their findings, patients who do not have any movement of the affected UL a month after the onset of stroke are unlikely to gain full motor recovery(42). However these patients may gain independence in PM with the use of adaptive methods and therefore a rehabilitative approach is adopted to assist such patients to compensate for loss of function by making use of one handed techniques(5).

This phenomenon attributes to learned non-use. The mechanism for overcoming the learned non-use aims at activating the ipsilateral motor cortex, inhibition of contra-lesional motor cortex and modulation of the sensory afferents. Therapeutic techniques such as distal cutaneous electrical stimulation, mirror therapy or anaesthesia of the unaffected limb and virtual reality, which encourages cortical representation of the affected UL to prevent learned non-use can be implemented(43). During occupational therapy intervention UL movements interact with the neural processes underlying recovery. It has been observed that functional improvement may continue even after six months post stroke onset. Task dependent cortical activation results from skills learnt during the first weeks after stroke onset where outcomes can be predicted(42).

The importance of the approach in therapy is that it should address motor function and, at the same time, increase independence in performance of ADL. There are various treatment approaches for UL recovery and functioning in the ADL. The outcome of these approaches is to improve ULMF as well as improving functional independence of stroke patients(5).

Frames of reference for this treatment approach vary widely and include Brunnstrom Movement Therapy which focuses mainly on motor recovery by directly working on the stages of recovery in the arm, hand, wrist and fingers. However more recent motor relearning programs have been advocated(44). The motor relearning program is based on improving motor function through practicing the required movement in specific context using meaningful and specific activities. Evidence suggests that tasks done in an appropriate environment yield improved motor function. This approach of

using relevant context and practicing motor functioning through meaningful activities has been shown to be more beneficial than traditional exercises and passive movements(45).

Treatment is often based on more than one frame of reference, which can include Brunnstrom's stages of motor recovery of the UL by directly working on the UL, in conjunction with other approaches such as Motor Relearning Therapy by Carr and Sherperd(46) and Bobath Neuro-developmental Therapy(47). This combination would encourage the use of the affected hand based of Brunnstrom stages while practicing movement based on motor relearning within a specific meaningful task. In addition the Bobath techniques would facilitate postural control, coordinated and isolated movements(19).

Kwakkel, van Peppen, Wagenaar, Dauphinee, Richards, Ashburn et al.(2004b) reported on intensive therapy early post stroke where the outcomes of functioning in ADL were measured using the Barthel Index. They confirmed that there is a significant improvement in ADL functioning after six weeks of treatment. They also referred to two systemic reviews which suggested that patients who received intensive therapy early after stroke had a greater and better chance of functional improvement in ADL. Therefore the period for optimal neural repair has been identified as the first three to six months post stroke and thus needs to be utilised effectively by training the affected UL intensively(48). The impact of arm training on functional outcome is greatest for those who have residual active movements of the affected UL on initial assessment(49). Intensity of treatment which is characterised by proprioceptive stimulation, repetition of movements and longer time spent on the rehabilitation of the affected UL has been found to be effective in improving motor function when done in less than 6 months post stroke(50).

Sensory motor training programmes of the affected UL include exercises for improving motor performance, strength, power and endurance. These are more favoured when done using functional tasks for better transference in different environments(51). One of the theoretical frameworks that encourage use of functional tasks is motor relearning as it focuses on performing functional tasks based on ADL. This is encouraged as it has been found to be task oriented and includes repetitive training that ensures positive functional outcome in stroke rehabilitation(43).

In the clinical setting, Maclean, Pound, Wolfe and Rudd (2002) found that therapists have identified motivation as a barrier that can deter patients' recovery and progress in therapy. This was described according to patients' demeanour whereby a patient that is actively participating in therapy was viewed as motivated and a patient that was passive during intervention was viewed as lacking motivation. "This concept of motivation is viewed as a dangerous label when used in clinical setting as it can be used incorrectly, for example if it is applied to a patient who is reticent but motivated"p445(52).

2.4 RECOVERY OF UPPER LIMB MOTOR FUNCTION POST STROKE

Upper limb motor function is the person's ability to selectively move parts of the UL in different directions with varying degrees of controlled movements of the shoulder and scapula, elbow, forearm, wrist and fingers(41). Motor recovery post stroke follows a predictable pattern as identified by Shelton and Reding (2001). Return of movement is likely to start with shoulder movement followed by synergistic patterns of shoulder, elbow and wrist flexor and extensor synergies. As the recovery progresses, one can expect to see the disappearing of synergistic movements and reappearing of selected movements such as flexion at the shoulder, elbow extension and forearm pronation and supination. The last movements to reappear are isolated movements of the wrist and fingers(53).

In controversy to this Kwakkel, Kollen, van der Grond and Prevo (2003) found that motor recovery does not always follow a proximal to distal direction(54). Recovery of the affected UL differs for each patient. Some patients do not regain any significant voluntary movement, while others recover movements that end up in flexor or extensor mass patterns. There are however patients who regain full selective control of movement (SCOM) of the arm and hand(53).

The Fugl-Meyer Assessment: Upper Extremity (FMA-UE) is a tool that was derived following a predictable sequence of stages in UL motor recovery and translated into ordinal scores(55). In a study by Fugl Meyer, Jasko, Olsson and Steglind (1975), that developed and described the assessment method FMA-UE, 15 participants were selected from the Goteborg stroke register in Sweden. A follow up assessment was done at one week post stroke and every week until each participant was one year post

stroke. The finding suggests that, an individual's arm can progress to stage 3, while his hand can remain in stage 1. With some clients, the hand can improve to stage 2 which is marked by brisk reflexes and muscle tone in the hand but no observable movements(55). With the last group, clients can have movement presenting stage 3 for both arm and hand, which is characterized by synergistic movements with finger flexion but no voluntary finger extension. The FMA has been used in many research projects and is a reliable outcome measure that follows the sequence of movements as they appear in a predictable manner(53). According to Pedretti and Early (2001), research studies of ULMF found that, recovery can progress up to stage 3 when FMA was used(41).(55).

Most recent research findings investigating intensity of arm training in motor recovery post stroke revealed that when the amount of therapy was increased during the post-acute stage, there was a significant increase in motor mobility of the affected upper limb after six weeks(19). Shanta, Kamal and Davidson, (2012), report that the greatest neural reorganisation and return of motor function occurs during the first three months post stroke and that recovery in motor function following stroke plateaus after a year(19). Jorgensen and Nakayama (2002) conducted a prospective, consecutive and community based study on a large sample of 1 197 patients with acute stroke from a stroke unit of a hospital in Copenhagen in Denmark to investigate the patterns of recovery post stroke. Assessments were done weekly until the participants were discharged from rehabilitation. Assessments were repeated again at 6 months post stroke. They used the Barthel Index to measure outcomes and findings indicated that most functional recovery was achieved within 12.5 weeks for 95% of their participants and that 80% of participants reached maximum functional recovery level within six weeks post stroke. This suggests that most recovery occurs early after stroke(56).

However it was found that patients who had a little movement in their affected UL during the first month had greater chance of motor recovery than those who had no UL movement after a month post stroke (50). According to Pedretti and Early (2001), even patients presenting with motor recovery characterised by hypertonicity and limb synergy (Brunnstrom stage 3) may remain at this stage and never regain functional movement(41). It is suggested that these patients should be taught to compensate for their loss of functioning by utilising one handed adaptive techniques in therapy(57). Kwakkel et al.(2003) agree with this as they found that ULMF can be predicted by

observing lack of voluntary ULMF in the first week and lack of synergistic movements at week four post stroke, which results in poor motor outcomes at 6 months post stroke(54). It is important for therapists to have knowledge of prognostic indicators in order to optimise treatment goals and better inform patients about their condition. Therefore treatment for patients with poor prognosis of ULMF should aim at encouraging patients to deal with existing impairment and focus on teaching compensatory techniques(54). Similarly, Adey-Wakeling and Crotty (2013) also mentioned that, it is vital for therapists to understand UL recovery patterns in order to set realistic goals and use appropriate interventions according to an individual's impairments(58).

The outcome of therapy is to achieve movement of the affected UL, postural adjustments and independence in PM tasks, making the patient as independent as possible without the use of compensatory techniques or assistive devices, using the motor skills learnt and residual abilities of the sound hand. A patient can achieve independence in PM functioning even though full motor recovery in the affected UL was not achieved (5).

For patients who are severely affected and who show no movement after the first six weeks post stroke, it must be accepted that there are limited chances of regaining movement and therefore treatment should concentrate on the use of compensatory methods to improve independence in functioning, rather than retraining motor function in the affected UL (54).

2.5 SITE OF INJURY AND PREDICTED OUTCOMES

Return of isolated or synergistic movements of the affected UL post stroke include anatomical considerations including the location of the lesion. Sub-cortical strokes have descending fibres that course through corona radiata and converge as they approach the internal capsule (IC) which is attributed to be the cause of devastating motor problems due to involvement of lesions that affect the corticospinal tract (CST) fibres. Neuro anatomical implications post stroke that also result in recovery of movement that ends in synergistic patterns includes lesions severely affecting primary motor areas or the CST but has preservation of the supplementary motor area (SMA). The pre-motor area (PMA) coordinates movements which rely on visual guidance,

therefore recovery of motor function depends on the location of the lesion and the severity of the insult(53).

The UL gets affected post stroke regardless of the site of lesion. In areas that do not involve representation of the hand, spontaneous recovery occurs. Recovery of isolated movements depends on the site of the lesion and there are increased chances for recovery in cortical strokes that involve SMA and PMA, and minimal chances with sub-cortical strokes involving the corona radiata and CST (53).

The penumbra is also implicated in predicting patients' potential outcomes for UL motor recovery(59). According to Furlan, Marchal, Derlon, Baron and Viader (2004), recovery post stroke depends on the area of infarct called the penumbra tissue and the extent of its damage. In their study of eleven patients, they discovered that the volume of penumbra that escaped infarction was highly correlated with neurological recovery for about p≤ 0,4to p ≤ 0, 0001. Once the penumbra survives infarction, there are more chances for secondary perifocal neuronal organisation(59). Thus saving the penumbra early after stroke is vital, to prevent it from infarction as well as to reduce residual neurological impairment. Once the local blood flow is re-established, the ischaemic penumbra can have functional recovery. The reverse of this can lead to irreversible damage affecting the penumbra depending on severity and duration of ischaemia. The penumbra can lead to irreversible infarcts within 6 – 8 hours after insult(59).

The middle cerebral artery (MCA) is the largest of the intra-cerebral vessels and occlusion of this vessel occurs in two thirds of all first time strokes(42). These stroke insults situated deep in the area around the MCA mean that the UL and hand are more affected than the LL because of anatomical distribution of the MCA that supplies circulation to the motor areas of the UL. The area of the MCA territory that has the motor fibres which are responsible for voluntary movements, called the corticospinal tract (CST), is the main determinant of UL motor recovery post stroke (53). The CST and rubrospinal tracts (RST) are close fibres that course together through the IC. The posterior limb of internal capsule (PLIC) is the main limb where all fibres of the CST run through, and damage to this area through brain insult such as stroke result in flaccidity if the CST fibres are severed. However, if the CST is damaged, RST takes over and compensates for the severed CST resulting in observable movements of the

UL. As the CST is specifically responsible for the movement of fingers (even though the RST compensate for the CST), there will still be problems with recovery of isolated finger movements as the RST is unable to assist. This explains why patients have achieved mass grasp but no isolated finger movements(53).

Consequently, patients with lesions in MCA where the hand is largely represented show slower recovery of the UL and there is a poor outcome in motor recovery of the hand versus the LL (42).

2.5.1 Prognostic indicators related to site of injury

Hendricks, van Limbeek, Geurts and Zwarts (2002) indicated that a prognostic factor for motor recovery of the UL is related to the initial amount of paresis at onset(49). Similar findings supporting this statement were documented by Jongbloed (1986) and Heller, Wade, Wood, Sunderland, Hewer and Ward(1987) who tabulated factors that predict poor functional recovery after stroke. The factors include severity of stroke such as coma at onset, large size of cerebral lesion, history of previous stroke or co-morbid medical condition such as CVD. Poor prognosis was also associated with resultant cognitive dysfunction, urinary or bowel incontinence, visual spatial deficit, hemi neglect, poor sitting balance, poor upper extremity function or lack of motor recovery one month post stroke. Thus all these factors must be considered when determining the outcomes for patients post stroke(57, 60).

If a patient has a lesion in the area supplied by the MCA, there could be little or no improvement in the motor recovery of the UL (53, 54, 58).

A prospective cohort study was conducted by Kwakkel et al. (2003) on a total population sample of 102 participants presenting with stroke in the MCA territory, that lead to flaccid paralysis. Patients aged between 30 – 80 years were recruited from 7 hospitals in Netherlands. All participants had paralysis of both UL and LL. Assessments were done 14 days' post stroke onset and repeated weekly for the first 10 weeks. The last assessment was completed at 6 months post stroke. Data was collected over a 32 month period. These participants received neuro-facilitation techniques of the UL(54). Sixty two percent of these patients could not regain dexterity at six months post stroke, and only 32% regained partial movement(54). In contrast, it has been identified that the size of lesion does not have much effect on motor recovery if the area of MCA distribution is not damaged(53).

Hosoe (2009) identified right hemisphere syndrome as one of the conditions that predicts poor recovery post stroke as it is mainly characterised by psychological problems which limit optimal engagement in rehabilitation. These symptoms include left unilateral spatial agnosia, pusher's syndrome, apraxia, motor perseverance, aphasia, disarticulation, talkativeness or change of personality. These may not all be present, for it depends on the site and severity of the stroke(61).

It has been mentioned that some patients do not recover motor function due to spasticity, contractures or flaccidity and require adaptive methods(62). As stated in Radomski and Latham (2008), there are positive and negative features which occur after stroke on the hemiplegic hand. Spasticity and hypo-reflexia are called positive features which sabotage recovery of mobility(5). However negative features include weakness, fatigability, slowness and impaired dexterity and they are worse than positive features in causing motor impairment(5). Negative features are considered to be due to dysfunction in recruitment, firing rate and modulation of motor neurons. Positive and negative features in muscle tone continuum in the extremes, such as severe spasticity and flaccidity, cannot be fixed in therapy (48). Therefore, these factors are prognostic indicators of poor motor recovery in the hemiplegic extremity.

Recovery of ULMF and PM post stroke is not associated with age and gender but mostly depends on the severity of stroke insult(63). A retrospective cohort study was conducted by Luk, Cheung, Ho and Li (2006) on878 Chinese patients attending rehabilitation from multidisciplinary team in a neuro rehabilitation ward in a hospital in Hong Kong. Participant's ages ranged between 65–80 years. It was also found that old age patients improve in ULMF after stroke(64). However, Bagg, Pombo and Hopman (2002) found age as a significant factor that predicts outcomes in motor functioning and performance in ADL at discharge(65). Tilling Sterne, Rudd, Glas, Wityk and Wolfe(2001) found age as a factor that affects the rate of recovery of the ULMF(66). Gender was also reported as a factor that does not relate to recovery of ULMF and PM after stroke(67).

2.6 IMPACT ON FUNCTIONAL PERFORMANCE IN PERSONAL MANAGEMENT ACTIVITIES

Performance in PM post stroke can be affected by various factors. These factors include motor impairment of the UL and LL on one side of the body which affects the

quality of how the person performs PM and other daily activities. Cognitive and perceptual effects can greatly affect the individual's ability to perform PM activities or impact on the quality of performance. Irrespective of whether patients gain recovery of the UL or not, the outcome of occupational therapy is for the patients to gain more functional independence in ADL or require minimal assistance(68).

This outcome should serve as an indicator for patients to be discharged to the community where they can practice and engage in basic and instrumental ADL or community participation. This should include function in basic ADL, including dressing as well as simple instrumental ADL such as meal preparation, or participation in leisure interests such as participation in sport for the disabled if the patient prefers an active lifestyle(69).

In support of this, Dromerick, Lang, Birkenmeier and Hahn (2006) collected data which was self-reported by participants who were three months post stroke who had recovery of ULMF and independence in PM. Participants mentioned that they had difficulty performing complex or instrumental ADL using the recovered affected UL as they felt that they were only independent in PM, but motor recovery of UL did not yield to spontaneous recovery in performance in instrumental ADL(70).

Trunk control is the prerequisite for functional recovery after stroke. When the client has trunk control deficits, there is poor functioning distally. The client will have an inability to perform PM skills and other meaningful tasks. Trunk control is one of the important components that occupational therapists assess when predicting the outcomes for rehabilitation post stroke(71). According to Hsieh, Sheu, Hsueh and Wang (2002), success in regaining independence in PM functioning can serve as an outcome measure for therapists as they set goals around achieving PM independence. These authors also identified trunk control as a predicting factor for ADL functioning six months post stroke(72).

During the inpatient management, the focus for intervention is on achieving functional independence in PM skills. Personal management skills include eating, hygiene tasks, dressing and grooming, which are crucial for social interaction and social participation. Once a person succeeds in performing PM independently, they experience a sense of self efficacy. Achievement in these skills assists them to understand themselves and their place in society(73). These opportunities need to be created by therapists during

intervention. As stated in Gillen and Burkhardt (2004), lack of participation in occupations, including PM, leads to breakdown in habits or physiological deterioration where a person ends up losing the ability to competently perform in their PM(71). Independence in ADL participation has been deemed important for the maintenance of homeostasis, neuronal physiology and mental capacity at peak level which promotes a sense of self-worth and stimulates societal relationships(74)

2.6.1 Prognostic indicators of performance in personal management

Prognostic indicators of PM functioning three to six months post stroke were identified by Kwakkel et al. (2004a). They found that the level of impairment post stroke, bladder incontinence, motor disability and age were the most predicting factors and he classified them as level A factors. Level of consciousness, disorientation, sitting balance and previous stroke were classified as level B predicting factors(42). Tilling Stern, Rudd, Glass, Wityk and Wolfe (2001) supported that urinary incontinence predicts poor recovery of functioning after stroke from a study done with 710 participants(66).

However Meijer Ihnenfeldt, De Groot, Van Limbeek, Vermeulen and De Haan(2003) identified less common predictive factors such as dysphagia, ideomotor apraxia, ideational apraxia, visuo-spatial construction problems(75). If the patient is not severely disabled in motor functioning at onset, there is a greater chance of recovery in occupational functioning(76).Similarly, Nijboer, Kollen and Kwakkel (2014) also found that visuospatial neglect affects recovery of functioning in both ULMF and performance in PM from a study which was conducted with 101 participants aged 65. However, it was found to be a less common problem by other researchers(77). Recovery of functioning in PM is a prognostic indicator for therapists and it is also used as a guide to plan for early discharge in therapy(10).

Galaski, Bruno, Zorowitz and Walker (1999) conducted a retrospective study was on 36 patients suffering from stroke. In-patients were assessed by the multidisciplinary team as part of the routine standard procedure. The researcher reviewed their records after discharge to identify factors which predict treatment outcomes in the hospital rehabilitation unit by comparing medical, diagnostic, demographic, functional and neuropsychological information from records. They reported that cognitive deficits including abstract thinking, judgement, short term verbal memory, comprehension and

orientation play an important role in predicting functional recovery in PM at the end of a hospital stay(78). Other factors that predict poor functional outcomes include weakness, fatigue, impaired motor functioning and visuo-spatial motor deficits(79).

The therapist's ability to predict functional recovery after stroke is regarded as important in evidence based practice, which is a basis for clinical therapists. They need to be objective and be able to identify patient prognosis on performance of PM. In the field of neurological rehabilitation prediction of outcomes for functioning is a growing trend. When predicting functional outcomes post stroke, severity of ULMF is an indicator at three months post stroke(67).

2.7 OUTCOME MEASURES

2.7.1 BETA Scales: South African Database for Functional Medicine (SADFM)

The SADFM-Beta Scale are an outcome measure that was developed by Loubser (2012) as a nursing tool that would assist nurses to measure patient's progress in PM functioning. The tool is presented in a radar graph with the aim of using similar vocabulary as therapists. It was also identified as the best method to display performance metrics of any ongoing programme.

SADFM-Beta Scale is an outcome measure for patients who have disabilities that affect their PM skills. The tool was designed for nurses who are working in rehabilitation, convalescent, gerontology and long term care facilities. It was developed to be used routinely by nurses and caregivers to score and record patient's performance in PM (80).

2.7.2 Fugl Meyer Assessment: Upper Extremity

Fugl Meyer Assessment (FMA-UE) is an outcome measure that was designed for the assessment of stroke patients who present with dysfunction on one side of the body, including the UL(55). This outcome measure was found to be useful in research and clinical settings, as it assists in the assessments of motor dysfunction of the UL to evaluate what the patient can do and the recovery of motor function post stroke. "It enables the therapist to record effectiveness of therapy and encourage the translation of clinical research into clinical practice"p1213(81). This outcome measure was tested by Velozo and Woodbury (2011) with 512 participants who were between 0 and 5

months post stroke. The purpose was to highlight the importance of using standardised assessments to improve clinical rehabilitation which is based on evidence(81).

The FMA–UE was proven to be valid and it was found that it measures what it is intended to. Hsieh Wu, Lin, Chang, Chen and Liu (2009) measured its construct validity and found a 95% confidence interval/index with a $p<0.05$ when tested with Functional Index Measure which assesses PM which had a p value $p<0.01$(82). The internal consistence of the FMA–UE was assessed by checking correlation between UE and FMA and found excellent correlation of 0.97 (83).

2.8 CONCLUSION

Young stroke is prevalent in South Africa and has devastating effects on ULMF and PM. Recovery of ULMF depends on the site of lesion and the extent of injury, and not on age. Lesions in the MCA territory, which also includes a sub-cortical area called IC where CST fibres course, result in poor recovery of ULMF(53). Effects of stroke also result in patient's inability to perform PM activities. Identified problems that could result in poor performance in PM skills include motor disability which include UL and LL, poor postural control, and cognitive perceptual deficits such as visual field neglect(68),(42). Occupational therapy intervention is crucial for restoration of ULMF using different therapeutic techniques to remediate stroke patients to perform PM activities independently or as close to independence as possible. If patient's ULMF does not recover due to factors mentioned in the prognostic indicators of ULMF, occupational therapy intervention needs to focus on compensating for the loss of ULMF through the use of adaptive methods and assistive devices.

CHAPTER 3: RESEARCH METHOD

3.1 INTRODUCTION

This chapter describes the research process followed by the researcher to achieve the four research objectives which were:

- To describe the profile of stroke patients treated in occupational therapy department at CHBAH.
- To determine ULMF on referral, on discharge and at one, two and three months post incidence of stroke survivors, attending occupational therapy at CHBAH initially as an in-patient and then as an out-patient.
- To determine the PM dysfunction on referral, on discharge and at one, two and three months post incidence in stroke survivors for patients attending occupational therapy initially as an in-patient and then as an out-patient.
- To determine the association between the outcomes for PM and PM of stroke survivors attending occupational therapy at CHBAH on referral, at discharge and at one, two and three months post incidence.

3.2 RESEARCH METHOD

A quantitative, descriptive longitudinal research design was used for this study. A descriptive research design was an appropriate methodology to use to obtain descriptive information concerning the current profile of the stroke survivors being treated at CHBAH. The descriptive longitudinal methodology was also used to describe and identify trends in the recovery pattern, rate of recovery UL mobility and PM recovery of stroke survivors attending occupational therapy over time while hospitalised and within the first three months following the incidence at CHBAH using the quantitative scores attained on standardised outcomes measures(84).

The quantitative methodology was used to describe numerically the two variables being investigated: recovery pattern and rate of recovery of UL mobility, and PM in stroke survivors post incident using the scores achieved on the standardised outcomes measures(84).

This research also used a correlation design as it intended to examine the association between motor recovery of UL and PM of stroke survivors during their admission and the three month recovery process post stroke(85).

3.3 RESEARCH CONTEXT

The data for this research were collected at CHBAH where the researcher works. Approximately eighty stroke survivors are referred for occupational therapy each month by doctors and physiotherapists, or are identified by routine screening. This number of stroke referrals includes patients who have cognitive and perceptual fallout and those have had a second stroke or more. Stroke survivors are seen by a multi-disciplinary team including occupational therapists during the in-patient period of hospitalization. The six occupational therapists assess and treat the referred patients and they use different intervention approaches and techniques. Some therapists are using an eclectic type of intervention where they combine different frames of reference for example neuro-developmental therapy (NDT), motor relearning approach, Rood approach, or Brunnstrom approach while others favour one of the approaches mentioned. In this time the stroke survivors are seen in the wards and also brought to the therapy practice rooms in the clinical occupational therapy department. Stroke survivors are hospitalised for periods of time varying from a minimum of 3 to over 30 days, depending on the severity of the stroke and other co-morbid and complicating factors. When stroke survivors are discharged from the hospital, they are booked for out-patient follow-up where the waiting time is approximately three weeks post discharge.

This research followed two specific steps which are illustrated in the flow diagram in Figure 3.1

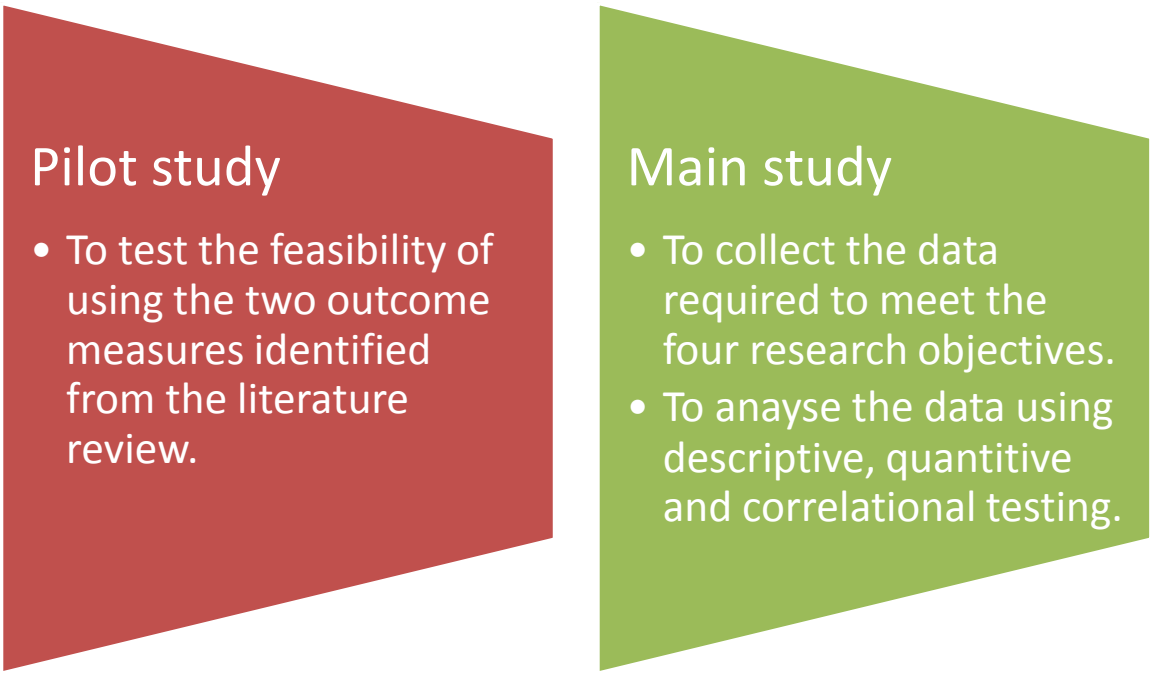


Figure 3.1 Steps in the research process

3.4 PILOT STUDY

A pilot study was undertaken before the main study to determine the clinical suitability of the two outcomes measures identified as possible data collection tools for this research from the literature review. The pilot study allowed the researcher to practice using the two outcome measures after the basic training as well as determine any problems with specific items. The researcher also practiced the use of the standardised scoring system.

3.4.1 Sample used for the pilot study

Five in-patient first stroke survivors were purposely sampled from the stroke survivors referred for occupational therapy and were invited to take part in the pilot study. The purpose of the pilot study was explained and their consent was gained.

3.4.2 Pilot study process

Each of the five stroke survivors were assessed on five occasions over a period of time on admission, on discharge and at one month, using the two standardised outcome measures that had been identified as possible data collection tools for the study:

- The Fugl-Meyer Assessment: Upper extremity measure was used to assess ULMF recovery after stroke.
- The SADFM: Beta Scale tool used to measure PM after stroke.

3.4.3 Pilot study results

The pilot study sample consisted of five stroke survivors who had a mean age of 62 years. The pilot sample had more males80% (n = 4) than females 20% (n=1) and the cohort presented with both left and right hemiplegia.

The results of the two standardized outcome measures are presented in Tables 3.1 and 3.2

Pilot study:

Table 3.1 SADFM: Beta Scale for personal management in pilot study

SADFM–Beta	Admission n=5	Discharge n=4	1 month n=3
	Median (Lower and upper quartile)		
Eating	2 (2-7)	2(2-7)	7 (2-7)
Grooming	2 (1-4)	2(1-7)	4 (1-7)
Bathing	1 (1-2)	1 (1-4)	2 (1-4)
Dressing Upper body	1(1-2)	1(1-4)	3 (1-4)
Dressing Lower body	1 (1- 2)	1 (1-4)	2 (1-4)
Toileting	2 (1-2)	2 (1-4)	2 (2-6)
Bladder management	2(1-4)	4 (1-6)	6 (6-6)
Bowel management	2 (1-2)	2(1-6)	6 (6-6
Transfers: Bed to chair	2(2-2)	2 (2-6)	2(2-6)
Transfers: Chair to toilet	2(1-2)	2 (2-6)	2 (2-6)
Transfers: Chair	2(1-2)	2 (1-6)	2 (1-6)
Locomotion: Walk	2(2-2)	2(1-6)	2 (1-6)
Locomotion: Stairs	1 (1-1)	1(1-1)	1 (1-1)

Participants were unable to perform PM tasks on admission as they were dependent on the therapist according to the definition of each task. There was little change observed or improvement of scores on discharge. Improvement was slow as there was no significant change at one month post stroke. However the median was high at one month for eating, bladder and bowel management as some of the participants were using nappies that they were able to manage independently.

Table 3.2 The Fugl-Meyer Assessment: Upper Extremity of upper limb function scores for pilot study

Fugl-Meyer Assessment	Admission n=5	Discharge n=4	1 month n=3
	Median (Lower and upper quartile)		
Arm	0.00 (0.00-8.33)	0.00 (0.00-16.66)	0.00 (0.00-94.44)
Wrist	0.00 (0.00-2.50)	5.00 (0.00-30.00)	50.00 (0.00-100.00)
Hand	0.00 (0.00-0.00)	17.00 (0.00-67.71)	100.00 (0.00-100.00)
Coordination	0.00 (0.00- 0.00)	0.00 (0.00-25.00)	0.00 (0.00-100.00)

There was no improvement of ULMF including arm, wrist, hand and coordination for the majority of participants 80% (n = 4) between admission from hospital and discharge. There was a steady decline in function at 1 month indicating that the participants who returned for therapy had little or no function. Of these participants 60% (n=3) had lesions in the MCA and 20% (n=1) in the Basal ganglia (BG) respectively. Only 20% (n=1) of participants experienced return of movement in ULMF including arm, wrist and hand and this participant had a lesion in the sub-cortical area of the brain. According to literature FMA-UE measure is sensitive to change in UL movement, however the site of lesion such as MCA may affect the rate of recovery of ULMF as it remains poor with scores of 0 as observed in these participants.

3.4.4 Discussion of Pilot study results

Scores for both the SADFM-Beta and the FMA-UE were low on admission, but showed improvement on discharge for only hand and wrist movement in terms of UL mobility. Personal Management as measured using the SADFM–Beta Scale was showing little

change on admission and discharge in the median scores, although the upper quartile scores were higher. This suggested that some stroke survivors had improved on the items grooming, bathing, dressing, toileting and transfers.

Initially there were concerns that the SADFM: Beta Scale was not sensitive enough to detect discreet changes occurring in the PM of these stroke survivors. However, improvement was seen on all items one month post discharge with upper quartiles indicating some stroke survivors were very close to being completely independent in most variables except for bathing, dressing and climbing stairs. The median scores all improved except for toileting and transfers. These changes in the later measurements indicated that the SADFM–Beta Scale was sensitive to changes taking placing in PM of these stroke survivors, and suggested that change could not be expected in the short in-patient hospital stay between admission and discharge.

The SADFM: Beta Scale for PM was found to be easy to administer and it was therefore accepted as a suitable assessment for evaluating change in PM of the stroke survivors and recording the data needed for this study. The occupational dysfunctions that participants experienced in performing PM tasks enabled the researcher to learn how to analyse their movement using SADFM-Beta Scale and to be able to score them according to the definition for completion of the task. The tool was user friendly as it allows the researcher to observe movements and amount of assistance needed, and to score according to percentages.

A similar increase in the median scores when using the FMA-UE measure for the wrist and hand were also noted at one month post discharge, although not for UL movement and coordination. This assessment was sensitive to the changes in the movement regained by these stroke survivors and was therefore suitable for use for collecting the data for this study.

The Fugl-Meyer–UE outcome measure was found to clearly differentiate between those stroke survivors with no function in the UL from those with some or complete return of function. The researcher, in assessing the pilot study participant's ULMF, became familiar with this assessment. Challenges that were initially experienced when using FMA-UE measure included the length of time needed to complete the assessment. This related to the researcher needing to learn the movements to be

assessed more systematically, and how to score simultaneously while completing that assessment with the participant.

Participants included in this pilot study had severe disability at onset of the stroke. They all presented with a flaccid UL and had difficulties performing PM tasks. However, these participants met the criteria for inclusion for the research. Change was noted in only one participant who observed change in ULMF but he was discharged from hospital while still having dysfunctions. The pilot study allowed the researcher to practice using the research tools and to be able to analyse research participants with fluency.

3.5 MAIN STUDY

The data for the main study was collected over a period of a year from February 2014 to February 2015.

3.5.1 Research population

The research population consisted of all the stroke survivors that were referred to occupational therapy during the research period.

3.5.2 Study sample

Purposive sampling was used for this study as the research randomly selected stroke patients and the participants who met inclusion criteria were invited to participate(84). The purposive sampling was used in this study as the researcher deliberately chose a certain segment of the population in this case patients with first time strokes from her practice context(86). Based on Cochran's sample size formula it was estimated that a sample of 45 stroke survivors presenting with a first CVA were required for this study. This sample size allowed a margin of error that the sample was representative of the population as it was set at 0.05. (87).

3.5.2.1 Inclusion criteria

All first stroke survivors aged between 18 and 75 years of age, regardless of other demographic factors such as gender, that were medically stable were considered eligible for the study. Only patients who were medically stable were included in order to safely assess the motor functioning and performance in PM and to ensure that the dysfunction related to the stroke and no other conditions. This decision was informed

by clinical experience that when stroke survivors are not medically stable they often have low level of consciousness, uncontrolled hypertension and are not able to actively participate in therapy. Additionally, as stroke survivor participants needed to give consent to participate in the research, those who were medically unstable would have had difficulty in giving informed consent.

3.5.2.2 Exclusion criteria

Stroke survivors were excluded if they had had a previous stroke, had cognitive impairments or were unable or unwilling to give informed consent.

3.5.3 Measurement tools

Three measurement tools were used to collect the data.

3.5.3.1 Demographic Questionnaire

Objective 1of the study was to describe the profile of stroke survivors.

Thus a demographic questionnaire was developed by the researcher to gather relevant information from stoke patients treated at CHBAH. The demographic data included age, gender and diagnosis (see Appendix A). Medical data, such as co-morbid conditions, were obtained from the stroke survivors or caregiver in cases where the stroke survivor had expressive aphasia. The identifying information such as the patient's name and contact details were kept separate, and a code was allocated to identify participants to ensure confidentiality.

3.5.3.2 Fugl-Meyer Assessment: Upper Extremity

Objective 2 was to evaluate ULMF of first time stroke survivors on admission, discharge and each month up until 3 months post episode. The Fugl-Meyer Assessment of Motor Function: Upper extremity was used to assess motor recovery in the UL after stroke(see Appendix B). This tool has been widely used in research studies to assess change in ULMF. The Fugl-Meyer assessment is the most comprehensive quantitative measure of motor impairment after stroke(88). The assessment consists of a 68-point motor domain that evaluates changes in motor impairment within the UL after stroke. It has a 3-point scoring system: a score of (0) indicates no movement noted, (1) reports that the movement is poor and (2) means a full range of movement has been achieved(88). This assessment tool is reported to

be a valid and reliable instrument and it has been used in many studies(88). Recent studies on the psychometric properties of this instrument confirmed its excellence in construct validity with p values p< 0.05(82).

Rabadi and Rabadi (2006) conducted a prospective study to validate FMA–UE. They compared FMA–UE to Action Research Arm Test (ARAT) to assess responsiveness when used to evaluate recovery of ULMF after acute stroke during inpatient rehabilitation. There were 104 participants in a rehabilitation unit who were assessed within 72 hours of admission and again 24 hours prior to discharge. Fugl Meyer Assessment for Upper Extremity and ARAT showed sensitivity to change in ULMF during acute phase of inpatient rehabilitation. Responsivity to change was 68 for ARAT and 74 for FMA-UE motor score with a p value 54 (p<0,001)(89).

The inter-rater and test-retest reliability of FMA-UE was done in a multicentre cohort study against other outcome measures such as ARAT and Box and Block Test which all test ULMF by Platz and Pinkowski, van Wijck and Kim (2005). The study consisted of 37 stroke patients, 14 multiple sclerosis and five head injury patients who had UL weakness. Fugl Meyer Assessment for Upper Extremity showed very high inter-rater and test-retest reliability similarly to the ARAT and Box and Block Test. The correlation between these motor scales was very high (rho >0.92) which indicates good cross validity(90).

The latest evidence on validity and reliability of FMA-UE measure was found by Toluee, Achacheluee, Rahnama and Karmi (2016) who investigated the test retest reliability and minimal detectable change of this outcome measure. In all the investigations for validity and reliability of FMA-UE it was concluded that this outcome measure has got good descriptive power it can therefore be used as a measure of recovery of ULMF after stroke. However, Cronbach alpha score could not found for this outcome measure(91).

This tool is highly recommended for use in research due to its sensitivity for evaluating changes in motor impairment following stroke(81). Any therapist trained in administering this assessment with stroke survivors would be able to monitor a stroke survivor’s progress and use it as a tool for the comparative analysis of effectiveness of different therapeutic interventions(92).

3.5.3.3 South African Data Functional Medicine-Beta Scale

Objective 3 was to evaluate independence in PM of first time stroke survivors on admission, discharge and each month up until 3 months post episode. The South African Data Functional Medicine-Beta Scale was developed to be used to measure a participant's level of functional recovery in PM (see Appendix C). SADFM–Beta Scale is a nursing measure that was validated by Loubser (2012) as part of his doctorate thesis. It measures the degree of functional independence focusing on 13 items of PM including feeding, bathing, dressing, grooming, bladder and bowel control, toileting, transfer from bed to chair, backwards walking on a level surface and walking up and down stairs. This outcome measure also assesses aspects of cognition which include: memory, problem solving, social interaction, expression and comprehension. These cognitive client factors were not assessed for this study as they fell outside of the objectives. Performance is measured by using ordinal scale ranging from 1–7 with number 1 denoting total dependence on someone else and 7 denoting total independence were allocated for each item assessed. The SADFM-Beta Scale has recently been validated. The reliability of this outcome measure was examined using the Rasch analysis and it was found to be a reliable tool. The internal construct validity of this outcome measure was tested using Rasch measurement model (RMM) to identify if it correlates with the items it intends to measure for it to be operationalised. The internal construct validity of this tool was tested on 4235 participants and it was found that it is measuring the constructs it is supposed to measure and it is used in the right population(93). Beta scale underwent a process of calibration whereby its scale structures were refined. The RMM helped to identify under fitting and over fitting characteristics in the scales. Where possible, scale structures would be rectified and adjusted until the scale could optimally fit RMM(93). The RMM proved Beta Scale to have good internal construct validity as it assessed a patient's ability against item difficulties and it proved to be measuring what it is intended to measure. Loubser et al. (2015) concluded that, Beta scale is validated patient evidence based outcome measure. Its calculations provide empirical evidence of the nurse's effort in restoring ADL in patients. Cronbach alpha score could not be found for this outcome measure.

3.5.4 Occupational therapy treatment

During the course of this research study the stroke survivors continued to receive routine occupational therapy from the therapist allocated to the ward to which the stroke survivor was admitted. The occupational therapy delivered to stroke survivors is guided by the occupational therapy stroke protocol (see Appendix D). The main focus of occupational therapy intervention at this research site is restoration of underlying client factors that cause poor ULMF, such as weakness, and restoration of functioning in ADL especially PM skills in this early stage of recovery.

Various treatment approaches are being used to facilitate recovery of motor mobility of the affected UL and performance in PM. Each session is tailored to the individual needs of each stroke survivor. Different therapists use different approaches and different techniques obtained during under- and post-graduate training.

Although therapists have different expertise and are using different approaches, it is vital that recovery and progress during the intervention process is recorded in a uniform and systematic way so that treatment done at CHBAH can be measured and reviewed in terms of its efficacy. The treatment frames of reference and plans typically used in occupational therapy are presented in (Appendix E).

3.5.5 Data collection

Stroke survivors were identified by the therapists, including the researcher, working in medical wards at CHBAH. Stroke survivors who met the inclusion criteria were recruited by the relevant therapist and were invited to participate in the study. Upon agreement to participate in the research, the therapist referred the stroke survivor to the researcher. Routine assessment and treatment was implemented regardless of whether the patient was included in the study or not by the occupational therapist assigned to that ward.

All stroke survivors who agreed to participate in the study were provided with the approved information sheet, informing them about the research study to be conducted as read to them by the researcher, after being identified by the researcher or referred by the therapist in the ward (Appendix F). In cases where the stroke survivor was unable to understand the information sheet the research further explained the research and their specific involvement in the process verbally. If the stroke survivor

agreed to participate in the study, they signed an informed consent form (Appendix G). Verbal consent was obtained if they could not write, and an ink pad stamp was used to take finger prints and print them on the consent form (Appendix H). A member of the family or an official from CHBAH or the referring therapist was asked to co-sign as a witness that the researcher had informed the stroke survivor about the research process, and that the stroke survivor has given their informed consent.

Chris Hani Baragwanath Academic Hospital is a typical, acute government hospital and the clients who attend the facility are representative of the population who make use of government funded institutions in South Africa. A similar sample group will therefore be able to be obtained at any other government hospital in South Africa.

3.5.5.1 Data collection1: On admission

The researcher then collected the first set of data for all the participants before any occupational therapy treatment was initiated. The researcher recorded the demographic profile of the participants using the demographic questionnaire that has been designed for this study (see Appendix A). Information for the demographic questionnaire was obtained from the participants and the participants' hospital files which recorded most of the medical data needed such as blood pressure on admission. All participants had had CT scans to identify the location of lesion and the type of stroke. Previous medical history was obtained from the participants. For participants who had expressive aphasia at the time of assessments, information was obtained from the medical file and, with the clients' permission, collateral information was obtained from the family to confirm if all information has been included. Participants' occupational background and living context was obtained from the participant or the family if the participant had aphasia.

The researcher then completed the on admission data collection assessment using the outcome measures described above: the FMA–UE measure and SADFM: Beta Scale to record ULMF and PM performance respectively. These assessments were done in the occupational therapy department gym, where all tools and equipment needed for the assessment were available. When assessing ULMF using FMA–UE the participant was required to sit on a chair. The tools included a patella hammer for assessing reflexes, an empty light weight bag to assess hook grip and release, a piece of A5paper to assess lateral prehension pinch, a pen to assess palmar prehension

grip, a round ball to assess spherical grasp and a plastic tumbler to assess cylindrical grasp(55).

When assessing occupational dysfunction using SADFM–Beta Scale, the participant was required to sit on the edge of a plinth or at the table. Tools that were used were organised according to the area of occupational functioning that was going to be assessed such as: Eating: plate and spoon; Grooming: face cloth, comb and tooth brush; Bathing: sponge bathing was done whereby a participant was assessed using a basin, face cloth and soap; dressing upper and lower body: a loose shirt and loose pants. Transfers were done with a participant sitting on a wheelchair and transferring to different surfaces in the gym, such as transfer from wheelchair to chair; toilet and bath tub. Locomotion was assessed using a wheelchair where the participant pushed the wheelchair over a smooth 50-meter surface or walked for 50meters over a smooth surface. Participants were required to walk up and down a flight of 10 stairs that are just outside the occupational therapy department.

Once this data collection process was completed the treating therapist would treat the participant according to the stroke protocol until discharge.

3.5.5.2 Data collection 2: On discharge

When the treating doctor indicated plans to discharge the participant, the therapist would inform the researcher to proceed with the second data collection session. Some participants were unfortunately discharged over the weekend when there had been no indication that discharge was imminent, and as a result these participants missed their second data collection at discharge. However, they were called and encouraged to attend their routine follow up appointment as an out-patient. These participants remained in the study although data were not collected at all planned data collection points.

3.5.5.3 Data collection 3, 4 and 5

Participants who came for follow-up were seen by their in-patient treating therapist or an alternate therapist, approximately three weeks after discharge. The researcher monitored the participants' follow-up appointments and the researcher made time to complete the third, fourth and fifth data collection assessments completed in an identical fashion to record change in ULMF and PM.

Some participants were assessed at three months post stroke as planned on the recovery of ULMF and functioning in PM. However, some participants were not discharged during the research time period due to the severity of the stroke, co-morbid issues, social and socioeconomic problems. These participants that remained in the hospital for the duration of the research time were assessed three to four times depending on level of recovery. However they did not have discharge assessments.

Participants' compliance and the treatment approach being used at each assessment was recorded, e.g. whether the treatment approach was therapeutic and focused on improving UL mobility and PM or rehabilitative with the aim of compensating for dependence in UL. The number of treatment sessions the participant attended was also recorded (Appendix I).

3.6 ETHICAL CONSIDERATIONS

The protocol for this research was presented to and approved by the Faculty's Postgraduate committee. Ethical clearance was obtained from the Wits Human Research Ethics Committee (see Appendix J). Thereafter, permission to conduct the study was obtained from the Chief Executive Officer of CHBAH and the head of the Occupational Therapy Department (Appendix K).

The approved information sheet outlining the purpose of the research, as well as requirements for participation in the study, was provided for each participant explaining that their participation was voluntary and that they could withdraw at any time. It also explained what would be expected of them in term of the research (Appendix F). Thereafter, they agreed to participate and gave written informed consent (Appendix G). Participants who were unable to write due to the dominant hand being affected gave verbal consent and finger prints, using an ink pad stamp (Appendix H). Participants were made aware that participation is voluntary and that they had the right to withdraw from the study at any time without any consequence. Confidentiality was ensured as no names were used on the data collection forms and only the researcher had access to identifying data which was kept in a secure locked location. All research participants were allocated a numerical code such as (001-045), and no names were written on the data collection to ensure confidentiality. The data will be stored according to HPCSA rules, and data will be kept in a secure locked place for six years.

3.7 DATA ANALYSIS

Information obtained using the demographic questionnaire, namely the FMA–UE and SADFM–Beta Scale, were recorded on Excel data sheets. Descriptive statistics was used to describe the demographics of the sample in terms of the central tendencies using means, frequencies and standard deviations(94). The student with the assistance of departmental research coordinator calculated all results using Statistica version 12 software. The demographic scores over the five assessment periods were analysed using Chi-squared tests to determine if there was significant change in these factors over the time that participants were being assessed, as there was loss of follow up over the duration of the study.

The analysis of variance (ANOVA) was used when comparing the outcome measures at the five assessment intervals (admission, discharge, 1, 2, 3 months post stroke). The ANOVA was done to determine if there was significant change over the five assessment intervals. The descriptive analysis and ANOVA were done for the two standardised outcome measures namely FMA–-UE and SADFM: Beta Scale. This was done in order to correlate the data and report the change relating to functional improvement. The outcome measures were analysed separately at all assessment intervals. The data for patients that were available on the specific assessment intervals was included for analysis for that specific interval. Frequency tables were made to show how many participants scored different points on FMA – UE and SADFM: Beta Scale on each variable and obtained cumulative frequency of all scores.

An intention to treat analysis was used in this study and all participants recruited into the study initially were included in the data analysis, as were those with no data available at discharge, one, two and three months post discharge.

The outcomes of the FMA-UE and SADFM-Beta Scale of stroke survivors were analysed using the median as a measure of central tendency. This describes the data set due to the small sample size. Ordinal scales and data were also used, as they were not normally distributed(85). The significant difference in the median scores over the assessment periods for both assessments was determined using non-parametric Chi-squared tests due to the ordinal nature of the scales on both outcome measures. The change that occurred was compared for each variable using box and whisker plots.

A Spearman's rank order correlation is used to measure the relationship between variables in the study, so that inferences could be drawn about the sample and generalised to the population(95). The correlation was used to determine if any association existed between the scores for the FMA-UE and the SADFM- Beta-Scale, on admission and discharge from hospital to UL and PM while the participants were in hospital receiving in-patient rehabilitation. Correlations between the FMA-UE and in the SADFM- Beta Scale at one, two and three months were established when participants were receiving out-patient rehabilitation. The non-parametric Spearman's rank order correlation co-efficient was used due to the ordinal scales on both outcome measures. Correlations interpretation was based on the following scale, as in table 3.3 below(84):

Table 3.3 Correlations levels

<0.2	Very weak relationship
0.2-0.4	Weak relationship
0.4-0.6	Moderate relationship
0.6-0.8	Strong relationship
> 0.8	Very strong relationship

Results from statistical tests are presented in tables for interpretation, and conclusions were drawn about the research question. Discussion of the results and why they occurred will follow, making reference to the literature as well as the implications of the results for practice or future research(95).

CHAPTER FOUR: RESULTS

4.1 INTRODUCTION

This chapter reports on the results of the main study. The data collection for the main study took 12 months. All stroke survivors who met criteria for inclusion and consented to participate were recruited and included in the study. The results will be presented according to the four objectives of the study described in 1.5 in Chapter 1.

After the pilot study which included five participants, 71 participants were recruited on admission. Forty-five participants were reassessed on discharge from hospital, indicating a 36.6% (n=26) loss from the initial patients recruited. The reason for this decline in patient numbers can be attributed to several reasons: Eighteen percent (n=13) of participants passed away while in hospital. Eleven point three percent of participants were reassessed after a one month period. Six percent (n=1) of the aforementioned 11.3% were still in hospital after two and three months; and had one, two and three month follow up assessment scores whilst still in hospital. Unplanned discharges for 40.8% (n=29) of patients occurred over the weekends making it impossible for the therapist to get a discharge assessment done.

The last three assessments were done during outpatient follow up at one, two and three months post stroke. At one month 75.6% (n=34) participants returned for follow up, which was reduced to 53.3% (n = 24) participants at two months and 46.7% (n=21) participants at three months post discharge. There was therefore a further loss to follow up of 31% (n=14) after discharge with a total loss to follow up at three months from admission of 69% (n=49).

Only 43.6% (n= 31) of participants that were assessed on discharge from hospital returned over the three-month period for treatment and were assessed in occupational therapy.

4.2 PROFILE OF STROKE SURVIVORS TREATED IN THE OCCUPATIONAL THERAPY DEPARTMENT AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

4.2.1 Demographics

The demographics of the participants at each assessment period are reported in table 4.1. The participants' ages ranged between 19 years and 75 years. The mean age was 47.34 and the standard deviation was 14.75. On admission, the highest number of participants was in the age band of 41-60 years, but over the four assessment periods the participants in the younger age band of 19-40 years were those who returned for therapy and were not lost to follow-up.

Male participants represented 42.3% (n=30), which was less than female participants 57.7% (n=41) (see Table 4.1). This gender representation of marginally more females than males was maintained over the other four assessment periods during the study, with no significant difference in gender of participants by the end of the three month follow-up period (p=0.999).

Table 4.1 Demographics of participants at the five assessment points in the study

Variable		Admission n=71 (100%)	Discharge n=45 (63.4%)	1 month n=34 (47.9%)	2 months n=24 (38.8%)	3 months n=21 (29.6%)	Chi square (df)	p value
		n(%)						
AGE	19-40 years	25 (35.22%)	19 (42.23%)	16 (47.05%)	12 (50.00%)	10 (47.61%)	12.312 (8)	0.137
	41-60 years	28 (39.43%)	16 (35.55%)	10 (29.42%)	5 (20.83%)	5 (23.80%)		
	61-75 years	18 (25.35%)	10 (22.22%)	8 (23.53%)	7 (29.17%)	6 (28.58%)		
GENDER	Male	30 (42.23%)	20 (44.44%)	15 (44.11%)	10 (41.66%)	9 (42.85%)	0.163 (4)	0.999
	Female	41 (57.77%)	25 (55.56%)	19 (55.89%)	14 (58.33%)	12 (57.15%)		

Significance p≤ 0.05*

Significance p≤ 0.01**

4.2.2 Medical History

Throughout the study there were slightly more participants with right hemiplegia versus left hemiplegia. Fewer participants with left hemiplegia were followed up and returned for assessment at two (37.5%) and three(38%)months post discharge assessed.

Table 4.2 Medical history of participants at the five assessment points in the study

HEMI SIDE	Admission n=71	Discharge n=45	1 month n=34	2 months n=24	3 months n=21	Chi square (df)	p value
	n (%)						
Right	36. (50.7%)	24 (53.3%)	20 (58.9%)	15 (62.5%)	13 (62%)	1.27 (4)	0.781
Left	35 (49.3%)	21 (46.7%)	14 (41.2%)	9 (37.5%)	8 (38%)		

Significance p≤ 0.05*
Significance p≤ 0.01**

As can be seen from Table 4.2, at the assessment on admission there were 50.7 % (n=36) participants with a right hemiplegia whereas there were 49.3% (n= 35) with left hemiplegia. Twenty-three of the participants with a right hemiplegia were lost to follow-up with 5 and 13 returning for the two and three-month follow-up assessments. This was slightly more than the 23 participants with left hemiplegia who were not followed up, as9 and 8returned for the assessment at two and three months post-discharge respectively. However, this difference was not found to be significantly different with p=0.781.

Table 4.3 Site of stroke and attendance at assessments by participants

		Admission N=71	Discharge n=45	1 month n=34	2 months n=24	3 months n=21	Chi square (df)	p value
		n (%)						
SITE	**MCA**	39 (54.9%)	21 (46.6%)	17 (50%)	17 (70.8%)	13 (61.9%)	7.95 (12)	0.781
	Basal Ganglia	14 (19.7%)	8 (17.7%)	7 (20.6%)	3 (12.5%)	2 (9.5%)		
	Lacunar	6 (8.5%)	6 (13.3%)	6 (17.6%)	2 (8.3%)	1 (4.76%)		
	Other	12 (16.9%)	10 (22.2%)	6 (17.6%)	6 (25%)	6 (28.5%)		

Significance p≤ 0.05*
Significance p≤ 0.05**

The majority of participants 55% (n=39) had lesions in MCA territory. It was observed that61.9% (n=13) of participants with lesions in MCA continued attending outpatient follow up appointments until the 3rd month which indicates that they still had problems with ULMF and/or PM. However, from the other sub-cortical regions, there were 19.7% (n=14) participants who had lesions in BG. Participants with lesions in BG experienced steady recovery at the end of the three months, with only 9.5% (n=2) of these participants coming back for out-patient follow up. Lacunar region accounted for8.5% (n=6) and all of these participants achieved full recovery of ULMF as well as independence in PM. The remaining 16.9 % (n=12) accounts for lesions in isolated areas in the cortical and sub-cortical regions.

Table 4.4 Type of stroke and attendance at assessments

	Admission N=71	Discharge n=45	1 month n=34	2 months n=24	3 months n=21	Chi square (df)	p value
Ischemic	54 (76.05%)	34 (75.55%)	26 (76.5%)	18 (75%)	16 (76.2%)	0.01 (4)	0.996
Haemorrhage	17 (23.9%)	11 (24.5%)	8 (23.5%)	6 (25%)	5 (23.2%)		

Significance p≤ 0.05*
Significance p≤ 0.05**

There were no significant differences for any of the medical history factors between the participants who continued with therapy over three months post discharge and those who were assessed on admission and at discharge. Seventy six point zero five percent (n=54) of all participants had ischemic strokes, making this the most common

type of stroke presentation. There were a number of participants 23.9% (n=17) who suffered a haemorrhage. These insults occurred in various areas of the brain.

4.2.2.1 Co-morbidities

Co-morbid conditions for participants were assessed on admission, and these were noted over the five assessment periods for all participants who continued with therapy (see Table 4.5).

Table 4.5 Co-morbidities found in the sample

	Admission n=71	Discharge n=45	1 month n=34	2 months n=24	3 months n=21	p value
	n (%)					
High Blood Pressure	27 (29.6%)	14 (31.1%)	10 (14.1%)	8 (33.3%)	8 (38.2%)	0.993
HIV + status	17 (23.9%)	14 (31.1%)	11 (15.5%)	7 (29.2%)	7 (33.3%)	
None	19 (26.8%)	11 (24.4%)	7 (20.6%)	6 (25%)	6 (28.5%)	
Cardio-vascular Disease	4 (5.6)	2 (4.4%)	3 (8.8%)	1 (4.2%)	1 (4.7%)	
Gliosis	1 (1.4%)	1 (1.85%)	1 (2.9%)	1 (4.2%)	1 (4.7%)	
Ear, nose and throat condition	1 (1.4%)	1 (1.9%)	0	0	0	
Thyroid	1 (1.4%)	1 (1.9%)	1 (2.9%)	0	0	
Anaemia	1 (1.4%)	0	0	0	0	

Significance p≤ 0.05*
Significance p≤ 0.05**

None of these co-morbidities were significant with p-value = 0.993.The most common co-morbidities were high blood pressure and HIV+ status.

Table 4.6 Blood pressure of participants with stroke at the five assessment points in the study

	Admission N=71	Discharge n=45	1 month n=34	2 months n=24	3 months n=21	Chi square (df)	p value
	Median (Lower and upper quartile)						
Systolic	151 (123- 176)	144 (115-172)				0.01 (1)	0.90
Diastolic	85.5 (73 – 101)	84 (69-100)					

Significance p≤ 0.05*

Significance p≤ 0.05**

High blood pressure was found to be one of the common risk factors for stroke in participants for this study. Blood pressure was high on admission for the majority of participants with the median of 155/85.5 whereby 155 is systolic and 85.5 is dystolic. There was a drop in BP on discharge with a median of 144/84.As BP stabilised at discharge, it was observed that it did not affect recovery of ULMF and PM.

4.2.3 Summary

It is clear from the results above that there was no significant difference in the demographic factors such as medical history and co-morbidities between the participants who completed the study and those that were lost to follow up at various stages throughout the study.

However, the data collected described the characteristics of stroke victims referred to occupational therapy:

On admission, there were more female than male participants and the majority of them were in the age bracket of (41 – 60) 39.4% (n=28). This was followed by those in the age bracket of (19 – 40) 35.2% (n=25) and the minority group were the participants in the old age bracket (61 – 75) 25.4% (n=18). However on discharge, there were more participants in the younger age bracket of (19 – 40), 42.23% (n=19) followed by those in the age bracket of (41 – 60)35.55% (n=16). This pattern continued however there was rapid recovery in the age bracket of (41 – 60). As a result, at three months they were the minority and the older age group showed slow and steady recovery.

The majority of participants who returned for follow up at three months (n=10) were those in the younger age band (19 to 40), followed by the older group (n=6) age bracket (61 to 75). The minority (n=5) were from the middle age group of (41 to 60). There were more participants who presented with ischemic strokes than haemorrhagic strokes. The most common co-morbidities were hypertension and HIV+ status. A number of participants (26, 76 %) did not have any co-morbidity and presented with stroke of an unknown source. Cardiovascular disease was also shown to be implicated in the occurrence of stroke, which accounted for (5, 6%) of participants in this study.

The most common site of stroke was in the MCA (54.9%). It was also the most common site of stroke for those participants (61.9%) who attended the three-month post stroke therapy sessions and completed the study.

4.3 FUGL-MEYER ASSESSMENT OF MOTOR FUNCTION: UPPER EXTREMITY OF UPPER LIMB FUNCTION

This assessment measured the ULMF of the stoke survivor participants. The results reflect the same loss to follow-up of participants from admission to discharge and over months one, two and three months post-stroke as described above. The results recorded in Table 4.7 note that the greatest improvement in ULMF occurred between the admission and discharge assessments for most participants, with the exception of co-ordination where results suggest that there was very little recovery except in a few participants. While functions of the arm continued to show an improvement at the one month post-stroke assessment, all other UL functions recorded lower scores at this assessment period. The lower scores continued to be evident in those participants who returned for the month two and three post-stroke follow-up assessments in spite of continued therapy.

Table 4.7 Scores on the Fugl-Meyer Assessment: Upper Extremity measure at the five assessment points in the study

Fugl-Meyer Assessment	Admission n=71	Discharge n=45	1 month n=34	2 months n=24	3 months n=21	Chi square (df)	p value
			Median (Lower and upper quartile)				
Arm	31.94 (8.33-77.78)	72.22 (6.94-100.00)	87.50 (23.61-100.00)	52.78 (0.00-100.00)	38.89 (0.00–90.28)	24.77 (4)	0.00**
Wrist	0.00 (0.00-40.00)	45.00 (0.00-100.00)	40.00 (0.00-100.00)	0.00 (0.00-70.00)	0.00 (0.00-100.00)	15.86 (4)	0.00*
Hand	17.86 (0.00-57.14)	92.86 (0.00-100.00)	64.29 (0.00-100.00)	24.60 (0.00-96.43)	16.27 (0.00-92.85)	24.41 (4)	0.00**
Coordination	4.000 (0.00-0.00	0.00 (0.00-100.00)	0.00 (0.00-70.00)	0.00 (0.00-50.00)	0.00 (0.00-50.00	14.22 (4)	0.00**

Significance p≤ 0.05*

Significance p≤ 0.05**

Each ULMF measured by the FMA-UE measure will now be discussed.

4.3.1 Fugl-Meyer Assessment: Upper Extremity: Arm

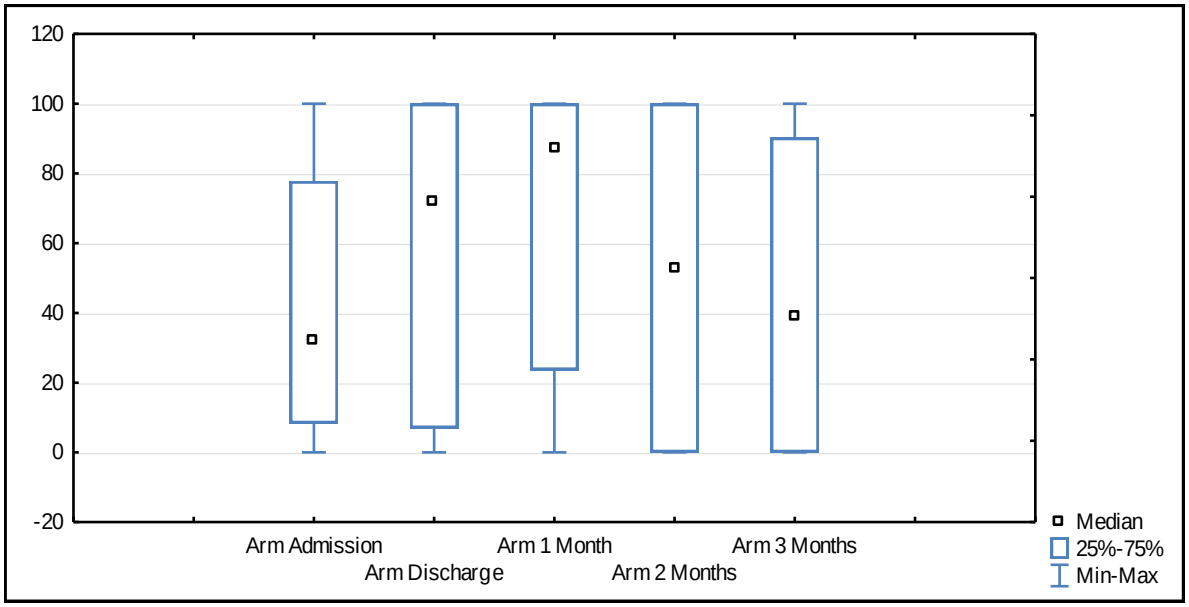


Figure 4.1 Median and quartile ranges for arm function for participants at the five assessment points

The scores for arm movement improved most between admission and discharge (medians 31.94 and 72.22 respectively, and quartile range scores 8.33 – 77.78 and 6.94 – 100.00 respectively) suggesting that while some participants had full arm movement at discharge, most did not. Slow improvement of the scores was noted at 1 month post-stroke (See Figure 4.1).

However scores at the two and three months post-stroke assessments demonstrated that more of the returning participants had less hand function over the remaining research period (medians 52.78 and 38.89 in the quartile ranges 0.00 – 100 and 0.00 and 90.28 respectively) although there were some who had full or almost full function.

These changes in scores for this variable over the research period was significant with p=0.00.

4.3.2 Fugl-Meyer Assessment of motor function: Wrist

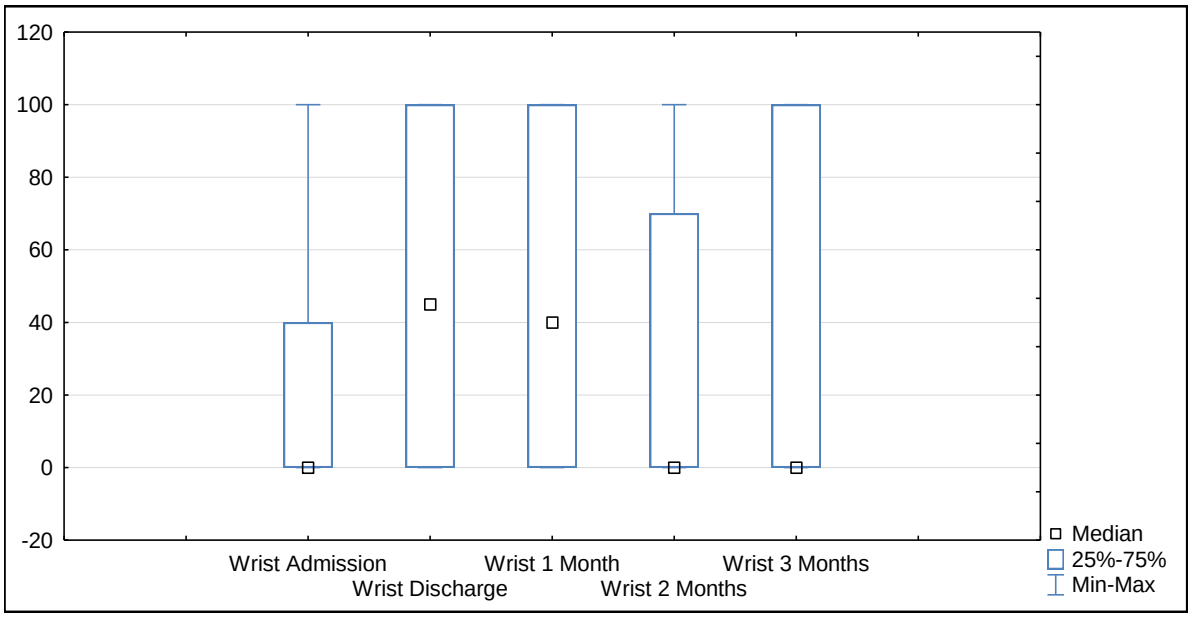


Figure 4.2 Median and quartile ranges for wrist movement for participants at the five assessment points

The results show that wrist movement also improved while participants were in hospital with the admission and that the wrist was affected in more participants than the arm discussed above. The median score on admission was 0.00 in the quartile range0.00 – 40.00.

However, at the discharge assessment the median was 45.09 in the quartile range 0.00 – 100.00 suggesting that some participants35.5% (n=16) had regained full wrist function at this point while others had recovery that ranged from none to moderate recovery. At the subsequent assessments at the one, two and three months post-stroke the returning participants generally showed an increasing reduction in the scores for wrist movement (medians 40.00, 0.00 and 0.00 in the quartile ranges of 0.00 – 100, 0.00 – 70.00 and 0.00 – 100.00 respectively).

Although there were participants that had regained full wrist function at the 1st and 3rd month assessments post-stroke, there were also participants that continued to have 33.3% (n=15)very limited wrist function. See Figure 4.2. There was a significant difference for change in wrist movement over the five assessment periods and p=0.00.

4.3.3 Fugl-Meyer Assessment of motor function: Hand

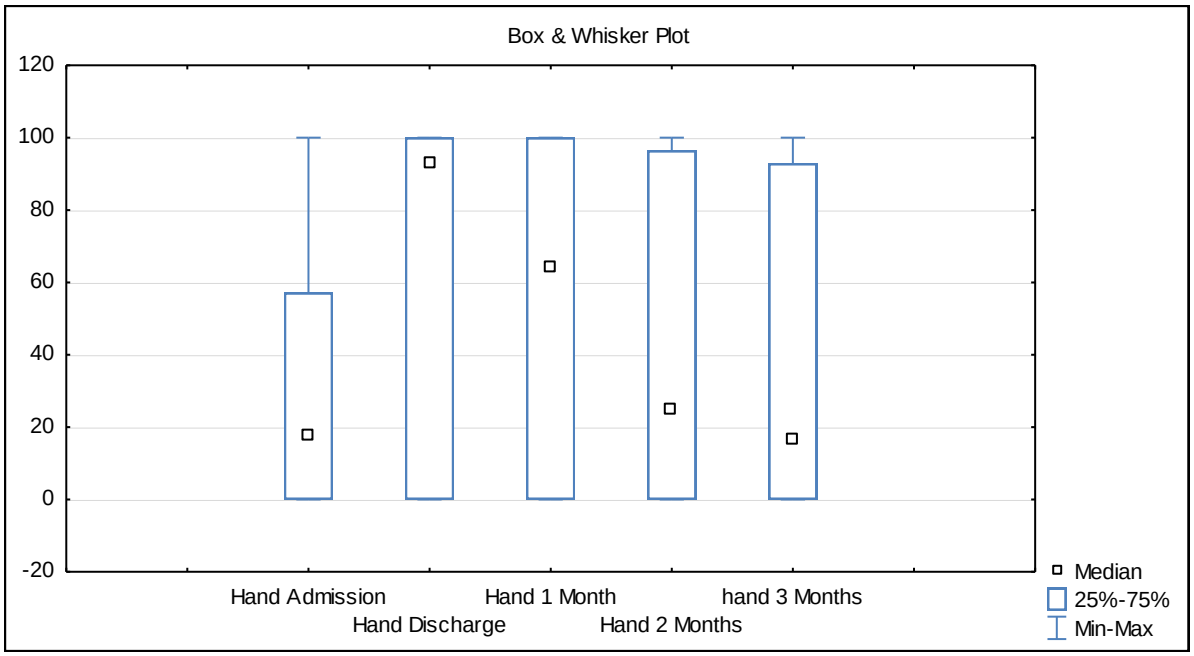


Figure 4.3 Median and quartile ranges for hand functions for participants at the five assessment points

The results of the hand variable followed the same pattern as that of the wrist except that the median scores at each assessment period were higher than that of the wrist at the same assessment time. Thus there was improvement in hand function between admission and discharge with the median increasing from 17.8 to 92.8 in the quartile range from 0.00 – 57.14 and 0.00 – 100. See Figure 4.3.

This result suggests that all participants experienced hand function difficulties on admission but by discharge most participants experienced improved hand function, however there were participants for whom hand function remained a problem.

It is probable that those participants who returned for follow-up and additional therapy were those participants that had poor hand motor mobility at the one, two and three months assessment periods where the median decreased from 64.29 to 24.6 and

16.27respectively in the quartile ranges of 0.00 – 100.00, 0.00 – 96.43 and 0.00 – 92.85. Again, the changes in this variable were significant with p=0.00.

4.4.4 Fugl-Meyer Assessment of motor function: Co-ordination

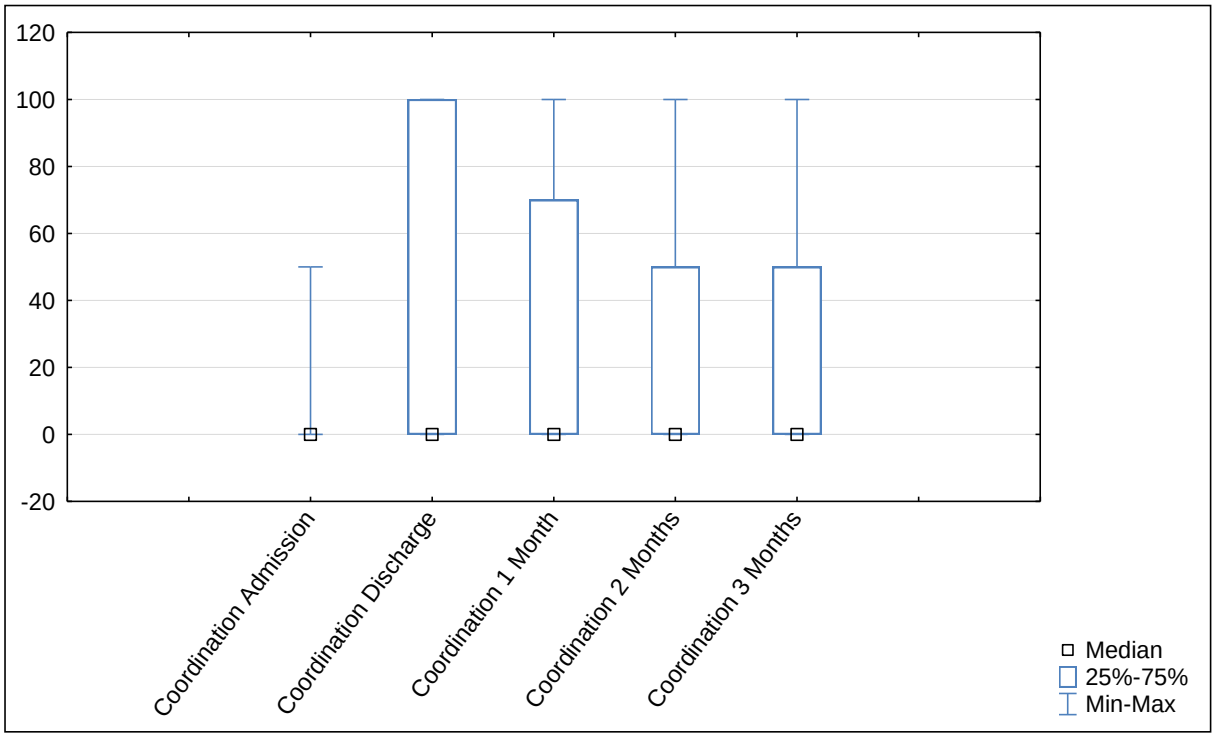


Figure 4.4 Median and quartile ranges for coordination for participants at the five assessment points

The results of the co-ordination variable showed the lowest recovery over the research period, although the changes were found to be significant with a p=0.00.

The median throughout the research period remained at 0.00. The quartile range on admission of 0.00 to 0.00 indicated that all participants experienced considerable coordination problems on admission. The quartile range of 0.00 – 100.00 at discharge suggests that some participants experienced improvement in coordination at the time of discharge. The wide range of quartile scores suggests that improvement was very varied with some participants experiencing very little improvement in coordination, while others experienced much more.

However, there was a steady decline in the quintile ranges for coordination at the one, two and three months assessments suggesting that the participants that returned for follow-up were those who continued to have greater difficulties with coordination.

4.3.5 Objective 2

For the FMA–UE measure, the greatest change occurred between admission and discharge with most participants achieving little or no improvement after the one month interval. Participants who returned at the two and three months intervals appear to be those who did not achieve improvement in ULMF. The median scores on the FMA–UE measure were compared for the five assessment points in the study. It was clear that all functions of arm, wrist and hand improved while the participants were treated in hospital before discharge, but that coordination did not follow this pattern.

The score for arm movement improved prior to discharge and again at the one month interval. This indicates that ULMF for the participants improved while in hospital and at the one month post stroke interval and that either only those with lack of ULMF or poor ULMF returned for therapy at the two and three months post stroke intervals. This is confirmed by the decrease in scores at the two and three months post stroke intervals, when participants with less arm movement and less function of the UL returned for therapy.

While movement at the wrist improved for participants between initial assessment and discharge while they were in hospital, there was a steady decline in function at the one month interval indicating that the participants who returned for therapy were those who had little or no wrist function. This was confirmed by the sharp decline in median scores at the two and three months intervals, with the median recorded as 0.For those participants who returned at the one, two and three months intervals the decreased scores for the wrist movement confirmed that only those with overall lack of, or limited, wrist movement returned for therapy at the two and three months assessment intervals. There was a significant decline in wrist function from discharge to the 3rd month assessment interval ($p=0.003$).

A significant change in hand motor function was seen when participants were still treated in hospital. There was improvement between the initial assessment and on discharge with the highest median close to 100% and these participants never returned for follow up appointments. This may be an indication that they achieved normal hand function. Participants who returned are those that had poor hand motor mobility at the one, two and three months assessment intervals. Performance continued to decline toward the 3rd month assessment interval indicating that the

participants with the greatest loss of hand function were those who continued to attend therapy at the two and three months assessment intervals.

There was improvement in co-ordination while the participants were treated in hospital prior to discharge. However, there was a steady decline in coordination at the one, two and three months assessment intervals. Note that the median score was 0.00 at all intervals. Therefore, patients who returned for follow up at the one, two and three months assessment intervals were those who, as stated above, had poor ULMF and therefore continued to have greater difficulties with coordination.

4.4 PERSONAL MANAGEMENT USING OUTCOME MEASURE SOUTH AFRICAN DATA: FUNCTIONAL MEDICINE (SADFM-BETA SCALE)

The change in the PM scores on the SADFM-Beta Scale varied between the different activities, as can be seen in Table 4.8.

Table 4.8 Scores on the SADFM Beta Scale for participants with stroke at the five assessment points in the study

SADFM–BETA	Initial Assessment=71	Discharge n=45	1 month n=34	2 months n=24	3 months n=21	Chi square (df)	p value
			Median (Lower and upper quartile)				
Eating	7 (5 – 7)	7 (7 – 7)	7 (7 – 7)	7 (7 – 7)	7 (7 – 7)	7.52 (4)	0.11
Grooming	4 (2 – 7)	5 (4 – 7)	7 (5 – 7)	7 (7 – 7)	7 (6 – 7)	11.25 (4)	0.02*
Bathing	3 (2 – 5)	5 (3 – 7)	5 (4 – 7)	7 (5 – 7)	7 (6 – 7)	10.24 (4)	0.03*
Dressing Upper body	3 (2 – 5)	5 (3 – 7)	7 (4 – 7)	7 (5 – 7)	7 (6 – 7)	13.93 (4)	0.00**
Dressing Lower body	3 (2 – 5)	5 (3 – 7)	5 (3 – 7)	7 (4 – 7)	7 (4.5 – 7)	7.25 (4)	0.12
Toileting	3 (2 – 7)	5.5 (2 – 7)	6 (3 – 7)	7 (5 – 7)	7 (4.5 – 7)	10.22 (4)	0.03*
Bladder management	6 (6 – 7)	7 (6 – 7)	7 (6 – 7)	7 (6 – 7)	7 (6.5 – 7)	10.08 (4)	0.04*
Bowel management	6 (6 – 7)	7 (6 – 7)	7 (6 – 7)	7 (6 – 7)	7 (6.5 – 7)	10.08 (4)	0.04*
Transfers: Bed to chair	4 (2 – 7)	6 (3 – 7)	7 (4 – 7)	7 (7 – 7)	7 (4.5 – 7)	4.72 (4)	0.31
Transfers: Chair to toilet	3 (2 – 7)	6 (3 – 7)	7 (4 – 7)	7 (7 – 7)	7 (4.5 – 7)	4.72 (4)	0.31
Transfers: Chair	3 (2 – 7)	5.5 (3 – 7)	7 (3 – 7)	7 (6 – 7)	7 (4.5 – 7)	12.00 (4)	0.017*
Locomotion: Walk/	3 (2 – 7)	6 (2 – 7)	6 (3 – 7)	7 (6 – 7)	7 (4 – 7)	10.64 (4)	0.030*
Locomotion:Stairs	1 (1 – 7)	6 (1 – 7)	6 (1 – 6)	6 (1 – 7)	7 (4 – 7)	10.40 (4)	0.034*

Significance * p≤0.05
** p≤0.05

There were four PM variables where consistent improvement over the five ratings of participants was not significant: eating (p=0.11), dressing the lower body (p=0.12) and transfers from the bed to the chair and chair to the toilet (p=0.31). The improvement over time for all other PM variables was significant, suggesting that the participants were dependent on admission and gained more independence while in hospital as a result of the therapy they received. This improvement continued after discharge and most of the participants were independent in these PM activities by two or three months post stroke.

4.4.1 Eating:

Eating in the context includes grabbing the utensil, scooping the food, bringing it to mouth and swallowing.

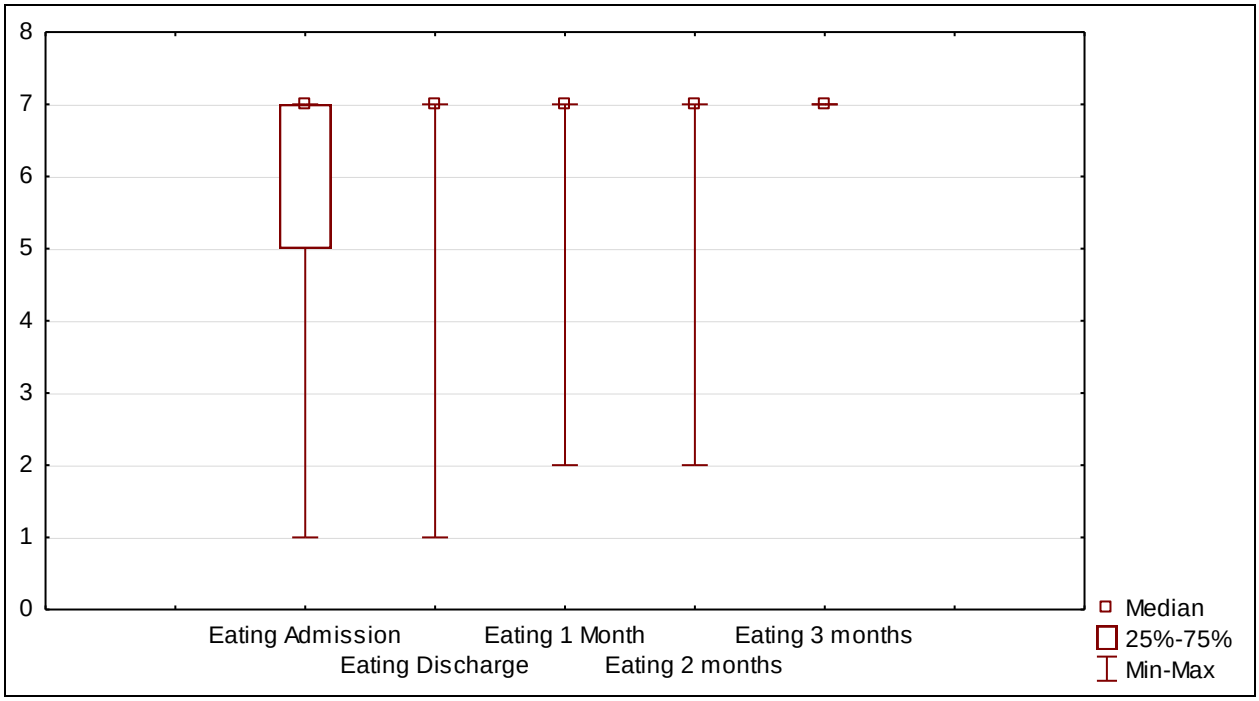


Figure 4.5 Median and quartile ranges for eating for participants at the five assessment points

The median score for eating was 7 for all five assessment points in the study. However, eating was a problem for some participants 38 % (n=27) on admission, with the lowest scores in the lower quartile range 5-7. However, by discharge all participants had achieved a score of 7 indicating achievement of independence. Thus those returning at the one, two and three months assessments had full independence in eating. The changes on this variable were not significant over the research period (p=0.11).

4.4.2 Grooming:

Grooming in this context refers to oral care, washing face, washing hands, brushing hair, makeup and shaving.

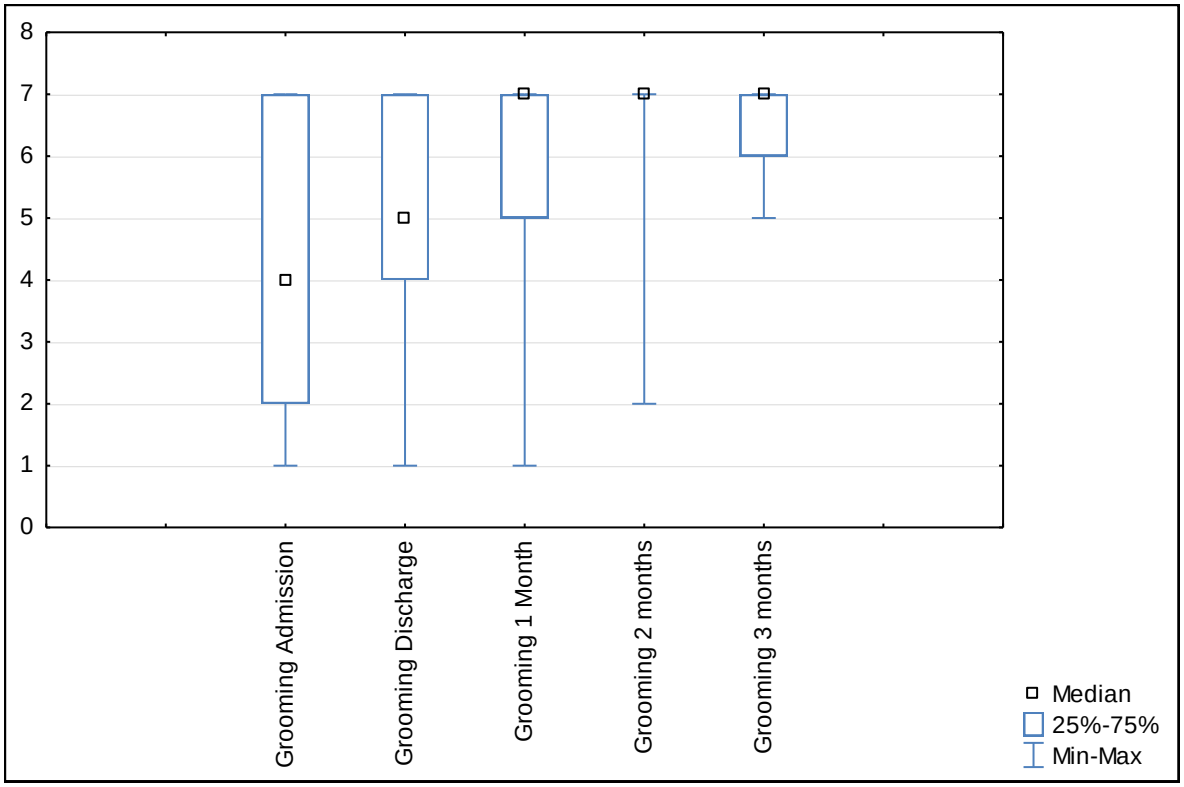


Figure 4.6 Median and quartile ranges for grooming of participants at the five assessment points

The majority of patients had difficulties with grooming on admission (median was 4 in the quartile range 2-7). There was some improvement noted at discharge from hospital but the participants mostly required assistance in grooming (median 5 in the quintile range 4-7). When participants returned at one month the improvement had been sustained, and most were independent with the median score of 7 in the quintile range 5 -7.

By the two and three months assessment most remaining participants were independent with scores of 7. However, it is interesting to note that the lower quartile score at 3 months dropped down to 6 as a single participant 2.2% (n=1) who remained in the study had a mild loss of independence in grooming (See Figure 4.5).

The lower quartile scores showed increased improvement overall with no participants scoring less than 6 at the three month post stroke assessment. The changeover the assessment period was found to be significant for this variable with p=0.02.

4.4.3 Bathing:

Bathing included the washing of the right arm, left arm, chest, abdomen, genitals, buttocks, right upper leg; left upper leg, right lower leg foot, left lower leg foot. (10 body parts).

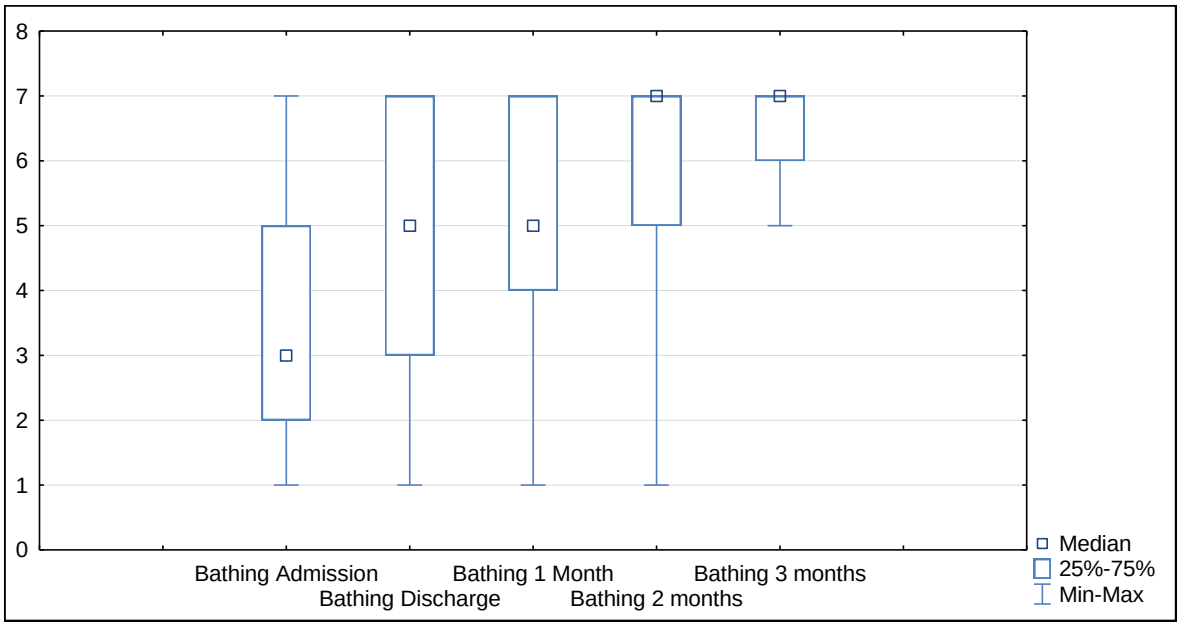


Figure 4.7 Median and quartile ranges for bathing for participants at the five assessment points

On admission, 84.5% (n=60)of the participants were dependent in terms of bathing (median 3 in the quartile range of 2-5). See Figure 4.6.

An improvement in independence in bathing was noted at the discharge from hospital assessment (median of 5 in the quartile score range of 3-7). A small improvement in independence in bathing was reported at the one month post-stroke recording (median 5 in the quartile score range 4-7).

This improvement in independence in bathing continued in the returning participants, reaching a median of 7at both the two and three months assessments. Thus the median scores improved from 5 to 6 from the one to three month assessment intervals, indicating that the returning participants were mostly independent in bathing at that stage35.5% (n=16). Again, the changes in this variable over the research period were found to be significant (p=0.03).

4.4.4 Dressing Upper Body:

Upper body dressing included pulling clothing on over right arm, overhead, left arm and down trunk

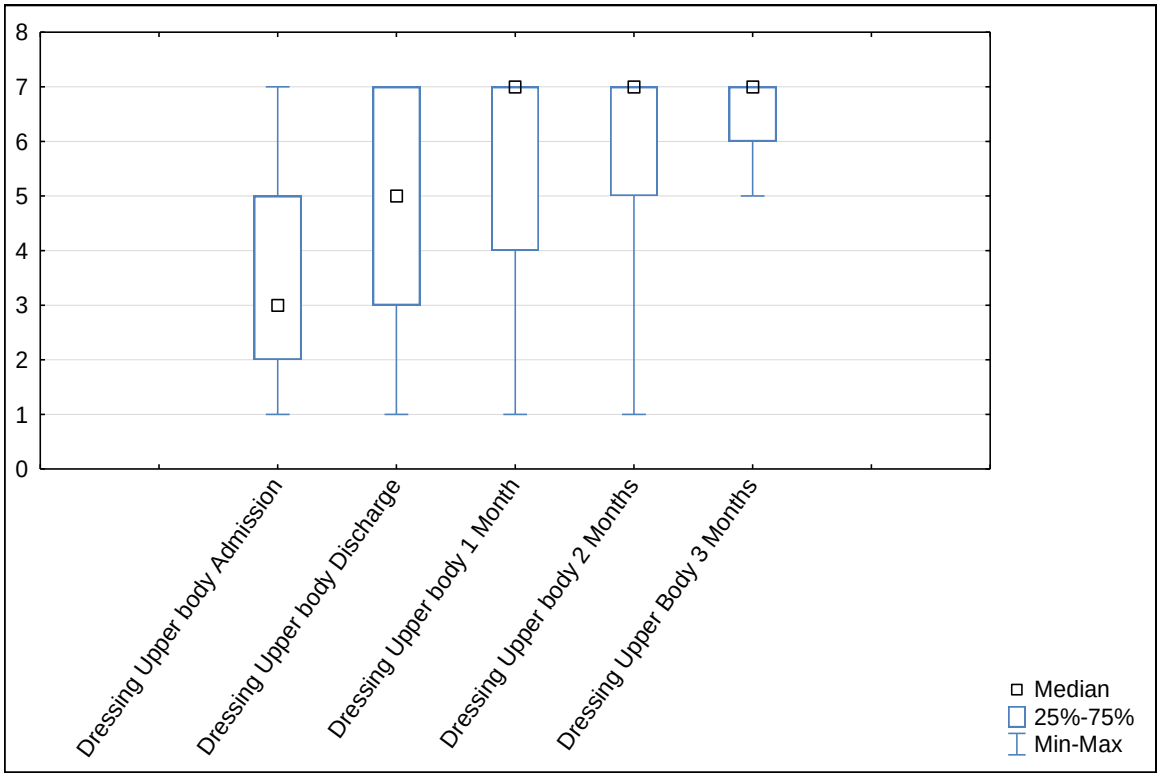


Figure 4.8 Median and quartile ranges for upper body dressing for participants at the five assessment points

Performance in dressing upper body was difficult for many participants on admission as they needed maximum assistance (median of 3 in the quartile score ranges of 2 and 5). See Figure 4.7.

The scores for dressing the upper body had improved by discharge with the median scores of 5 in the quartile range 3-7. The median score of the remaining 34 participants had improved to 7 at one month post stroke, with this median being maintained at the two and three months assessments.

At two and three months post-stroke the quartile range scores improved from 5-7 to 6-7, indicating that there were returning participants who achieved independence. Aminority6.6% (n=3) needed a little assistance in performing this dressing task, mostly in setting up the tasking terms of fetching the clothes. The changes in this variable over the study period were significant (p=0.00).

4.4.5 Dressing Lower Body:

Lower limb dressing includes pulling up clothing over right leg, left leg, over the hips and feet.

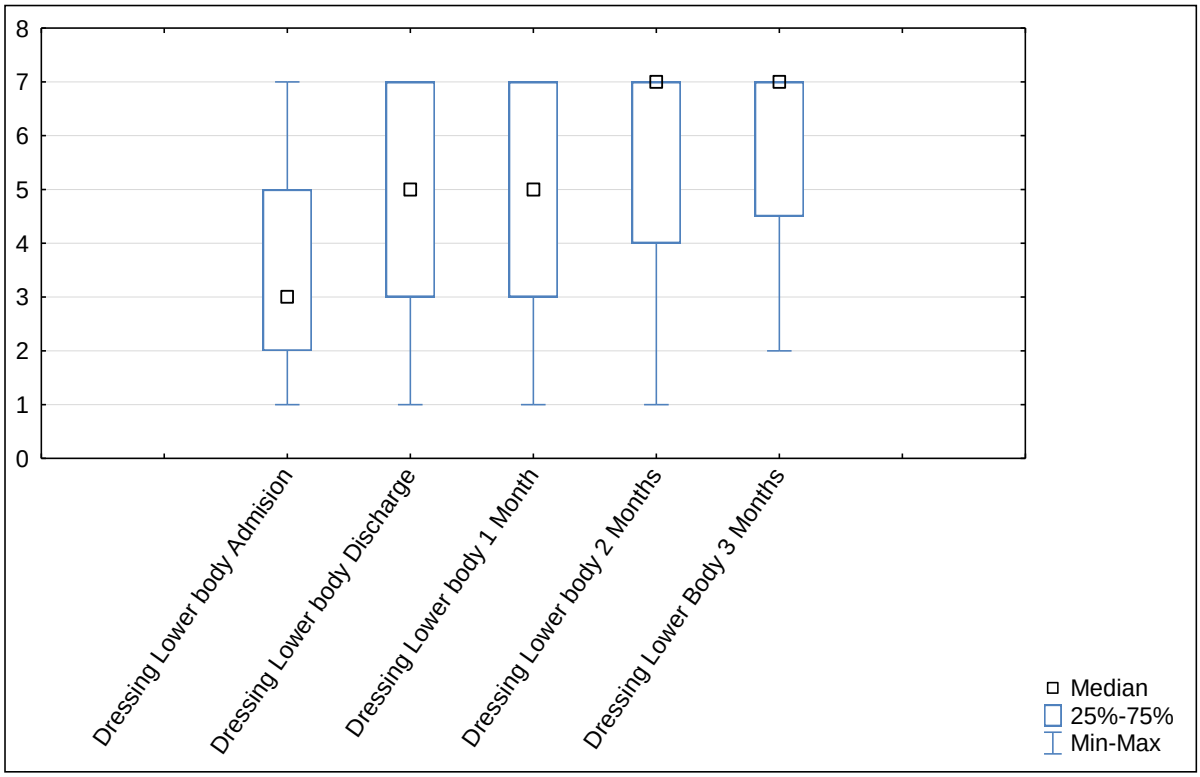


Figure 4.9 Median and quartile ranges for lower body dressing for participants at the five assessment points

Lower body dressing seemed to recover at a slower pace than upper body dressing, and this variable did not achieve a significant change over the five assessment periods (p=0.12).

In hospital lower body dressing progressed at the same rate as upper body dressing until discharge, with participants achieving some independence (median 5 in the quintile score range3-7). No further improvement occurred between discharge and the 1 month post-discharge assessment in those participants who returned for follow-up. See Figure 4.8.

Although the median for lower body dressing was 7 at the two and three months assessments the minimum quartile range scores indicate that some participants were still dependent for lower body dressing at two months (quartile range4-7) with a slight

improvement to the minimum quartile range score of those that returned for follow-up at three months (quartile range 4.5-7).

4.4.6 Toileting:

Toileting includes pulling pants down, cleaning, pulling pants up and steadying.

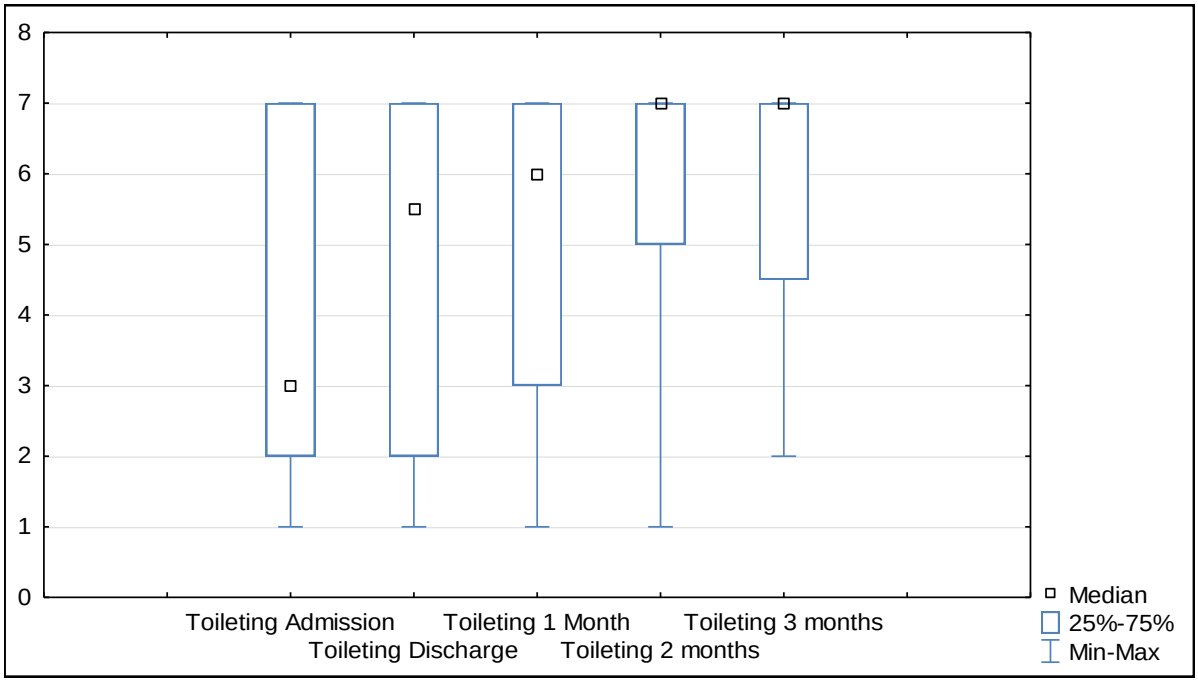


Figure 4.10 Median and quartile ranges for toileting for participants at the five assessment points

Significant improvement (p=0.03) was seen in toileting in participants over the research period. Again most participants were dependent in toileting on admission (median 3 in the quartile score range 2-7) and still required assistance in this activity on discharge (median 5.5 in the score quartile score range 2-7).

Thus, while some participants were not fully independent in bowel and bladder management on admission (median 6 in the quartile score range of 6-7), by discharge most participants were independent and the median in both cases was 7 in the quartile score range of 6-7.

At one month post-stroke, independence in toileting was recorded for most participants returning for the one month post–stroke assessment (median 6 in the score range 3-7).

By the 2 month assessment, although the median was 7, not all returning participants were independent (quintile score range 5-7) and one participant's independence in toileting had deteriorated.

4.4.7 Bladder and bowel management:

4.4.7.1 Bladder management: includes the subject controlling the emptying of their bladder.

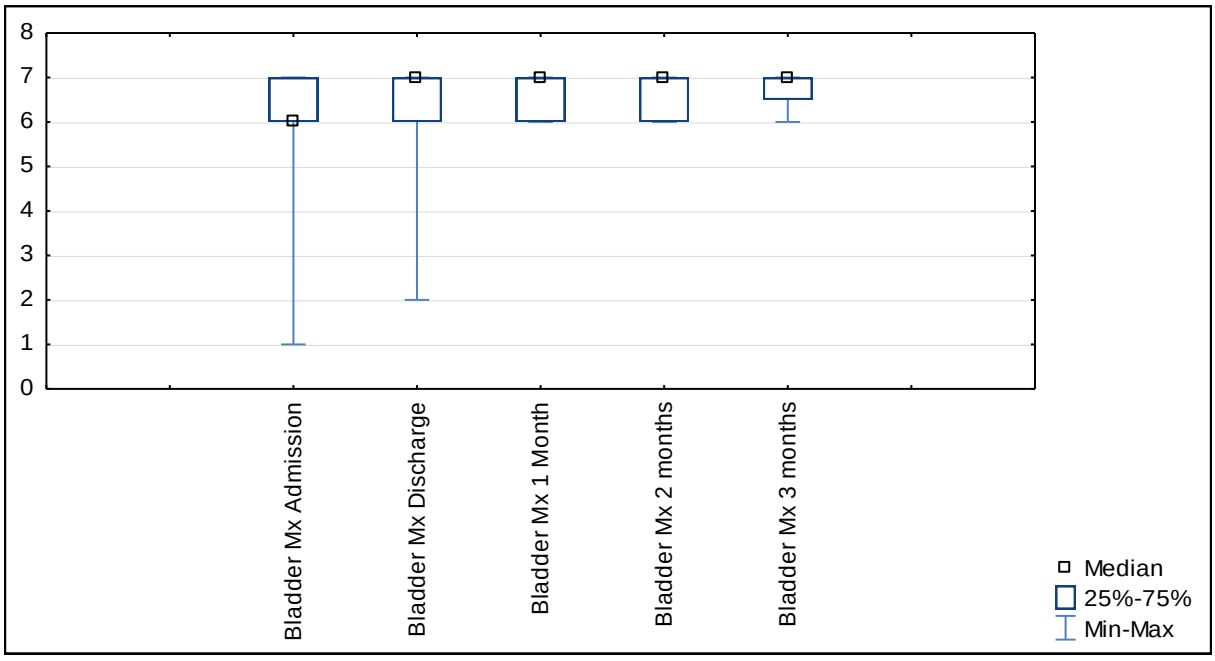


Figure 4.11 Median and quartile ranges for bladder management for participants at the five assessment points.

4.4.7.2 Bowel management:

4.4.7.3 Bowel management includes the subject controlling the emptying of their rectum.

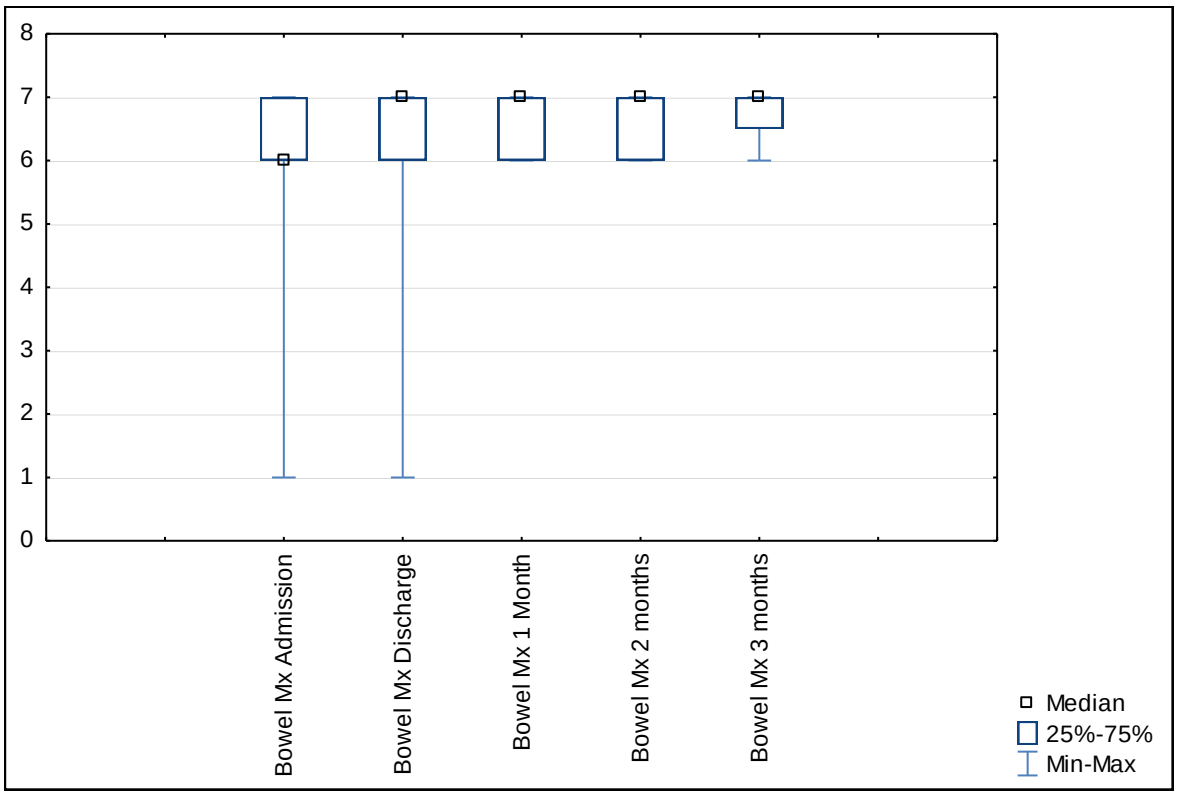


Figure 4.12 Median and quartile ranges for bowel management for participants at the five assessment points

These two PM activities appeared to have been the least affected by the onset of stroke in this study cohort. No significant change was seen in bladder and bowel management over the five assessment periods even though some participants were dependent on admission. The change over the assessment period was not significant. The majority were using nappies for bowel management as they had difficulty with transfers and locomotion (p=0.31).

These scores were maintained over the remaining three assessments for participants that returned for follow-up in the research period, with the median continuing at 7 but with the quartile scores ranging from 6.5-7. This indicates that while 42.2% (n=19) of the returning participants were independent in bowel and bladder management, 8.9% (n=4) who returned were still wearing nappies indicated by the minimum score of 6.5. See Figures 4.10 and 4.11.

4.4.8 Transfers: Bed to chair and back:

This transfer includes lifting, steadying and easing from the bed to a chair.

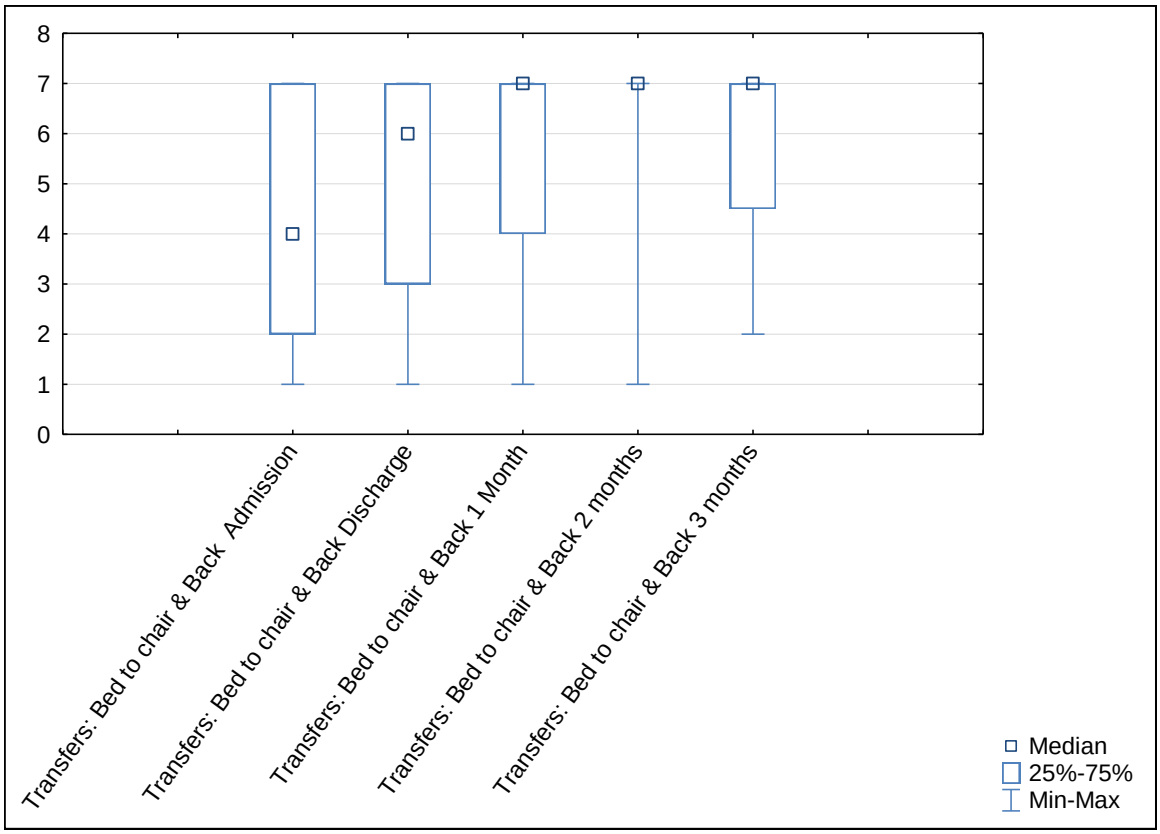


Figure 4.13 Median and quartile ranges for transfer from bed to chair and back for participants at the five assessment points

There was no significant change over the five assessment periods for the ability to transfer from the bed to a chair and back (p=0.31). Thirty-one percent (n=22) participants were independent for this activity on admission (see Figure 4.12), while others were dependent on others for transfer.

This is evident in the lower quartile range score of 2 on admission improving steadily until all participants achieved a median score of 7 with a quartile range score of 7-7 at the two months post stroke assessment. However, at the final assessment the median remained at 7 while the lower quartile score fell to 4.5 indicating a number of returning participants were less independent in this bed to chair transfer than at the two months post stroke assessment.

4.4.9Transfers: Chair to toilet and back:

This transfer includes lifting, steadying and easing the body from a chair to the toilet and back.

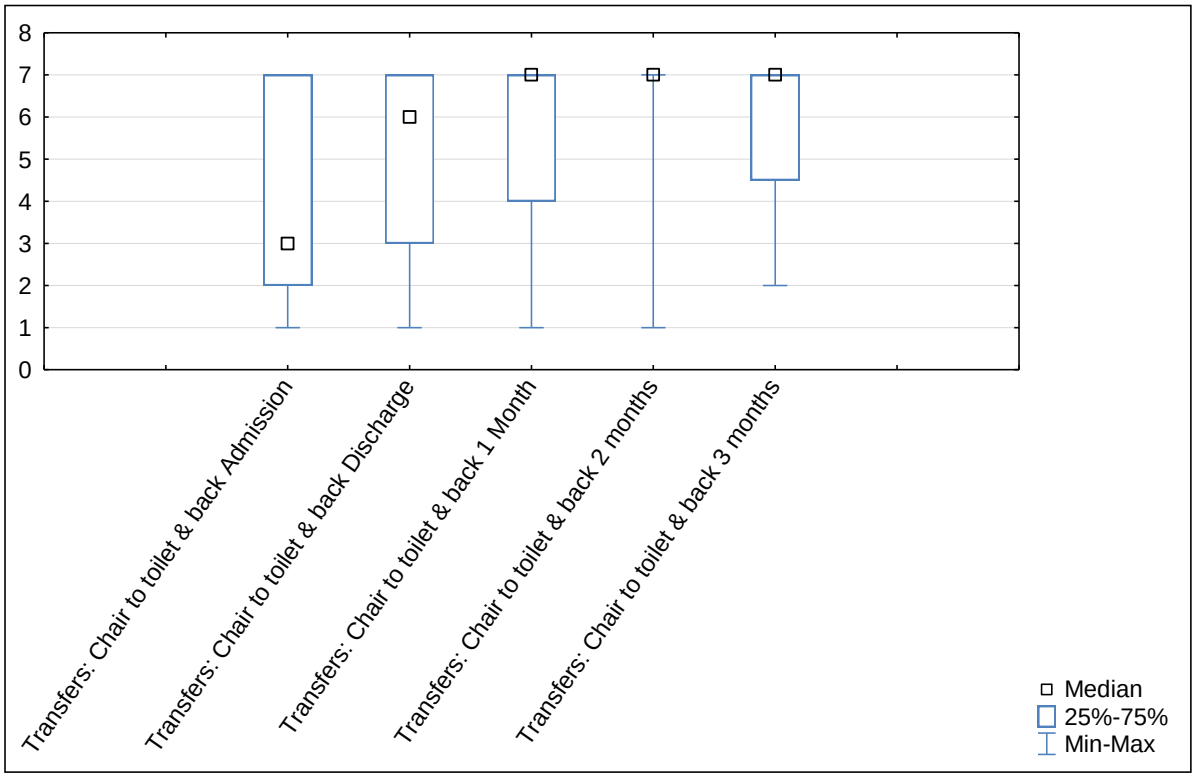


Figure 4.14 Median and quartile ranges for transfer from chair to toilet and back for participants at the five assessment points

Similar results were found for transfers from the toilet to chair and back to those for transfer to and from the bed to chair and back, except for the median on admission which was slightly lower at 3 rather than 4. See Figure 4.13 below.

4.4.10 Transfers: Chair to bath/shower:

This transfer involves lifting, steadying and easing the body from a chair into the bath or shower.

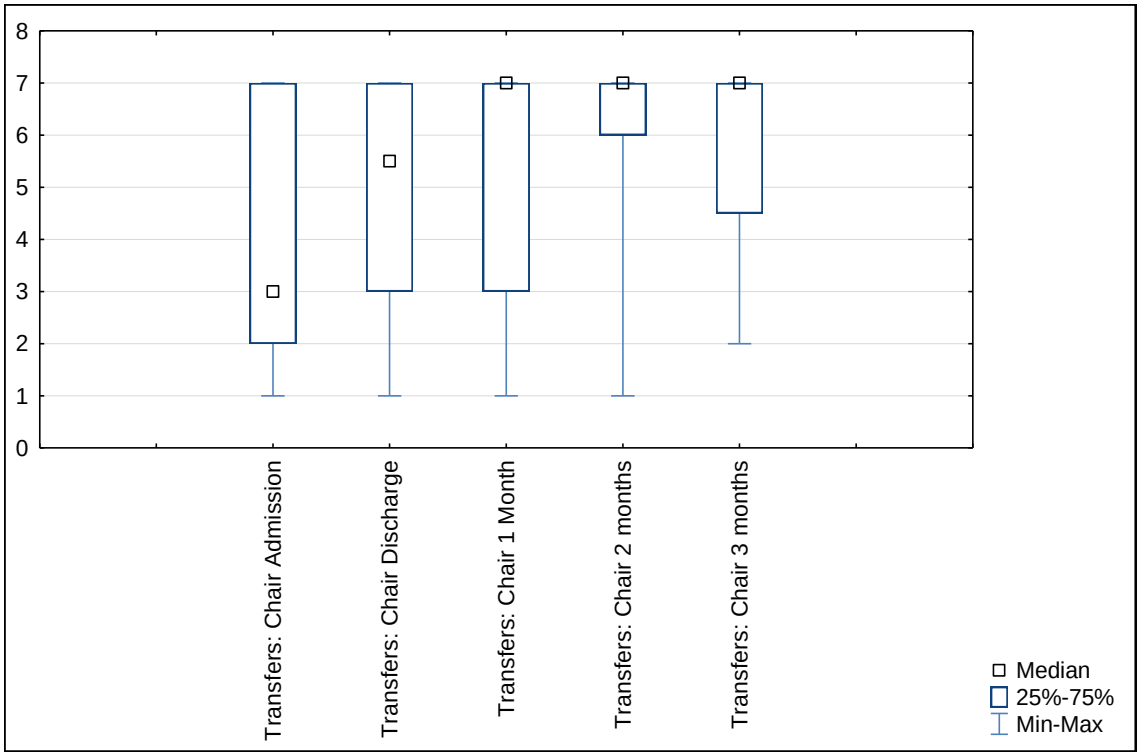


Figure 4.15 Median and quartile ranges for transfer: chair to bath/shower for participants at the five assessment points

Again, the scores on this transfer variable were similar to the other two transfer variables discussed above (see Figure 4.14). The only differences were the medians on discharge for the transfer to chair variable, which were slightly lower at the discharge assessment (5.5). This indicates that fewer participants were independent for this transfer variable than for the previous two at the same assessment period.

Also, the scores at the two months assessment indicated that some of the returning participants had gained slightly less independence as seen by a lower quartile range score of 6. Even so, the improvement was found to be significant over the research period with p=0.01.

4.4.11Locomotion: Walk/ Wheelchair:

Locomotion involves subjects moving themselves independently over 50 meters of level area by walking or pushing themselves in a wheelchair.

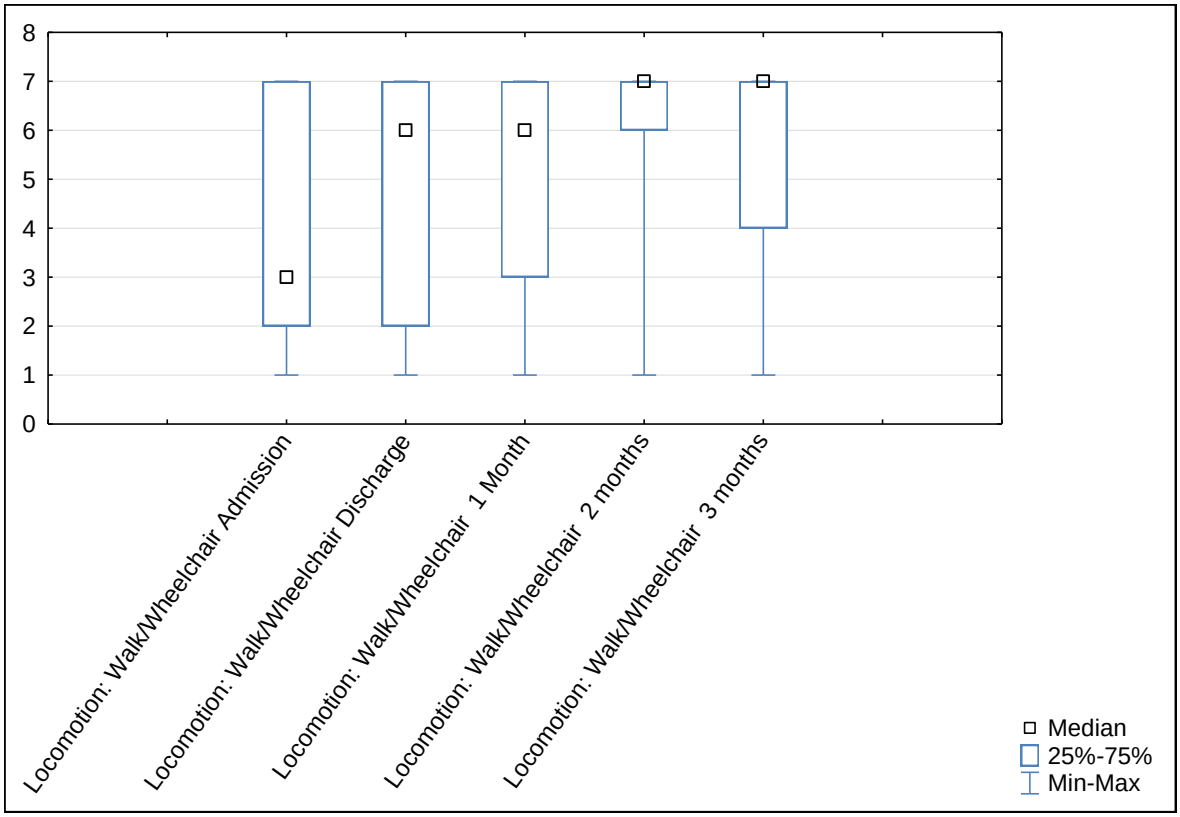


Figure 4.16 Median and quartile ranges for Locomotion: walking/wheelchair for participants at the five assessment points

There was a significant change over the five assessment periods for the ability to walk or mobilise in a wheelchair, with p=0.03.

The median score of 3 indicates that most participants were dependent in terms of this variable on admission. However, the quartile ranges from 1-7 suggests that some participants never lost independence in this aspect as a result of stroke while others were very dependent. See Figure 4.15.

The median for this variable increased to 6 at the discharge assessment and only improved to 7 at the end of the data collection period. Some of the participants who returned for follow-up remained dependent from admission to the two months post-stroke assessment with lower quartile scores of 1, but improved slowly to the three months post-stroke assessment.

Participants who were less independent seemed to return for treatment as indicated by the change of the lower quartile score from 6 at two months to 4 at three months.

4.4.12Locomotion: Stairs:

This involves the subject moving themselves independently up and down 10 stairs without a handrail.

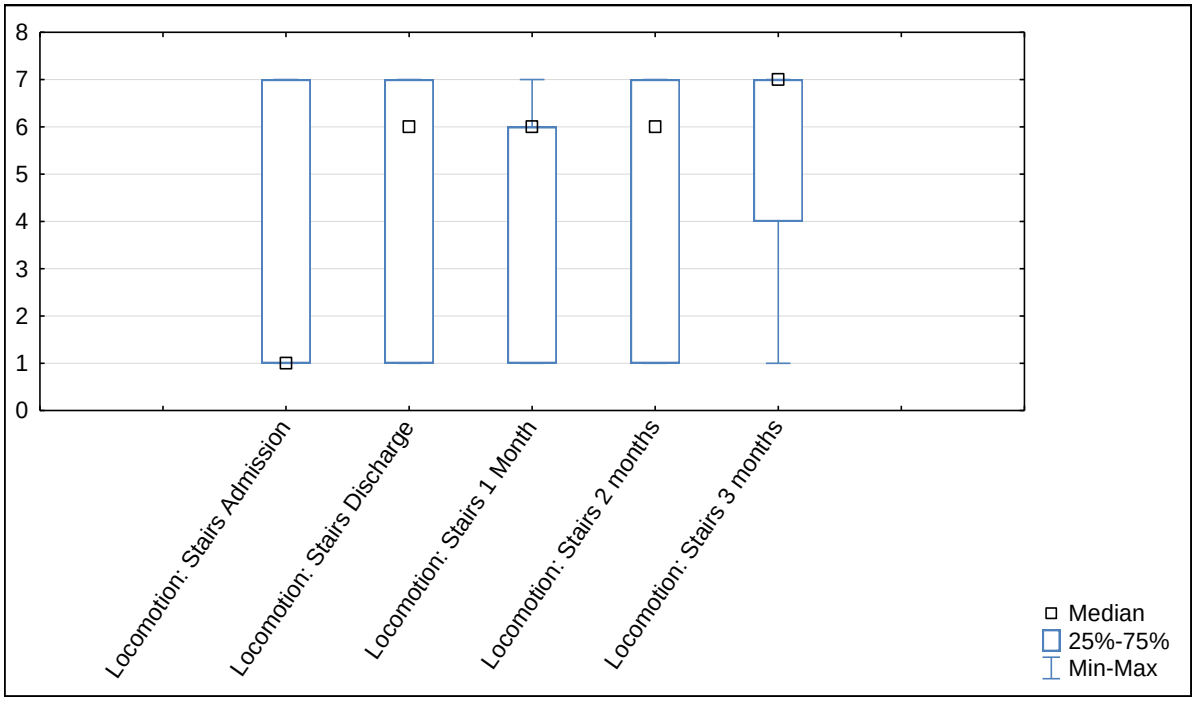


Figure 4.17 Median and quartile ranges for locomotion: stairs for participants with stroke at the five assessment points in the study

There was a significant change over the five assessment periods in the ability to walk up and down the stairs, with a p=0.03.

Results, indicated by the median scores, demonstrate that most participants were dependent for this variable on admission (median of 1 in the quartile range of 1-7), but by the discharge assessment most were independent in climbing up and down stairs (the median score of 6 in the quartile range of 1-7).

Similar scores were noted at the one and two month follow-up assessments. A median score of 7 in the quartile range of 4-7 was only attained at the three months post-stroke assessment, suggesting this was a difficult activity for 8.8% (n=4) returning participants to achieve independence.

4.4.13 Summary

Eating was not a problem in this study as all participants were independent in eating at discharge. This maximum score of 7 was maintained over the rest of the data collection period.

For the grooming component, the majority of participants had difficulties on initial assessment and they got discharged from hospital requiring assistance. The median was 7 during follow up at one, two and three months assessment intervals. It is interesting to note that the lower quartile score at 3 months remained at 6, which indicates that perhaps the participants who remained in the study at this stage still continued to require assistance to some degree in grooming. However, there was no participant scoring less than 5 at the three month interval.

An improvement in bathing was seen prior to discharge from hospital and continued improvement was reported at the first month post-stroke recording. This gradual improvement in independent in bathing continued, reaching a median of 7 for both intervals at 2 and 3 months with the minimum score reaching 5 at three months, indicating that some participants continued to require assistance with bathing at that interval.

Performance in dressing the upper body was difficult for some 67.6% (n=48) patients on admission as they needed maximum assistance. However there were some 32.3% (n=23)patients who had scores ranging between 5 and 7 where they needed assistance in setting up for the task only, whereby another person brings clothing items and sets them ready for the patient to dress. The median improved at one, two and three months to a maximum score which indicates that there were patients who achieved independence in upper body dressing at these intervals. However, the minimum score remained at 1 up to the two month post stroke interval. At the three month post stroke interval there was a marked improvement, with the minimum score being 5 with participants requiring assistance to set up the task.

Lower body dressing did not achieve a significant change over the five assessment periods with participants achieving some independence in hospital but no further improvement at 1 month post discharge. Although the median for lower limb dressing was 7 at month two and three, the minimum scores indicate that some 11% (n=5)

participants were still totally dependent for lower limb dressing at the 2 month interval, with a slight improvement to a minimum score of 2 at the three month interval.

Improvement was seen in toileting although the minimum score at the one and two month intervals indicated that 8.9% of participants were still nearly totally dependent in toileting at this stage. By the three month interval most participants who attended the assessment had achieved independence. The decrease in the lower quartile to 4.5 indicated that those who returned at the three month post-stroke interval were the participants who were more dependent in toileting.

Significant change was seen in bladder and bowel management over the 5 assessment periods. Participants were dependent on initial assessment and at discharge from hospital, as the majority of them were using nappies for bladder and bowel management due to difficulty with transfers and locomotion. There was improvement seen at discharge with the medium score of 7 which was maintained at one, two and three months. This indicates that these patients were independent in bladder and bowel management at this stage, and those who returned at three months are those who were still wearing nappies. This was indicated by the minimum score of 6 which meant that they were still wearing nappies but were able to change themselves independently.

The median improved gradually over the five assessment periods for the ability to transfer from the bed to a chair and back, transfer from the toilet to a chair and back as well as transferring to a bath/shower and back. Some 47.8% (n=34) participants presented with independence in this aspect on admission already. Six point six percent (n=3) remained dependent even at the two month post discharge interval, with the need for assistance indicated by a minimum score of 2 and 3. Again the participants who returned at three months were those that were more dependent.

There was no significant change over the first three assessment intervals in the ability to walk/mobilise in a wheelchair, even though the median score improved significantly. Twenty-seven point six percent of participants (n=19) were totally dependent even on initial assessment with a minimum score of 1, however 47.8% (n=34) of participants were showing independence in this aspect at that stage already. Eight point nine percent of participants remained dependent even at the one, two and three months intervals post stroke and required assistance which is indicated by a minimum score

of 1. Participants who were less independent were those who returned for treatment at the three month interval.

There was a significant change from the initial assessment to discharge in the ability to walk up and down stairs, as indicated by the median score which improved. Even on admission, participants were showing independence in this aspect. A median score of 7 was only attained at the three month post-stroke interval, indicating this was a difficult aspect for patients to achieve independence in. Some participants remained dependent even at three months post stroke, as seen by the minimum score of 1 thus indicating the need for maximum assistance. There was a significant change over the five assessment periods in the ability to walk up and down the stairs with a $p=0.03$.

4.5 CORRELATION BETWEEN PERSONAL MANAGEMENT AND UPPER LIMB FUNCTION

The scores for the SADFM-Beta Scale and the FMA-UE measure were correlated to determine the association between the variables of these two assessments (Table 4.9).

Table 4.9 Correlation between scores for the South African Data: Functional Medicine (SADFM-Beta Scale) and the Fugl-Meyer Assessment: Upper extremity measure on admission and discharge

South African Data: Functional Measurements (SADFM-Beta)	Fugl-Meyer Assessment: Upper Extremity							
	Upper limb		Wrist		Hand		Coordination	
	Rho							
	Initial Assessment	Discharge	Initial Assessment	Discharge	Initial Assessment	Discharge	Initial Assessment	Discharge
Eating	**0.60**	0.48	0.42	0.35	0.38	0.33	0.35	0.28
Grooming	0.58	**0.66**	0.35	0.52	0.27	**0.61**	0.29	0.56
Bathing	0.58	**0.68**	0.33	**0.58**	0.26	**0.63**	0.34	**0.60**
Dressing upper body	0.55	**0.65**	0.33	0.53	0.27	**0.60**	0.34	0.56
Dressing lower body	0.53	**0.72**	0.33	**0.62**	0.28	**0.72**	0.33	**0.62**
Toileting	0.57	**0.70**	**0.52**	0.55	**0.43**	**0.66**	0.43	0.58
Bladder management	0.43	**0.85**	0.37	**0.71**	0.29	**0.79**	0.31	**0.69**
Bowel management	0.43	**0.83**	0.37	**0.63**	0.29	**0.69**	0.31	**0.62**
Transfers: Bed to chair & Back	**0.67**	**0.59**	**0.53**	0.47	0.47	**0.58**	0.45	0.55
Transfers: Chair to toilet & back	**0.68**	**0.59**	**0.53**	0.47	0.47	**0.58**	0.45	0.55
Transfers: Chair	**0.65**	**0.65**	**0.53**	0.52	0.47	**0.58**	0.45	0.57
Locomotion: Walk/Wheelchair	**0.59**	**0.59**	**0.50**	0.55	0.45	**0.66**	0.43	**0.59**
Locomotion: Stairs	**0.62**	0.53	0.53	0.44	0.43	0.56	0.44	0.56

As can be seen in the above table, on admission the correlations between the different variables ranged from moderate to high. The variables for which there was a strong relationship was between functionality of the UL and eating, all 3 types of transfers and climbing stairs. This reflects the importance of UL movement to all these variables.

The variables with the weak relationships were related to the association between the wrist, hand and coordination, eating, grooming and dressing as well as bowel and bladder management, where hand function is needed for all the tasks.

The UL movement had moderate correlation with grooming, bathing, dressing upper and lower body, toileting, and bowel and bladder management. The participant could provide some assistance with their unaffected UL when nursing staff helped them with these tasks.

On discharge, there were 2 variables which had very strong correlations between ULMF and bowel and bladder management. This was because participants ULMF was poor and they could not manage to change their nappies. They were dependent on nurses in order to complete these tasks. There was a strong correlation between UL and hand functionality in grooming, bathing, and dressing upper and lower body, toileting as well as wrist functionality and coordination and dressing upper body and bowel and bladder management. These tasks require the use of both hands where wrist stability and coordination are required.

In most cases there was a positive p value increase in scores on admission and discharge. However, correlation between eating and all variables in the UL decreased at admission. This may be related to the fact that as participants became more independent, they used more complex eating utensils for eating which may account for this. A decrease in scores is also noted between admission and discharge on transfers: bed to chair and back, chair to toilet and back and UL and wrist functionality as well as chair to bath/shower and wrist functionality.

There were moderate (40-60) correlations between wrist movement and the personal variables however on discharge. There were high correlations between wrist movement and lower body dressing and bladder and bowel management. All other correlations between wrist movement and PM variables were moderate to low.

On admission there was an overall moderate to low correlation between hand function and all the PM variables with Rho> 5. However, on discharge there was a high correlation between hand function and grooming, bathing, dressing the upper and lower body, toileting, bowel and bladder management (0.79) and locomotion by walking or in a wheelchair. The association between the remaining variables was moderate to low.

On admission the association between co-ordination and the PM variables were all below Rho <0.4 and therefore of a moderate to poor correlation. However, on discharge there was a high correlation between co-ordination and bathing, dressing of the lower body, and bladder and bowel management. The remaining correlations were moderate to weak.

4.5.1 Objective 4

When the initial assessment scores for the SADFM-Beta and FMA-UE were correlated, there were no correlations between ULMF, wrist function and hand function versus independence in PM. At this stage most participants were dependent in PM irrespective of their functioning due to the acute nature of their illness, and showed the effect of ULMF on their inability to move around at that stage.

There were however a number of correlations evident at discharge between scores for the SADFM-Beta Scale and the FMA-UE. At this stage the participants had started to engage in PM activities more actively and the loss of function in the UL had a direct effect on their ability to engage in these activities optimally. Wrist movement did not indicate strong correlation and does not seem to affect PM much. There was however a correlation between ULMF and hand function with PM areas of bowel and bladder management, and to a lesser degree with lower body dressing.

At the one, two and three months assessment intervals there were only low correlations found between ULMF and PM. This confirms the findings above that most participants had achieved independence or only required assistance with PM post discharge even though their ULMF remained problematic. Since those who had adequate ULMF did not return for therapy, results need to be considered in the light of this.

A loss of co-ordination does not correlate on initial assessment or at discharge. Equally, there were low correlations between co-ordination and PM at the one, two and three months assessment intervals.

CHAPTER 5: DISCUSSION

5.1 INTRODUCTION

The purpose of this study was to investigate outcomes of OT intervention in participants who presented with a first time stroke. The first objective for this study was to determine the demographic characteristics and medical history of participants diagnosed with first time stroke.

A demographic questionnaire was used to obtain the profiles of stroke patients attending occupational therapy at CHBAH. Two different outcome measures were used. In order to assess ULMF, the FMA-UE was used. PM was assessed by using the SADFM Beta Scale at 5 intervals during admission to research, at discharge and one, two and three months post stroke.

Descriptive analysis was used to determine outcomes using the outcome measures during these points of assessment. A descriptive study design provided opportunity to identify if outcome measures were sensitive to change in ULMF and PM. It also served to determine the association between ULMF and PM in stroke participants three months post stroke.

Participants in this study suffered from deficits in ULMF and they had problems in performing PM tasks. This study brings about the effects of using outcome measures and occupational therapy intervention at five intervals such as on admission to research, upon discharge one, two and three months post stroke.

The stroke demographics including site of lesion, side of hemiplegia, characteristics of participants attending occupational therapy at CHBAH, and predictors of ULMF and PM will be discussed.

5.2 Sample

This study was designed to use an intention to treat analysis. This implied that all participants were included in the data analysis irrespective of at what point they dropped out of the study. The sample was selected from the population of first stroke sufferers admitted to CHBAH during the research period of twelve months. Seventy-one patients agreed to participate in the study and were assessed on admission.

Forty-five of the 71 participants were assessed on discharge, while 34, 26 and 21 returned for their assessments at one, two and three months follow up appointments respectively. This represented a loss to follow up of 36.3 %(n=26) at discharge, 52.1% at one month post discharge, 66.1 % at two months and 70.4 % at three months post discharge.

In planning this study, a sample size of 45 participants was calculated to be required. Seventy-one participants were recruited and they had the first data collection assessments on admission. Forty-five were reassessed on discharge. This was consistent with the estimated number. However, by the final data collection at three months, only 21 participants returned.

As stated by Gallagher et al.(2011) in the studies that they conducted in rural villages of Ireland, access to transport becomes a challenge to disabled people if they are using public transport as it affects out-patient compliance to rehabilitation services(32).

The possible implication for this study is participants who default their out-patient follow up. Participants not measured during out-patient follow up would cause information to be insufficient about the variables being measured, as it would not be available for analysis.

The limitation of this study was the exclusion of participants who were suffering from cognitive deficits. This reduced the number of suitable research participants. Cognitive assessments need to be included as part of initial assessments post stroke and part of intervention carried out during therapy.

5.3 PROFILE OF STROKE PATIENTS TREATED IN THE CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL OCCUPATIONAL THERAPY DEPARTMENT

5.3.1 Characteristics of the sample (N = 71)

The first objective of the study was to describe the profile of stroke survivors seen by the occupational therapy department of CHBAH.

In this study, of the 71 participants, 35.2% (n=25) fall within the age group (19-40) years. A further 39.6% (n= 28) fall within the age group (41-60) and 25.3% (n=18) was over (60+). The youngest participant in the study was aged 19 years and the oldest participant was aged 75 years. Cerrato et al. (2004) also found high stroke prevalence

in young age groups between 16 and 49 in a study of 273 patients(26). Therefore, stroke in young people, between ages 16-49, appears to be common.

The high prevalence of stroke in the younger age brackets (19 to 40 and 41 to 60) in this study can be accounted for by the prevalence of the co-morbid condition of HIV+ status. Sen et al. (2012) confirmed that HIV causes cerebral vasculitis which is the thinning of cerebral blood vessels. This leads to stroke in younger individuals(36). In this study, there were fewer 17.7% (n=12) participants in this age category who did not have a known co-morbidity.

Gender of participants did not play a significant role in predicting recovery of ULMF. There were 44.4% (n=20) male participants in this study. Female participants accounted for 55.6% (n=25) of participants and out of this number, 36% (n=16) did not achieve full recovery of ULMF. The participants who did not achieve full recovery of ULMF were at different stages of motor recovery of FMA-UE. This variation was caused by the predictors of ULMF which includes site of the lesion. Similarly in PM there were 10% (n=2) of the male participants and12%(n=3) of female participants who did not achieve independence in PM. Incidence of stroke was found to be higher in women than men, as observed by(27)). It has been found in this study that there are more females who suffer from stroke than males. Therefore, gender difference in stroke incidence has been established in this study.

Of the 71 participants, most 50.7% (n=36) were suffering from right sided hemiplegia, meaning that they had lesions on the left hemisphere of their brains. Fifty three point three percent (n=24) of the 45 participants that completed the study also presented with right sided hemiplegia. Of these participants, 28.9% (n= 13) obtained full recovery of ULMF as measured by FMA-UE.

In the sample of participants that completed the study, 46.7% (n=21) had lesions in the MCA territory. Fifty-two percent (n=11) of this group of participants did not achieve full motor recovery of the affected UL, with 48% (n=10) achieving full recovery into stage 6 of SCOM on the FMA-UE measure. Nine point five percent (n=2) of these participants had clearly marked lesions involving IC, and all these participants had poor outcomes in ULMF and PM. From the other sub-cortical regions, there were 17.8% (n=8) of participants who had lesions in BG and 13.3%(n=6) in the lacunar area. All of these participants achieved full recovery of ULMF as well as independence in

PM. Only one participant who had BG lesion did not regain motor functioning, but remained in stage 2 SCOM of the UL. The remaining participants 22.2% (n=10) account for lesions in isolated areas in the cortical and sub-cortical regions. The predominant site of lesion was found to be MCA, as also found in previous studies(54). This occurs as a result of MCA being one of the large cerebral blood vessels that form part of circulation(54). However, apart from the influence of the involvement of the MCA on UL recovery, the involvement of IC proved to be a poor indicator for UL recovery post stroke(53).

Participants who formed part of the sample had various co-morbid conditions and the most common chronic co-morbid conditions were HIV and hypertension, followed by those who had no known co-morbid condition. Hypertension and HIV prevailed equally as co-morbidities affecting 31.1 % (n=14) of participants, while 24.4% (n=11) of the sample did not suffer from any other known condition.

The type of stroke that most participants 57% (n=41) suffered from was ischemic strokes in different sites in the brain. The remainder 43% (n=30) of participants presented with haemorrhagic strokes which supports the literature reporting that brain infarction or ischaemic stroke is more common than brain haemorrhage. Findings were observed in the study that was done by Connor et al.(2009) with 67 participants in which 96% had ischaemic stroke and only 4% of participants had haemorrhagic stroke(37). This is also supported by a review that was done by Beal (2010) in the USA who found that out of 780,000 patients who suffered from stroke, 87% of them suffered from brain infarction(38).

The only influencing demographic factor on ULMF recovery post stroke was identified as the site of lesion. The site of lesion that is in MCA territory was found to result in severe motor paralysis of the UL which subsequently sabotaged motor recovery patterns. It was mentioned in the findings of this study that participants who had lesions involving CST in the MCA territory, never regained full recovery of ULMF. This is consistent with current evidence reported by Kwakkel, et al. (2003) and reported by de Nap Shelton and Redding (2001)reported that predictors of ULMF include severity of motor impairment, site and size of lesion as well as integrity of the descending motor tracts which include CST(53, 54, 58).

5.4 OUTCOMES OF UPPER LIMB MOBILITY RECOVERY POST STROKE OVER THE RESEARCH PERIOD

The second objective was to determine change in ULMF on referral, and ULMF outcomes on discharge, at one, two and three months in patients treated in the occupational therapy department at CHBAH. It was found that the outcome measure that was used to assess participants was sensitive to change. As a result, there was change noted in terms of rate of recovery and nature of recovery in ULMF that was observed at different periods of assessments, and marked changes in rate of recovery was seen between admission and discharge from hospital. Participants who returned for out-patient follow up at one month were those whose nature of recovery still demonstrated residual motor impairments in the UL either in arm, wrist, and hand and/or coordination deficits.

5.4.1 Predictors of outcomes of UL motor mobility at (5 intervals) post stroke

The site of the lesion was found to be a variable that influenced the recovery of ULMF. In support of this, Kwakkel et al.(2003) reported that lesions in the MCA region involving the territory where the hand is represented in the motor homunculus, is a predictor of poor motor recovery(54). That was evident in this study as 46.6% (n=21) of participants had lesions in the MCA territory and 9.5% (n=2) of those cases had lesions that severed the PLIC. These participants remained between stage 1 and stage 3 of the selective control of movement of FMA–UE measure.

Participants who did not achieve full recovery of ULMF appear to be those who had lesions in the MCA territory, with single cases of lesions in the anterior cerebral artery and caudate nucleus sites. However, there were participants who had lesions in the MCA territory that experienced full recovery of ULMF. This indicates that it depends where in the MCA territory the damage occurred and on the size of the cerebral lesion. Therefore, MCA stroke is not a prognostic indicator for poor motor recovery of ULMF on its own, for it also depends if the motor tracts of the CST fibres are severed. Lesions that spare the PLIC gain recovery of SCOM of the UL(53). However lesions that involve the cortex, corona radiata and PLIC have decreased recovery of ULMF due to cortical representation of motor functioning and the pyramidal tracts that converge as they pass through corona radiata to PLIC(53). The majority of participants75 % (n=6) who had strokes in the basal ganglia and thalamic lesions regained full ULMF.

Participants experienced a rapid recovery of the hand function between the first assessment and the assessment done on discharge. However, recovery did not continue at this rate as it slowed down gradually at subsequent assessment intervals (Figure 4.3). Recovery of arm followed a steadier recovery, peaking at one month interval. A steady decline in recovery was also noted at subsequent intervals. In contrast to these findings, Kwakkel et al.(2003) recorded data from longitudinal studies which indicated that ULMF does not follow a linear pattern as observed in this study during recovery, as it depends on the site of the lesion(54). An explanation for this finding can be the decline in participants' numbers over the study period. Only participants with a poor arm and hand function recovery rate continued to attend follow up appointments. Therefore, the steady decline in recovery rate was observed at the last 3 out-patient assessment intervals.

There were 11.11%(n=5) of participants who regained some movement of the UL (arm) which placed them at stage 3 of SCOM of FMA-UE measure, however there was no movement of the hand. This phenomena is explained by Fatima (2001) that lesions that affect IC, severely affect the UL whereby there can be no recovery of movement in the affected UL(53). However, she continued by stating that in some cases participants regain a limited amount of movement in the UL which is not functional but there were no movement in the hand(53). This means that the motor fibres that course together with CST which are called RST tracts are the ones responsible for movement of the arm, but there will not be movement in the hand because the hand is innervated by the CST fibres only. There were 2.2% (n=1) of participants in this research who experienced full recovery of movement of the hand but limited movement in the arm (stage 4 of FMA–UE measure). The recovery of ULMF of these participants started distally, opposite to the more usual sequence of recovery from proximal to distal.

Age was not a significant predictor of recovery of ULMF and PM in this study as there were variations in pace and ultimate recovery outcomes across the different age groups. Participants recovered at different intervals regardless of their ages. Therefore, age was not found to be a predicting factor in terms of functional outcomes. The literature in terms of age being a predicting factor for recovery post-stroke is mixed. A study done with 878 Chinese participants aged between 65 and 80 found that participants of an advanced age showed improvement in rehabilitation (64). Tilling

et al. (2001) found that participants in the older age range show recovery after stroke but their rate of recovery is slow(66). However, on the other hand, Bagg et al. (2002) found that age is a significant factor that predicts outcomes in motor functioning and performance in ADL on discharge from hospital(65). This was not evident in the results of this study as participants recovered at different rates regardless of age.

In the younger age group (19 to 40), there was significant improvement of the UL. In these participants, 68% (n=13) of them achieved full recovery of the ULMF. Participants who did not regain motor recovery constitute 32% (n=6) and these are the participants that had lesions in MCA territory and only one participant had a lesion in the caudate nucleus and one who had a lesion in BG. They were in different stages of FMA-UE, with 83% (n=5) achieving stage 3 and 17% achieving stage 4 respectively.

Participants in the age group (41 to 60) fared even better with significant improvement of ULMF. In these participants 75% (n=12) achieved full recovery of ULMF. The other 25 % (n=4) did not regain ULMF and these participants had lesions in MCA territory.

Participants who were in the older age group (61 to 75) in this study varied in terms of rate of recovery of the ULMF and PM. Only 40% (n=4) achieved full recovery of ULMF and 60% (n=6) were at various stages of motor recovery of FMA-UE. This is supported by Tilling et al.(2001) who identified that patients who are in older age groups have a slower rate of motor recovery(66).

However, the common factor in all the participants who did not regain ULMF was the site of the lesion and more particularly, those who suffered a MCA stroke. Only 2 participants who had lesions in BG and caudate nucleus were amongst those who did not regain full ULMF. Therefore it can be concluded that the site of the lesion is a greater prognostic indicator for recovery of the UL post-stroke than age(53).

5.4.2 Functional recovery of the upper limb post stoke

This study confirmed that the administration of the FMA-UE can be used as a tool to assist in tracking recovery of patients who present with ULMF deficits post stroke. This outcome measure was found to be sensitive to changes of ULMF of stroke participants at 5 assessment intervals.

Recovery of the UL varied for each participant. Participants 82.2% (n=37) who had residual movement of the arm post-stroke achieved normal SCOM (stage 6) during in-

patient occupational therapy intervention and therefore scored 100% in the FMA-UE subtests including UL wrist, hand and coordination on discharge. These participants were initially disabled enough to warrant occupational therapy intervention. These participants never returned for out-patient follow up at one, two and three months post stroke. The optimal time for recovery is within the first 4-6 weeks post stroke, and this is substantiated by Kwakkel et al. (2003)(54). Participants 17.8% (n=8) who had severe impairment of the UL on admission recovered slowly, and they continued to attend occupational therapy at the various assessment intervals. Their rate of recovery in UL function varied for each participant and recovery was influenced by the site of lesion.

A number of participants 56% (n=40) had wrist problems on initial assessment. However, a significant improvement in wrist functioning from initial assessment was observed with participants achieving full recovery of wrist function at one month post-stroke. However, there were 66.7% (n=30) participants who returned for follow up at the two months post-stroke. Participants who returned for follow up on the two and three months assessment interval were those who continued to present with poor wrist function. This affected their occupational functioning and they therefore needed intervention.

There was a significant improvement in participants' hand function when they were still in hospital. Some of the participants 28.9% (n=13) were discharged from hospital having achieved full recovery of hand function. These participants never returned for follow up at one, two and three months post stroke. This occurred as a result of site of lesion as it was observed that this is the group that had lesions not involving motor fibres or motor cortex. Again it was noted that recovery of hand function was influenced by the site of the lesion. It was observed that hand function was severely affected in the group of participants that had lesions in the MCA 46.6% (n=21), and to a much smaller degree in those with BG lesions 17.7% (n=8). This group of participants came for follow up rehabilitation sessions at one, two and three months post stroke. Some 33.3% (n=15) of these participants did not regain functional movement of the affected hand and had poor hand function at the end of the research. The SCOM of their hand according to FMA-UE varied between stage 1 to 3 which is characterised by lack of movement or synergistic movements of the arm and hand which prevents production of energy efficient and effective(53).

Coordination was a problem for most participants 73.2% (n=52) on initial assessment and continued to present as problematic for some 53% (n=24) on discharge. Those participants who had improved coordination on discharge also had a marked improvement in ULMF. For both hand function and coordination, participants who returned at one, two and three months were those who continued to experience difficulties in this regard. These participants were those that had lesions in MCA and BG and their ULMF remained at SCOM stage 3 of FMA for motor recovery of the UL. This is characterised by poor isolated and coordinated movements of the fingers(53)

There are 31% (n=14) of participants who did not return for follow up at one month. This was not indicated as they had achieved full recovery during hospital intervention. Coupar et al. (2012) also found that lesser disability during admission is a good predictor for full recovery of ULMF(76). There are 20% (n=9) of participants who returned at one month post-stroke with their ULMF fully recovered. At two months post-stroke, there was 2.2 % (n=1) of participants who achieved full recovery of ULMF. A further 11% (n=5) of these participants returned for therapy at three months presenting with full recovery of their ULMF.

Therefore, there was a significant improvement of ULMF which was achieved at various times by participants. Some participants were discharged from hospital with full recovery and some got full recovery denoted by stage 6 at various stages during out-patient follow up. The optimal rate of recovery was achieved during in-patient treatment. However, recovery of ULMF also occurred during out-patient follow up intervention. Overall there were approximately 64.4% (n=29) participants who achieved full recovery in ULMF. This placed them at stage 6 of FMA-UE measure after receiving occupational therapy at CHBAH during in hospital intervention and out-patient follow up at one, two and three months post-stroke.

The remaining 35.6% (n=16) are the participants who had poor outcomes of ULMF. These participants were at various stages of FMA-UE measure varying from stage 2 (6.7%) n=3, stage 3 (17.7%) n=8 and stage 4 (11.1%) n=5. This occurred as a result of the site of lesion. All except 2 of these participants had lesions in the MCA. Only 2 single cases had lesion in caudate nucleus and BG respectively, and were in stage 2 and 3 respectively.

At CHBAH, patients who plateau in the recovery of ULMF three months post stroke but no longer require assistance in performing PM tasks continue to attend therapy for a further three months after stroke. They are then discharged from occupational therapy. However, they are given home programs according to the treating therapist's evaluation depending on residual motor disability. This is consistent with the findings by Kwakkel et al. (2003) that recovery of ULMF after stroke reaches a plateau after 6 months, which is an indicator for discharge from rehabilitation. These researchers found that if the patient still presents with a flaccid UL a month after stroke, a prediction of poor recovery of ULMF can be made at this stage(22). In light of the current evidence(54). Adey-Wakeling et al. (2013) also found that prognostic indicators are essential factors and cornerstones in rehabilitation that assist therapists in setting realistic goals for patients and designing appropriate intervention that is beneficial. Thus therapists need to be aware of the severity of motor impairment on the affected UL and its influence on long term outcome(58).

5.5 CHANGES IN PERSONAL MANAGEMENT OVER THE RESEARCH PERIOD

The third objective for this study was to determine PM dysfunction on referral, at discharge from hospital and at the one, two and three month assessment intervals. The majority of patients 84% achieved independence in performing PM activities overall. Participants who could not regain independence in PM and continued to require assistance, as well as those who were totally dependent on others, might have suffered from deficits in client factors and performance skills that were not measured in this study.

Recovery in PM as shown by SADFM-Beta Scale in eating was not a problem for participants on initial assessment, as most participants were able to eat making use of their one functional UL and hand. Sixty-nine percent (n=49) of participants were independent in eating at the initial assessment interval because those whose dominant hand was affected, were using a compensatory technique of using the unaffected UL. Those whose dominant hand was not affected, were eating normally. This occurred as a result of the eating task being a unilateral task which is performed with one hand.

For grooming, the majority 57.7% (n=41) of participants had difficulties performing this task during initial assessments. The grooming task requires the use of both hands, therefore participants had difficulty performing this task due to poor ULMF of the affected hand. Six point seven percent (n=3) participants who were still dependent in the grooming task at three months were those that had severe disability of the UL and poor mobility in transfers. This is supported by Kwakkel et al. (2004a) whereby severe disability at onset predicts poor recovery of functioning in PM tasks(42).

In the end, the majority of participants 93.3% (n=42) were independent in grooming related tasks which was gradually built up at different intervals up to three months post stroke. In these participants who were independent, 24.4% (n=10) were using compensatory techniques by using one arm due to poor recovery of ULMF. Heller et al, (1987) suggested that patients should be taught to compensate for their loss of functioning by utilising one handed adaptive techniques in therapy(57).

Independence in bathing was achieved by 35.5% (n=16) of the participants on discharge from hospital. Improvement in bathing continued during follow up assessment at the one, two and three month assessment intervals in terms of independence in bathing. Overall, 84.4% (n=38) participants were independent in bathing as their ULMF had recovered or one handed techniques were used by participants who did not achieve recovery of ULMF.

However, independence in bathing was not achieved by all participants. There are 8.9% (n=4) of participants who needed assistance in bathing and some 6.7% (n=3) were dependent on someone to perform the task for them. These results were found because these participants had poor recovery of ULMF and bathing is a task that requires the use of both hands. These participants had difficulty achieving independence using one handed compensatory techniques. Moreover, they had other client factors and performance skills affecting their performance in PM such as poor muscle strength of the trunk and poor muscle strength of the affected UL and LL. Hsieh et al. (2002) also found poor trunk control as a predictor of poor functional outcomes post stroke(72).

Similar results were observed in upper and lower body dressing whereby some 8.9% (n=4) participants still needed assistance to complete these tasks and 6.7% (n=3) were dependent on others to complete the task. Dressing upper body and the lower

body was found to be difficult to achieve by these participants because they require both hands. They had difficulty learning to adapt and use one hand to perform these tasks. Therefore, these participants had poor recovery of ULMF which affected their ability to perform activities that require bilateral hand function. Again this is supported by Heller et al. (1987) and Trombly et al. (2002) who encourage compensatory techniques of using one UL (unaffected one) for their loss of functioning on the affected UL(57, 96) .

Most participants 77.8% (n=35) achieved independence in bowel and bladder management at discharge. These are the participants who could mobilise to the toilet by walking or were able to perform body transfers from wheelchair to other surfaces. Only a few 22% (n=10) participants were still using disposable nappies on discharge. These are the participants who had severe dysfunction in ULMF, accompanied by other client factors and performance skills such as poor muscle strength and endurance, poor SCOM of the UL and difficulty to mobilise from bed to toilet independently. Nurses used disposable nappies as a better management for these participants. At the three month interval, only 11% (n=5) of participants were still dependent on others for bowel and bladder management. This occurred as a result of poor recovery of ULMF to balance with both hands which results in a poor ability to transfer from bed to wheelchair and from wheelchair to toilet. Participants also had poor wheelchair mobility and locomotion as they could not push themselves in a wheelchair using one hand. Severe motor disability and urinary incontinence were found to be the predictors that also affect functional outcomes post stroke(75, 76).

The ability to transfer from wheelchair to surfaces such as a bed, chair and bath was achieved by the majority 89% (n=40) of participants. Some 35.6% (n=16)of participants were initially using wheelchairs and as a result they needed assistance in transfers and wheelchair locomotion. Participants who were still dependent in transfers are those that returned for therapy at one, two and three months post stroke. These participants were unable to walk due to the side of hemiplegia which affected both UL and LL. Eleven percent (n=5) participants who were still dependent at three months were those that had poor recovery of ULMF. This affected participants' ability to balance with both hands and transfer from wheelchair to bed, chair and bath, as their LL on the affected side was weak.

However, the 24.4% (n=10) of participants who returned for follow up intervention at the various intervals between one, two and three months were able to mobilise by walking independently. There are 11 % (n=5) participants who did not achieve independence in locomotion at various points of assessments whereby they were unable to push themselves in a wheelchair or walk for a distance of 50 metres as assessed by SADFM-Beta Scale. At the end of the study, there is a minority of participants 8.9% (n=4) who could not regain independence in walking at three months post stroke and they were still dependent on others. These are the participants who never regained LL motor function in order to walk and climb up and down stairs according to SADFM-Beta Scale as they remained wheelchair bound.

The findings of this research are consistent with the evidence from previous studies on the recovery of UL with LL involvement as well as urinary incontinence which eventually affect recovery in performance of PM tasks.As stated by Coupar et al. (2011)(76), severe disability at stroke onset, as well as urinary incontinence, affects motor recovery and performance in ADL including difficulty performing PM tasks(75). This was observed in these participants as they never regained movement of the UL and LL and they required assistance from others for transfers and locomotion. The 11% (n=5) participants who had bladder and bowel incontinence and who were wearing nappies had additional problems with PM tasks. This included mobility in transfers and locomotion that included poor ability to walk or push oneself in a wheelchair. Kwakkel et al. (2003) reported that, poor recovery of LL at 2 weeks post-stroke is a predictor of poor recovery of ULMF at 6 months post-stroke. At CHBAH, it was observed that the patients who had severe disability of the affected LL at onset with no movement at one month post stroke when they came for outpatient follow up, were likely to be issued a wheelchair. In the register for patients issued a wheelchair in CHBAH occupational therapy department, there were approximately 5 to 7 stroke patients who received a wheelchair in each month from January to November 2016. All these patients had severe disability of the affected LL.

5.5.1 Predictors of outcomes in personal management at 3 months post stroke

It is crucial for individuals to regain independence in PM functioning in order to do personal tasks for themselves and mobilise in their environment. At three months post stroke the PM was largely influenced by the following factors:

Age was not a predictor of recovery of functioning in PM. In the younger age group (19 to 40), there was significant improvement in occupational functioning in PM. In these participants, 89% (n=17) of them achieved independence in PM and 11% (n=2) needed assistance in performing PM tasks.

Participants who were in the age range (41 to 60) also had significant improvement in PM functioning with 87.5% (n=14) being independent in performing PM tasks and 12.5% (n=2) needing assistance to perform PM tasks. Similarly in participants who were in the older age group (61 to 75) experienced significant improvement in PM functioning with 70% (n=7) of them achieving independence in performing PM tasks. The other 30% (n=3) that needed assistance in performing PM tasks had other predictive factors for poor functioning in ADL such as severe dysfunction of UL in stage 1 and 2 of FMA-UE. This is characterised by flaccidity of the UL (stage 1) and in ability to move the UL even though there is tone and reflexes (stage 2) and poor sitting balance. Trunk control or sitting balance was identified in the literature as one of the factors that affected recovery of functioning in PM (72).

However, this was a limitation for this study as performance skills such as trunk control were not assessed. They can potentially affect ability to mobilise and perform PM.

Recovery pattern was similar in all age ranges whereby the majority of participants 84.4% (n=38) achieved independence in performance in PM tasks. Luke et al.(2006) also found that even participants who are in advanced ages also experience recovery during therapeutic intervention(64).

5.5.2 Independence in personal management tasks post stroke

SADFM-Beta Scale was used to assess PM of stroke participants at 5 intervals. This outcome measure gave clear information of how the participant is performing using a 7-point scale. Percentages of the amount of function in PM gave a clear understanding of how much assistance was needed by the participant when performing a PM task.

Independence in PM was not achieved by all participants. There were 3 categories that emerged when analysing the outcomes for this research. They were as follows: some participants were dependent on someone else as they could not actively participate and required someone to completely do the task for them; some participants would initiate tasks but needed assistance to complete PM tasks; and some participants were fully independent in PM tasks. Eighty four point four percent

(n=38)of participants achieved independence whereby they did not require assistance from someone else. Twenty one percent (n=8) of the 84% achieved modified independence in PM in that they were using compensatory techniques, such as the one handed technique, as their affected UL never regained adequate motor functioning. A further 8.9 % (n=4) of participants still required assistance three months post stroke in order to perform their PM tasks. The last category constitutes 6.7% (n=3) of participants who needed maximum assistance and they were completely dependent on the caregiver to perform PM tasks for them. These participants did not achieve independence and were still dependent in performing PM tasks not just because of poor ULMF, but due to other difficulties including the inability to perform body transfers.

Participants who obtained relatively high scores of 7 in SADFM-Beta Scale during initial assessments are those that did not have problems involving mobility in transfers and locomotion. These participants started by using one handed techniques to perform PM activities. Intervention was carried out and participants were taught motor relearning skills to use the affected limb during task performance. Compliance in attending occupational therapy intervention was shown to be beneficial. It contributed to participant's improved performance in PM tasks, even though ULMF recovery was suboptimal to 17.8% (n=8) of them. Participants who did not gain full recovery of ULMF were taught compensatory one-handed techniques to perform tasks.

However, participants who did not achieve recovery in ULMF as well as the affected LL were wheelchair bound. They had difficulties using one handed techniques to balance during transfers. They also had difficulties pushing themselves with one hand to mobilise the wheelchair.

The main findings of this research were that patients who were unable to perform PM tasks were those that had poor recovery of ULMF as well as poor motor recovery in the affected LL. At CHBAH after 6 months post stroke, caregiver training is required for patients who still need an assistant to perform one or more of the PM tasks and continue with custom made home programme.

This standard practice at CHBAH is consistent with the current scientific evidence based practice, although treatment would vary according individuals. Patients with flaccid UL where poor motor recovery is anticipated would need compensatory

techniques. Those who have potential for UL motor recovery would need appropriate intervention to restore ULMF beneficial to them(58).

5.6 ASSOCIATION OF THE OUTCOMES FOR UPPER LIMB MOTOR MOBILITY AND PERSONAL MANAGEMENT RECOVERY OVER THE RESEARCH PERIOD

Correlation between ULMF as assessed using FMA-UE and the relationship with PM as assessed by SADFM-Beta Scale on admission during initial assessment, were moderate to strong(0.53- 0.68) for UL movement and all aspects of PM as well as transfers and locomotion. This indicates the importance of UL movement for all components of PM including transfers. In PM tasks, bilateral hand use is usually required. A lack of movement in the UL resulted in a moderate correlation of UL movement to these tasks. This indicated that deficits prevented participants from carrying out aspects such as stabilising the plate, cutting food, bathing, dressing or toileting. These tasks require gross arm movements and hand grasps. Both dressing and bathing requires the use of both hands and participants experienced difficulty completing these tasks when bathing and dressing the unaffected side of the body. This was due to weakness of the affected side.

The movement in the wrist, hand and co-ordination showed no strong correlations to PM on the initial assessment with a moderate correlation between wrist and hand movement and toileting and wrist movement and eating. It would appear that the amount of ULMF is a better predictor of PM function in activities at this stage. Unlike toileting the lowest correlations for all aspects on the FMA–UE were seen for bowel and bladder control, which were least affect by UL function. This may be due to the loss of bowel and bladder control and severe impairment of ULMF. On the whole, bowel and bladder control does not require bilateral UL, wrist and hand movement. However, toileting requires bilateral UL, wrist and hand movement in order to manage clothes and pull pants up and down.

It was interesting that all transfers and locomotion correlated strongly with UL function. Those with poor functioning were unable to manage bed mobility and transfers. Locomotion tasks also occur mostly in wheelchairs at this stage. This was also true for wrist, hand and co-ordination on the FMA-UE. This occurred because arm, wrist and hand movements and weight bearing on the UL is required when transferring the body from one surface to another. Participants need to grasp the bed rails, propel the wheelchair and hold on to a walker for transfers and locomotion and, when moving up and down stairs, the participants relied on the UL by holding onto the rail for balance.

Moderate to strong correlations between the UL, wrist, hand and co-ordination scores and PM were found on discharge except for correlations of wrist, hand movement and co-ordination for eating. The correlation for eating and UL movement was also lower as participants had probably learnt to manage eating with one hand by discharge. The correlation of all other PM tasks and transfers and locomotion with the FMA-UE indicated that on discharge those with more ULMF achieved higher scores for PM.

On discharge, participants who had full recovery of ULMF were able to dress independently. Participants who still had poor ULMF on discharge had learnt compensatory techniques. They used the unaffected arm and hand to thread both UL when dressing the upper body. They still scored poorly in independence, as they had not yet practiced and become proficient at these adapted techniques. Lower body dressing obtained a strong correlation value of 0.72 in both UL and hand and 0.62 for the wrist. This task requires a person to hold the pants with both UL in order to thread each leg. Participants had difficulty performing this task with one hand and the independence in this aspect was closely related to function in the UL and hand. Bowel and bladder management at this stage correlated strongly with UL function, wrist and hand movement. This was probably due to participants still receiving assistance in the form of nappies from nursing staff in the hospital if they did not have the ULMF and mobility to toilet independently, even if they were continent.

Higher correlations were also noted for all components of the FMA-UE except UL movement for transfers and locomotion on discharge. Participants who achieved recovery of ULMF were able to transfer in bed and to bath more independently, as well as use walkers and wheelchairs on discharge. This was because they were able to hold and use their arms for weight bearing. Locomotion using a wheelchair needed the use of both hands to grip and push the wheelchair. Those with better recovery of hand function were able to grip and push the chair, resulting in more independence in locomotion.

Participants who did not achieve recovery of ULMF, although they were taught compensatory methods, were not confident in transfers by discharge as they had not had time to practice these aspects in hospital sufficiently.

It was observed that, as the ULMF improves, there was a significant correlation in performing PM tasks. Participants who had severe disability of the UL which was

marked by stage 1, 2 or 3 of SCOM remained dependent on others to perform aspects of their PM tasks and needed assistance with transfers and locomotion. The results indicate that UL, wrist, hand and co-ordination scores are related to the amount of function in PM, transfers and locomotion that can be expected after stroke when participants are discharged from hospital.

This relationship changes post discharge since the participants have had an opportunity to practice and use compensatory techniques in their PM once they were at home, as seen in the low correlations for all values for FMA-UE and SADFM – Beta at one, two and three months discharge. Deficits in UL, wrist, hand and co-ordination scores on the FMA-UE at these stages no longer impacted on PM. This is because the participants were using compensatory methods learnt during rehabilitation to achieve independence in PM, irrespective of the return of ULMF.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The data collected using the demographic questionnaire yielded a better understanding of factors that constituted the profile of stroke participants. Examples are length of hospital stay, age, gender, site of lesion, co-morbidities, type of stroke and their significance to outcomes in ULMF and PM three months post stroke.

The length of hospital stay depends on the hospital. At CHBAH length of hospital stay varies between 3 days for patients who are medically stable and ± 30 days for patients who have co-morbid conditions. Co–morbid conditions that precipitate stroke in young patients are hypertension and HIV. The most common type of stroke is ischaemic stroke or infarction and secondly is haemorrhagic stroke. There is no specific co–morbid condition that influences the aetiology of infarction as this was found in patients with varying co-morbid conditions.

Age was not found to be a significant factor that causes stroke. Stroke greatly affects young people and the most common co-morbid condition that resulted in stroke was HIV. Upper limb motor function recovery rate post stroke was not found to be affected by a patient's age, as participants across all ages recovered and those who did not recover had other factors affecting recovery. Age was found not to be a predictor of ULMF. Recovery of ULMF occurs across all ages and participants in the older age range experienced full recovery after occupational therapy intervention. Gender does not have an influence at any stage on the recovery of motor functioning and performance in PM.

The site of lesion appeared to have a direct influence on recovery of ULMF. The site of the lesion commonly affected by stroke is MCA. Stroke in the MCA territory is found to be a predictor of poor recovery of ULMF. However, recovery of patients who suffered from MCA lesions differed. Those who had lesions that severed the motor fibres did not recover in terms of ULMF, whereas those not affected in the motor fibres that run through the MCA territory experienced full recovery of the ULMF.

There was variability in the process of recovery of ULMF, as it did not follow a specific pattern of proximal to distal recovery. The recovery of ULMF could start distally in the hand while the patient remained with proximal weakness. The amount of paresis as measured by FMA–UE measure at onset of stroke was a good predictor of UL recovery at three months post stroke(49). This was observed in participants who had residual movement after stroke, as they achieved full recovery of ULMF as oppose to those who had no or very little movement.

The recovery of functioning in PM mostly depended on the severity of the UL motor dysfunction. Tasks that required the use of one hand such as eating did not get affected significantly. However, tasks that required the use of both hands such as grooming, bathing and dressing had staggered patterns of recovery. Participants who experienced full recovery of ULMF achieved independence in PM.

Participants who could walk but had no movement of the UL could still perform PM tasks, but they were using one handed compensatory techniques. This indicated that poor recovery of ULMF in stroke survivors did not equate to a total loss of functioning in PM. Recovery was staggered from being totally dependent in PM tasks, to needing assistance to complete the tasks to performing tasks with poor quality and efficiency. Therefore, participants who did not achieve recovery of ULMF fell into 3 distinct categories for PM such as modified independence, needed assistance and dependent.

Urinary incontinence is a predictor of poor recovery in performance of PM tasks as all participants who had poor recovery of ULMF, as well as urinary incontinence, were still dependent in PM three months post stroke. Poor recovery of ULMF and mobility in transferring from one surface to another resulted in poor recovery of performance in PM tasks.

The occupational therapy interventions that participants received were beneficial to participants' recovery in ULMF and PM. These variables were observed during in-patient intervention where participants received occupational therapy intervention more frequently with a minimum of 3 days per week for those participants who stayed in hospital for more than a week. Some 47.9% (n=34)of participants came for out-patient follow up occupational therapy. Although progress was observed in PM and

ULMF during in-patient as well as out-patient follow up, the recovery rate slowed down when participants received less frequent intervention as out-patients.

However, there were 6.7% (n=3) of participants who attended occupational therapy, and were assessed in all 5 intervals, who did not benefit from occupational therapy intervention. These were predominantly participants who had lesions in the MCA territory which is one of the prognostic indicators for poor motor recovery(54).

These findings will assist occupational therapists at CHBAH in identifying outcome measures to determine the progress and prognosis of the patient during and after intervention. Occupational therapy interventions should focus on improving ULMF and PM using functional tasks to yield better outcomes early after stroke onset. This was observed in the correlation of these variables as they improve in a mirror image pattern.

The objectives for this study were specifically designed to allow the natural day to day process of occupational therapy intervention at CHBAH to occur. Participants were only assessed by the researcher, while the treating therapist continued with treatment of participants in the wards and during out-patient follow up.

6.2 RECOMMENDATIONS

Future research to focus on treatment techniques used to improve ULMF is required.

The use of outcome measures in an acute rehabilitation setting like CHBAH, using a valid and reliable instrument like FMA–UE, is useful. Intensive rehabilitation as soon as patients are stable increases recovery of ULMF and independence in PM. Patients continue to recover post-discharge from hospital, and out-patient therapy is important. Not all patients require out-patient follow up post-stroke. Further research on the compliance in home programmes to evaluate if it contributes to improvement of ULMF and independence in PM is recommended. Other factors influencing recovery, such as poor motivation, needs to be explored further.

Stroke survivors who are discharged from hospital need to be referred to community based rehabilitation resources to integrate with other stroke survivors and to learn survival skills and social participation to improve their quality of life. A follow up needs to be done by referring therapists.

Prognostic indicators should be discussed with the stroke patient's caregivers. In this way, they can endeavour to maximise function of the patient in terms of ULMF and PM through home exercise programme.

Therapists in clinical settings need to understand the recovery patterns of ULMF. They can design appropriate interventions, using an appropriate treatment approach (therapeutic approach or rehabilitative approach) that are best suited to the individual patients specific needs.

A further research area should be to investigate the use of functional activities versus the use of eclectic approach in the treatment of stroke patients. Finally the effects of spatial neglect on functional recovery needs to be researched as spatial neglect is a heterogeneous condition. Therefore one approach might not be effective.

REFERENCES

1. Valderas JM, Starfield B, Sibbald B, Salisbury C, Roland M. Defining comorbidity: implications for understanding health and health services. The Annals of Family Medicine. 2009;7(4):357-63.
2. Law M, Baptiste S, McColl M, Opzoomer A, Polatajko H, Pollock N. The Canadian occupational performance measure: an outcome measure for occupational therapy. Canadian Journal of Occupational Therapy. 1990;57(2):82-7.
3. Miller-Keane Encyclopedia and Dictionary of Medicine N, and Allied Health. 7th ed: Saunders,; 2003.
4. Langhorne P, Coupar F, Pollock A. Motor recovery after stroke: a systematic review. The Lancet Neurology. 2009;8(8):741-54.
5. Radomski MV, Latham CAT. Occupational Therapy for Physical Dysfunction 6th ed. Philadelphia, USA: Lippincott Williams & Wilkins; 2008.
6. Roley SS, Barrows CJ, Susan Brownrigg OTR L, Sava DI, Vibeke Talley OTR L, Kristi Voelkerding B, et al. Occupational therapy practice framework: Domain & process 2nd edition. The American journal of occupational therapy. 2008;62(6):625.
7. Dobson F. Assessing selective motor control in children with cerebral palsy. Developmental Medicine & Child Neurology. 2010;52(5):409-10.
8. Pandian S, Narayan Arya K. Relation between the upper extremity synergistic movement components and its implication for motor recovery in poststroke hemiparesis. Topics in stroke rehabilitation. 2012;19(6):545-55.
9. Legg L, Drummond A, Leonardi-Bee J, Gladman J, Corr S, Donkervoort M, et al. Occupational therapy for patients with problems in personal activities of daily living after stroke: systematic review of randomised trials. Bmj. 2007.
10. Meijer R, Van Limbeek J, Peusens G, Rulkens M, Dankoor K, Vermeulen M, et al. The Stroke Unit Discharge Guideline, a prognostic framework for the discharge outcome from the hospital stroke unit. A prospective cohort study. Clinical rehabilitation. 2005;19(7):770-8.
11. Bertram MY, Katzenellenbogen J, Vos T, Bradshaw D, Hofman KJ. The disability adjusted life years due to stroke in South Africa in 2008. International Journal of Stroke. 2013;8(A100):76-80.
12. Indredavik B, Bakke F, Slørdahl S, Rokseth R, Håheim L. Treatment in a Combined Acute and Rehabilitation Stroke Unit Which Aspects Are Most Important? Stroke. 1999;30(5):917-23.
13. Bernhardt J, Thuy MN, Collier JM, Legg LA. Very early versus delayed mobilisation after stroke. The Cochrane Library. 2009.
14. Craig LE, Bernhardt J, Langhorne P, Wu O. Early Mobilization After Stroke. Stroke. 2010;41(11):2632-6.
15. Rohweder G, Ellekjær H, Salvesen Ø, Naalsund E, Indredavik B. Functional outcome after common poststroke complications occurring in the first 90 days. Stroke. 2015;46(1):65-70.
16. Winstein CJ, Rose DK, Tan SM, Lewthwaite R, Chui HC, Azan SC. A randomised controlled comparison of upper extremity rehabilitation strategies in acute stroke. A pilot study of immediate and long term outcome. 2004.
17. Blennerhassett J, Dite W. Additional task-related practice improves mobility and upper limb function early after stroke: a randomised controlled trial. Australian Journal of Physiotherapy. 2004;50(4):219-24.
18. Mudzi W, Stewart A, Musenge E. Case fatality of patients with stroke over a 12-month period post stroke. SAMJ: South African Medical Journal. 2012;102(9):765-7.
19. Pandian S, Arya KN, EWR D. Comparison of Brunnstrom Therapy and Motor Relaearning Programme in Rehabilitation of Poststroke Hemiparetic Hand:A randomised Control Trial. Body Work and Movement Therapies. 2012;16(1):330-7.

20. World Health Organization. WHO STEPS Stroke Manual: The WHO STEPwise approach to stroke surveillance. 2005.
21. Lemogoum D, Degaute J-P, Bovet P. Stroke prevention, treatment, and rehabilitation in sub-saharan Africa. American journal of preventive medicine. 2005;29(5):95-101.
22. Rosman KD. The epidemiology of stroke in an urban black population. Stroke. 1986;17(4):667-9.
23. Connor M, Rheeder P, Bryer A, Meredith M, Beukes M, Dubb A, et al. The South African stroke risk in general practice study. South African Medical Journal. 2005;95(5).
24. Maredza M, Bertram MY, Tollman SM. Disease burden of stroke in rural South Africa: an estimate of incidence, mortality and disability adjusted life years. BMC neurology. 2015;15(1):1.
25. Connor MD, Walker R, Modi G, Warlow CP. Burden of stroke in black populations in sub-Saharan Africa. The Lancet Neurology. 2007;6(3):269-78.
26. Cerrato P, Grasso M, Imperiale D, Priano L, Baima C, Giraudo M, et al. Stroke in young patients: etiopathogenesis and risk factors in different age classes. Cerebrovascular Diseases. 2004;18(2):154-9.
27. Petrea RE, Beiser AS, Seshadri S, Kelly-Hayes M, Kase CS, Wolf PA. Gender differences in stroke incidence and poststroke disability in the Framingham heart study. Stroke. 2009;40(4):1032-7.
28. Wasserman S, De Villiers L, Bryer A. Community-based care of stroke patients in a rural African setting. SAMJ: South African Medical Journal. 2009;99(8):579-83.
29. Zhu HF, Newcommon NN, Cooper ME, Green TL, Seal B, Klein G, et al. Impact of a stroke unit on length of hospital stay and in-hospital case fatality. Stroke. 2009;40(1):18-23.
30. Van Straten A, Van der Meulen J, Van den Bos G, Limburg M. Length of hospital stay and discharge delays in stroke patients. Stroke. 1997;28(1):137-40.
31. Wegner L, Rhoda A. The influence of cultural beliefs on the utilisation of rehabilitation services in a rural South African context: therapists' perspective: original research. African Journal of Disability. 2015;4(1):1-8.
32. Gallagher BA, Hart PM, O'Brien C, Stevenson MR, Jackson AJ. Mobility and access to transport issues as experienced by people with vision impairment living in urban and rural Ireland. Disability and rehabilitation. 2011;33(12):979-88.
33. Bhagavati S, Choi J. Rapidly progressive cerebrovascular stenosis and recurrent strokes followed by improvement in HIV vasculopathy. Cerebrovascular Diseases. 2008;26(4):449-52.
34. Tipping B, de Villiers L, Wainwright H, Candy S, Bryer A. Stroke in patients with human immunodeficiency virus infection. Journal of Neurology, Neurosurgery & Psychiatry. 2007;78(12):1320-4.
35. Singer EJ, Valdes-Sueiras M, Commins DL, Yong W, Carlson M. HIV stroke risk: evidence and implications. Therapeutic advances in chronic disease. 2013;4(2):61-70.
36. Sen S, Rabinstein AA, Elkind MS, Powers WJ. Recent developments regarding human immunodeficiency virus infection and stroke. Cerebrovascular Diseases. 2012;33(3):209-18.
37. Connor MD, Modi G, Warlow CP. Differences in the nature of stroke in a multiethnic urban south african population the Johannesburg Hospital stroke register. Stroke. 2009;40(2):355-62.
38. Beal CC. Gender and stroke symptoms: a review of the current literature. Journal of Neuroscience Nursing. 2010;42(2):80-7.
39. Seedat Y, Rayner B, Veriava Y. South African hypertension practice guideline 2014. Cardiovascular journal of Africa. 2014;25(6):288.
40. Qureshi AI, Safdar K, Patel M, Janssen RS, Frankel MR. Stroke in Young Black Patients Risk Factors, Subtypes, and Prognosis. Stroke. 1995;26(11).
41. Pedretti LW, Early MB. Occupational therapy: Practice skills for physical dysfunction. 5th ed: Mosby St. Louis, MO; 2001.

42. Kwakkel G, Kollen B, Lindeman E. Understanding the pattern of functional recovery after stroke: facts and theories. Restorative neurology and neuroscience. 2004;22(3-5):281-99.
43. Oujamaa L, Relave I, Froger J, Mottet D, Pelissier J-Y. Rehabilitation of arm function after stroke. Literature review. Annals of physical and rehabilitation medicine. 2009;52(3):269-93.
44. Sveistrup H. Motor rehabilitation using virtual reality. Journal of neuroengineering and rehabilitation. 2004;1(1):1.
45. Winstein CJ, Rose DK, Tan SM, Lewthwaite R, Chui HC, Azen SP. A randomized controlled comparison of upper-extremity rehabilitation strategies in acute stroke: a pilot study of immediate and long-term outcomes. Archives of physical medicine and rehabilitation. 2004;85(4):620-8.
46. Carr JH, Shepherd RB. A motor learning model for stroke rehabilitation. Physiotherapy. 1989;75(7):372-80.
47. Bobath K, Bobath B. The neuro-developmental treatment. Management of the motor disorders of children with cerebral palsy. 1984:6-18.
48. Ada L, Canning C, Refshauge K, Ada L, Ellis E. Changing the way we view the contribution of motor impairments to physical disability after stroke. Science-based Rehabilitation, Theories into Practice. 2005:87-106.
49. Hendricks HT, van Limbeek J, Geurts AC, Zwarts MJ. Motor recovery after stroke: a systematic review of the literature. Archives of physical medicine and rehabilitation. 2002;83(11):1629-37.
50. Kwakkel G, van Peppen R, Wagenaar RC, Dauphinee SW, Richards C, Ashburn A, et al. Effects of augmented exercise therapy time after stroke a meta-analysis. Stroke. 2004;35(11):2529-39.
51. Van Peppen RP, Kwakkel G, Wood-Dauphinee S, Hendriks HJ, Van der Wees PJ, Dekker J. The impact of physical therapy on functional outcomes after stroke: what's the evidence? Clinical rehabilitation. 2004;18(8):833-62.
52. Maclean N, Pound P, Wolfe C, Rudd A. The concept of patient motivation a qualitative analysis of stroke professionals' attitudes. Stroke. 2002;33(2):444-8.
53. de Nap Shelton F, Reding MJ. Effect of lesion location on upper limb motor recovery after stroke. Stroke. 2001;32(1):107-12.
54. Kwakkel G, Kollen BJ, van der Grond J, Prevo AJ. Probability of regaining dexterity in the flaccid upper limb impact of severity of paresis and time since onset in acute stroke. Stroke. 2003;34(9):2181-6.
55. Fugl—Meycr AR, Ja'asko IL, Olsson S, Steglind S. Tge Post Stroke Hemiplegic patient. Scand J Rehab Med. 1975;7(1341).
56. Jørgensen HS, Nakayama H, Raaschou HO, Vive-Larsen J, Støier M, Olsen TS. Outcome and time course of recovery in stroke. Part II: Time course of recovery. The Copenhagen Stroke Study. Archives of physical medicine and rehabilitation. 1995;76(5):406-12.
57. Heller A, Wade D, Wood VA, Sunderland A, Hewer RL, Ward E. Arm function after stroke: measurement and recovery over the first three months. Journal of Neurology, Neurosurgery & Psychiatry. 1987;50(6):714-9.
58. Adey-Wakeling Z, Crotty M. Upper limb rehabilitation following stroke: current evidence and future perspectives. Aging Health. 2013;9(6):629-47.
59. Furlan M, Marchal G, Derlon JM, Baron JC, Viader F. Spontaneous neurological recovery after stroke and the fate of the ischemic penumbra. Annals of neurology. 1996;40(2):216-26.
60. Jongbloed L. Prediction of function after stroke: a critical review. Stroke. 1986;17(4):765-76.
61. Hosoe T. Right Hemisphere Syndrome and Left Hemiplegia in Stroke Rehabilitation 2009 [Available from: http://www.ergod.org/essay/lefthemiplegia.html.
62. Sabari JS, Lieberman D, Association AOT. Occupational therapy practice guidelines for adults with stroke: American Occupational Therapy Association; 2008.

63. Bonita R, Beaglehole R. Recovery of motor function after stroke. Stroke. 1988;19(12):1497-500.
64. Luk JK, Cheung RT, Ho S, Li L. Does age predict outcome in stroke rehabilitation? A study of 878 Chinese subjects. Cerebrovascular Diseases. 2006;21(4):229-34.
65. Bagg S, Pombo AP, Hopman W. Effect of age on functional outcomes after stroke rehabilitation. Stroke. 2002;33(1):179-85.
66. Tilling K, Sterne JA, Rudd AG, Glass TA, Wityk RJ, Wolfe CD. A new method for predicting recovery after stroke. Stroke. 2001;32(12):2867-73.
67. Veerbeek JM, Kwakkel G, van Wegen EE, Ket JC, Heymans MW. Early prediction of outcome of activities of daily living after stroke a systematic review. Stroke. 2011;42(5):1482-8.
68. Mercier L, Audet T, Hébert R, Rochette A, Dubois M-F. Impact of motor, cognitive, and perceptual disorders on ability to perform activities of daily living after stroke. Stroke. 2001;32(11):2602-8.
69. Wolf TJ, Baum C, Connor LT. Changing face of stroke: Implications for occupational therapy practice. American Journal of Occupational Therapy. 2009;63(5):621-5.
70. Dromerick AW, Lang CE, Birkenmeier R, Hahn MG. Relationships between upper-limb functional limitation and self-reported disability 3 months after stroke. Journal of rehabilitation research and development. 2006;43(3):401.
71. Gillen G, Burkhardt A. Stroke Rehabilitation: A Function-Based Approach, St. Louis, Mo., Mosby-Year Book. Inc; 2004.
72. Hsieh C-L, Sheu C-F, Hsueh I-P, Wang C-H. Trunk control as an early predictor of comprehensive activities of daily living function in stroke patients. Stroke. 2002;33(11):2626-30.
73. Christiansen C. Ways of living: Self-care strategies for special needs: American Occupational Therapy Association; 2000.
74. Wilcock A. A theory of the human need for occupation. Journal of Occupational Science. 1993;1(1):17-24.
75. Meijer R, Ihnenfeldt DS, de Groot IJ, Van Limbeek J, Vermeulen M, De Haan R. Prognostic factors for ambulation and activities of daily living in the subacute phase after stroke. A systematic review of the literature. Clinical Rehabilitation. 2003;17(2):119-29.
76. Coupar F, Pollock A, Rowe P, Weir C, Langhorne P. Predictors of upper limb recovery after stroke: a systematic review and meta-analysis. Clinical rehabilitation. 2011:0269215511420305.
77. Nijboer TC, Kollen BJ, Kwakkel G. The impact of recovery of visuo-spatial neglect on motor recovery of the upper paretic limb after stroke. PLoS One. 2014;9(6):e100584.
78. Galski T, Bruno RL, Zorowitz R, Walker J. Predicting length of stay, functional outcome, and aftercare in the rehabilitation of stroke patients. The dominant role of higher-order cognition. Stroke. 1993;24(12):1794-800.
79. Ingles JL, Eskes GA, Phillips SJ. Fatigue after stroke. Archives of physical medicine and rehabilitation. 1999;80(2):173-8.
80. Loubser HJ. The validation of nursing measures for patients with unpredictable outcomes: Faculty of Health Sciences, University of the Witwatersrand, Johannesburg; 2012.
81. Velozo CA, Woodbury ML. Translating measurement findings into rehabilitation practice: an example using Fugl-Meyer Assessment-Upper Extremity with patients following stroke. J Rehabil Res Dev. 2011;48(10):1211-22.
82. Hsieh Y-w, Wu C-y, Lin K-c, Chang Y-f, Chen C-l, Liu J-s. Responsiveness and validity of three outcome measures of motor function after stroke rehabilitation. Stroke. 2009;40(4):1386-91.
83. Lin J-H, Hsueh I-P, Sheu C-F, Hsieh C-L. Psychometric properties of the sensory scale of the Fugl-Meyer Assessment in stroke patients. Clinical rehabilitation. 2004;18(4):391-7.

84. Kielhofner G. Research in occupational therapy: Methods of inquiry for enhancing practice: FA Davis; 2006.
85. Field A. Discovering statistics using SPSS: (and sex and drugs and rock n roll). Los Angels: Sage Publications; 2009.
86. Guarte J, Barrios E. Estimation under purposive sampling. Communications in Statistics—Simulation and Computation®. 2006;35(2):277-84.
87. Sage. Resources for the development, adaptation and implementation of clinical guidelines. The South African Cochrane Centre. 2013.
88. Gladstone DJ, Danells CJ, Black SE. The Fugl-Meyer assessment of motor recovery after stroke: a critical review of its measurement properties. Neurorehabilitation and neural repair. 2002;16(3):232-40.
89. Rabadi MH, Rabadi FM. Comparison of the action research arm test and the Fugl-Meyer assessment as measures of upper-extremity motor weakness after stroke. Archives of physical medicine and rehabilitation. 2006;87(7):962-6.
90. Platz T, Pinkowski C, van Wijck F, Kim I-H, Di Bella P, Johnson G. Reliability and validity of arm function assessment with standardized guidelines for the Fugl-Meyer Test, Action Research Arm Test and Box and Block Test: a multicentre study. Clinical Rehabilitation. 2005;19(4):404-11.
91. Toluee Achacheluee S, Rahnama L, Karimi N, Abdollahi I, Jaberzadeh S, Arslan SA. The Test-Retest Reliability and Minimal Detectable Change of the Fugl-Meyer Assessment of the Upper Extremity and 9-Hole Pegboard Test in Individuals With Subacute Stroke. فیزیک درمانی-نشریه تخصصی فیزیوتراپی (Physical Therapy Physical Therapy-Journal). 2016;5(4):225-30.
92. Duncan PW, Propst M, Nelson SG. Reliability of the Fugl-Meyer assessment of sensorimotor recovery following cerebrovascular accident. Physical therapy. 1983;63(10):1606-10.
93. Loubser HJ, Casteleijn D, Bruce JC. The BETA® nursing measure: Calibrating construct validity with Rasch analyses. Health SA Gesondheid. 2015;20(1):22-32.
94. Trochim WM, Donnelly JP. Research methods knowledge base. 2001.
95. Cresswell JW. Research design:qualitative, quantitative and mixed methods approaches. 3rd ed. Los Angels: Sage Publications; 2009.
96. Trombly CA, Radomski MV. Occupational Therapy for Physical Dysfunction 5th ed. Philadelphia, USA: Lippincott Williams & Wilkins; 2002.
97. Gillen G. Stroke rehabilitation: a function-based approach: Elsevier Health Sciences; 2015.
98. Taub E, Uswatte G, King DK, Morris D, Crago JE, Chatterjee A. A placebo-controlled trial of constraint-induced movement therapy for upper extremity after stroke. Stroke. 2006;37(4):1045-9.
99. Steultjens EM, Dekker J, Bouter LM, van de Nes JC, Cup EH, van den Ende CH. Occupational Therapy for Stroke Patients a systematic review. Stroke. 2003;34(3):676-87.
100. Trombly CA, Radomski MV. Occupational Therapy for Physical Dysfunction. Philadelphia, USA: Lippincott Williams & Wilkins; 2002.
101. Trombly CA, Wu CY. Effect of rehabilitation tasks on organisation of movement after stroke. American Journal of Occupational Therapy. 1999;53:333 - 44.

APPENDIX A: DEMOGRAPHIC QUESTIONNAIRE

TO BE KEPT SEPARATE

Code: __ _____

Age: _ _____

Gender: Male ☐ Female ☐

Diagnosis: _____

Other illnesses: _____

Blood Pressure on admission: _____

MEDICAL HISTORY

_____

_____

_____

APPENDIX B: FUGL MEYER ASSESSMENT OF MOTOR FUNCTION: UPPER EXTREMITY SUBTEST

Patient code: _____ Date: _____

SHOULDER/ELBOW/ FOREARM

Stage	Instruction	Response	ONLY COMPLETE GREY BLOCKS Score 1	Score 2	Score 3	Score 4	Score 5	Scoring criteria
I & II Reflex activity	Tap the biceps & finger flexor tendons	Stretch reflex at elbow and/or fingers						0 = no reflex can be elicited 2= reflex can be elicited
	Tap the triceps tendon	Stretch reflex						
III Voluntary Movement within Synergy	Flexor synergy "Turn your affected hand palm up and touch your ear	**Flexor synergy**	**Xxxxx**	**xxxxx**	**xxxxx**	**xxxxx**	**xxxxx**	(for each of 9 details) 0 = cannot perform 1 = can perform partly 2 = can perform faultlessly
		Shoulder retraction						
		Shoulder elevation						
		Shoulder abduction to 90^{o}						
		Shoulder external rotation						
		Elbow flexion						
		Forearm supination						
	Extensor synergy "Turn your hand palm down and reach to touch your unaffected knee"	**Extensor synergy**	**Xxxxx**	**xxxxx**	**xxxxx**	**xxxxx**	**xxxxx**	
		Shoulder adduction & internal rotation						
		Elbow extension						
		Forearm pronation						
IV Voluntary Movement mixing Flexor & extensor Synergy	"Show me how you would put a belt around you [or tie an apron]	Affected hand moves to lumbar spine area						0=cannot perform 1= hand must actively pass anterior-superior iliac spine 2= faultless
	'Reach forward to take [object held in front of patient]"	Reaches into 90^{o} of shoulders Flexion						0=elbow flexes or shoulder abducts immediately 1= if these occur later in motion

								2= faultless
	''Put your arm to your side & bend your elbow. Turn your palm up & down.''	Pronates and supinates forearm with elbow at 90^{o} and shoulder at 0^{o}						0= if cannot position arm or cannot pronate or supinate 1= shoulder and elbow joints correctly positioned and supination seen 2= faultless
V:Voluntary movement outside of synergies	"Turn your palm down and reach over here to touch object held out to side	Abducts shoulder to 90^{o} with elbow extended to 0^{o} forearm pronated						0= initial elbow flexion or loss of pronation 1= partial motion or elbow flexes and forearm supinates later in motion 2= faultless
	"Reach as high as you can toward the ceiling"	Flexes shoulder from 90^{o} to 180^{o}						0= elbow flexes or shoulder abducts immediately 1= if these occur later in motion 2 = faultless
	"Reach your arm directly forward and turn your palm up and down"	Flexes shoulder to 30-90^{o}; extends elbow to 0^{o} ; and supinates and pronates						0 = if cannot position arm or cannot rotate 1 = correct position and beginning rotation 2 = faultless
VI: Normal Reflex Activity (tested if patient scores 6 in stage V tests)	Tap on biceps, triceps and fingers flexor tendons	Normal reflex response						0 = 2 reflexes are markedly hyperactive 1 = 1 reflex hyperactive or 2 reflexes lively 2 = no more than 1 reflex lively and none hyperactive
	Assessments	Total points	0	0	0	0	0	
		Percentage score	0.00	0.00	0.00	0.00	0.00	

WRIST

Stage	Instruction	Response	ONLY COMPLETE GREY BLOCKS Score 1	Score 2	Score 3	Score 4	Score 5	Scoring criteria
Wrist stability with elbow flexed	Put the shoulder in 0°, elbow in 90° Flexion and forearm pronated. "lift Your wrist and hold it there"	Patient extends wrist to 15°. Therapist can hold upper arm Position.						0 = cannot extend 1 = can extend, but not against resistance 2 = can maintain against slight resistance.
Wrist stability with elbow extended	Put the elbow in 0°. Lift your wrist and hold it there	Patient extends wrist to 15°. Therapist can hold upper arm Position.						0 = cannot extend 1 = can extend, but not against resistance 2 = can maintain against slight resistance.
Active motion with elbow flexed and shoulder at 0°	"Move your wrist up and down a few times".	Patient moves smoothly from full flexion to full extension. Therapist can hold upper arm.						0 = no voluntary movement 1 = moves but less than full range 2= faultless
Active motion with elbow extended	"Move your wrist up and down a few times".	Patient moves smoothly from full flexion to full extension. Therapist can hold upper arm.						0 = no voluntary movement 1 = moves but less than full range 2= faultless
Circum-duction	"Turn your wrist in a circle like this [demonstrate]."	Makes a full circle combining flexion and extension with ulnar and radial deviation.						0 = cannot perform 1 = jerky or incomplete motion 2 = faultless
	Assessments	Total points	0	0	0	0	0	
		Percentage score	0.00	0.00	0.00	0.00	0.00	

Hand

ONLY COMPLETE GREY BLOCKS

Stage	Instruction	Response	Score 1	Score 2	Score 3	Score 4	Score 5	Scoring criteria
III: Mass Flexion	"Make a fist"	Patient flexes fingers						0 = no flexion 1 = less than full flexion as compared to other hand 2 = full active flexion
III: Hook Grasp	" Hold this shopping bag by the handles"	Grasp involves MCP extension And PIP & DIP flexion						0 = cannot perform 1 = active grasp no resistance 2 = maintains grasp against great resistance
IIIB-VI: Finger extension	" Let go of the shopping bag" "Open your hands wide"	From full active or passive flexion, patient extends all fingers.						0 = no extension 1 =partial extension or able to release grasp 2 = Full range of motion as compared to other hand
IV: Lateral Prehension	"Take hold of this sheet of paper [or playing card]."	Patient grasps between thumb & index finger.						0 = cannot perform 1 = can hold paper but not against tug 2 = holds paper well against tug
V: Palmar Prehen-sion	"Take hold of this pencil as if you were going to write."	Therapist holds pencil upright and patient grasps it						0 = cannot perform 1 = can hold pencil but not against tug 2 = holds pencil well against tug

V: Cylindrical grasp	"Take hold of this paper cup [or pill bottle]	Therapist holds the object and patient grasps with 1st and 2nd fingers together						0 = cannot perform 1 = can hold cup but not against tug 2 = holds cup well against tug
VI: Spherical grasp	"Take hold of this tennis ball [or apple]	Patient grasps with fingers abducted						0 = cannot perform 1 = can hold ball but not against tug 2 = holds ball well against tug
	Assessments	Total points	0	0	0	0	0	
		Percentage score	0.00	0.00	0.00	0.00	0.00	

CO ORDINATION

ONLY COMPLETE GREY BLOCKS

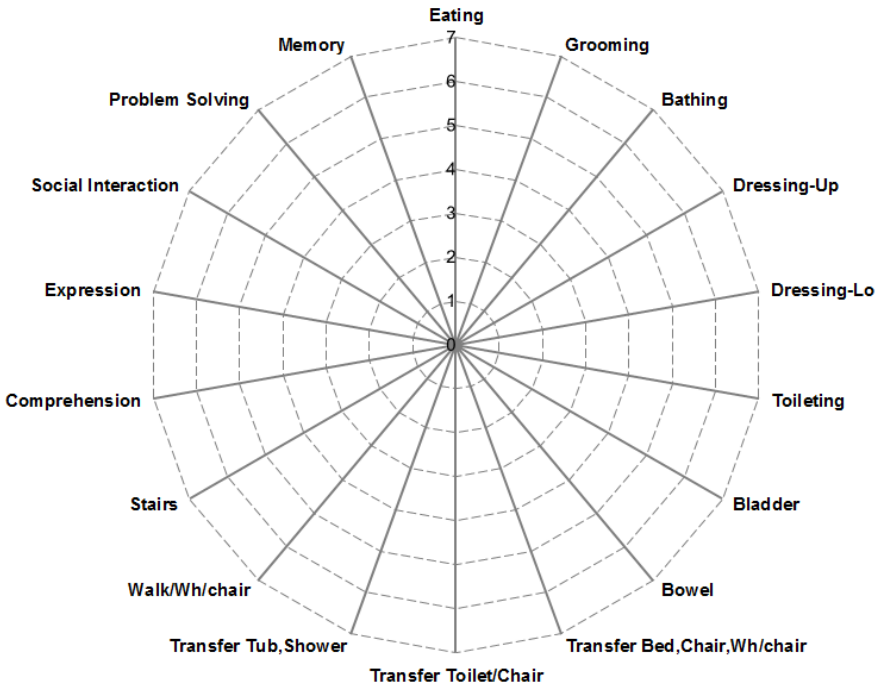
Stage	Instruction	Response	Score 1	Score 2	Score 3	Score 4	Score 5	Scoring criteria
VI Normal Move-ment	"Close eyes =. Now, touch your nose with your fingertip. Do that as fast as you can 5 times."	Patient does finger-to-nose test						
		Tremour						0 = marked 1 = slight 2 = none
		Dysmetria						0 = pronounced and unsystematic 1 = slight and systematic 2 = none
		Speed						0 = > 6 sec slower 1 = 2-5 sec slower 2 = < 2 sec slower
	Assessments	Total points	0	0	0	0	0	
		Percentage score	0.00	0.00	0.00	0.00	0.00	

TOTAL UPPER EXTREMITY SCORE	Upper limb	Wrist	Hand	Co-ordination	Total score/66	Total %
Assessment 1	0	0	0	0	0	0
Assessment 2	0	0	0	0	0	0
Assessment 3	0	0	0	0	0	0
Assessment 4	0	0	0	0	0	0
Assessment 5	0	0	0	0	0	0

APPENDIX C: SOUTH AFRICAN DATA: FUNCTIONAL MEDICINE (SADFM) – BETA SCALE

The Beta scale has been developed by Loubser (2012) to accurately and routinely measure the basic activities of daily living (ADLs) in geriatric and psychiatric patients. Currently it is being used by nursing staff to evaluate the outcomes of their patients' activities of daily living.

It is the second in a series of five measures to quantify human functionality. For this study, the Beta will be used. It is a measure with eighteen items, each divided into seven categories, rendering a total score of between 18 (poor ability) and 126 (excellent ability) to perform basic ADLs independently.
The Rasch Measurement Model was used to determine reliability and internal validity of the Beta and was found to be satisfactory (Loubser 2012).



APPENDIX D: OCCUPATIONAL THERAPY INTERVENTION

A protocol that is followed at CHBAH for the treatment of stroke patients

Occupational therapists:

- Start intervention by focusing on decreasing impairment in body structures and functioning followed by basic activities of daily living. They use a combination of approaches to increase upper extremity control (96)
- Implement early mobilisations in bed which include rolling, transition from lying to sitting and sitting on chair to improve patient sitting endurance (96)
- Train self-management skills as soon as possible including feeding, grooming, bathing and dressing to encourage patient to regain control of himself and if necessary compensatory skills would be introduced to overcome disabilitie(96)
- Do ange of movement activities for arm, hand and wrist.
- Perform heavy joint compression to facilitate co-contraction on targeted joints for patients with low muscle tone (96)
- Performlight joint compression on patients with increased muscle tone, to decrease tension on muscles around targeted joints (96).
- Use arm positioning methods:

- Use of table while seated, put hand in pocket or under belt or use over shoulder bag while standing (97)
- Encourage frequent changes of position to prevent contractures and pain.

- Emphasiseintegration of upper extremity into performance of various functional tasks.
- Implement treatment techniques such asmoving of objects across a work surface with a static grasp,whilethehand is in contact with an object
- Limit arm in spaceactivities(rest arm on an object)e.gironing, opening& closing drawer, polishing, sliding paper across a table
- Encourage reaching in spacee.g removing dishes from a cabinet, reaching for food in the fridge.
- Encourage reach and manipulation of objects with different sizes and shapes to encourage control of hand. Choose activities appropriate to patient’s level of available motor control.
- Grade fine motor activities from gross to precise manipulation.

- Implement weight bearing to facilitate muscle activity in the paretic armThis is done when sitting to support trunk, and when standing(96)
- Use constraint induced movement: Restrain the unaffected UL and thus encourage movement in affected hand e.g. when reaching (98)
- Encourage bilateral hand use by clasping hands together when reaching for an object e.g. food on a plate or pushing with hands forward while arms supported on table (96).
- Splint patients who are developing spasticity to maintain soft tissue length (99)

APPENDIX E: TREATMENT FRAMES OF REFERENCE

1. Brunnstrom

Brunnstrom therapy intervention starts by focussing on improving trunk control and by improving muscle strength of the affected side for stability. The treatment focus progresses through the stages of recovery from synergistic movements to whole limb movements. This is considered the normal pattern of motor development. Treatment works on different stages of ULMF starting with arm, wrist, hand and fingers and coordination. Recovery of the affected UL is graded according to six stages. These stages are as follows: 1. Flaccidity; 2. Synergies elicited reflexively; 3. Voluntary movement in synergy; 4. Movement deviating from synergy; 5. Independent from basic synergies; 6. Isolated joint movements(100).

Treatment is done through performing functional tasks. Sensory processing is encouraged by stimulation through proprioceptive and tactile input(100).

2. Rood

This frame of reference focuses on facilitation of movement through re-education of muscular responses using repetition. Return of movement is practiced in real life tasks and in different environments to increase effectiveness and carry over. This enables the patient to problem solve and elicits motor responses according to the requirements of the task(100).

It is aiming at facilitation of co-contraction which is simultaneous contraction of agonists and antagonists muscles to provide stability and maintain static posture. It is regarded as the foundation for postural control during execution of task(100).

Improvement of ULMF is achieved through sensory input to elicit motor output using functional tasks(100). There are specific neuro facilitation techniques used to facilitate return of muscle tone or inhibit it. These includeinhibitory techniques such as neutral warmth and light joint compression to decrease tension on muscles around targeted joints.Facilitation techniques for hypertonicity includes quick stretch and heavy joint compression to facilitate co-contraction on targeted joints(100).

3. NDT/Bobath

Neurodevelopmental therapy uses sensory input to affect motor output and facilitate recovery based on developmental sequence to assess and treat patients. Their aim is to elicit basic movement of postures to normalise movement in order to affect automatic release of skilled movements for occupational functioning(100).

Bobath identified that people with stroke suffer from postural control problems, loss of selective movements in ULandLL and maintaining balance against gravity. These patients tend to compensate for loss of movement on the hemiplegic side by using the unaffected UL when performing tasks.

Bobathuses specific manual handling techniques to address the problems of tone and movement control, and to provide sensory messages about how movement is organised and executed. The aim is to facilitate normal development of movement by preventing or eliminating abnormal patterns of coordination, retraining normal responses and increasing functional use of the affected UL. It is a hands on approach to body parts in order to produce therapeutic changes in tone and movement(100).

Patients are encouraged to use compensatory techniques to cope with challenging activities, as well as use bilateral hand function, such as clasping hands together. to perform the task(100). Weight bearing through the affected UL is implemented to encourage elbow extension while doing the task with the unaffected hand. Verbal instructions and demonstrationsare used as principles for treating the affected UL.Available motor learning patterns in the trunk, arm and leg are used to increase recovery of ULMF(101).

4. Carr and Shepherd

This is a frame of reference emphasising motor relearning based on improving motor function through practicing the required movement in a specific context using meaningful and specific activities(16).It is designed for clients who haveresidualmovements on the affected UL after brain insult and neuromuscular organisationcan be elicited through functional tasks. Activities can promote patients in learning maximum use of residual motor abilities(101).

The Carr and Shepherd framework is centred on optimal task performance Understanding ofpostural alignment as important in reaching with the hand and manipulation. These can be addressed together including shoulder, handand wrist. A therapist does not have to wait for the shoulder to improve in order to treat the hand,

as one treats all muscles that are moving(100). It encourages patients to actively participate and focus on strengthening of weak muscles, stretching exercises and practicing observed tasks in varying conditions, whilst incorporating newly acquired mobility.

It encourages the use of principles for motor relearning, such as verbal instruction, visual demonstration, manual guidance, repetition, practice and feedback.

APPENDIX F: INFORMATION SHEET

INFORMATION SHEET FOR PARTICIPANTS

The outcomes for upper limb mobility and personal management during the three months after onset of stroke in patients attending occupational therapy."

Dear Patient,

My name is ZukiswaMsengana and I am completing my Masters of Science Degree in Occupational Therapy at the University of the Witwatersrand. The research will take place at Chris Hani Baragwanath Academic Hospital. The aim of the research is to determine the recovery in arm and hand movement and independence in personal management (which includes bathing, dressing, grooming, bladder and bowel control, toileting, transfer from bed to chair etc), after a stroke for patients who are attending occupational therapy at the hospital.

I am inviting you to participate in the research project. If you agree to take part you will need to complete a biographical questionnaire about your health and resources in your place of residence. I will be completing an assessment of the movement in your affected hand and arm as well as observing you in your PM activities. These assessments will be done before you start your routine occupational therapy treatment and when you are discharged. You will also be assessed when you come for your out-patient appointments which will be booked for up to three months after your discharge.

Taking part is voluntary and if you refuse to take part or want to stop taking part at any time this will have no consequences or affect your therapy in any way.

Confidentiality will be ensured as no names will be used on the data collection forms and only the researcher will have access to identifying data which will be kept in a secure locked location.

Feedback from the research will be available on request.

CONTACT INFORMATION

Should you require more information please contact Miss ZukiswaMsengana (researcher) at 011 9338294/9113, or Prof P de Witt (research supervisor) at 011 717 3701.
Should there be any ethical queries about the research please feel free to contact the Human Research Ethics Committee (HREC) Chairman Prof P Cleaton-Jones at 011 7171234 or anis.keshav@wits.acc.za

Thank you in advance.

ZukiswaMsengana

Chief Occupational Therapist

Chris Hani Baragwanath Academic Hospital.

APPENDIX G:INFORMED CONSENT FORM

I hereby confirm that I have been informed by the researchers about the nature, conduct, benefits and risks of the study: "**The outcomes for upper limb mobility and personal management during the three months after onset of stroke in patients attending occupational therapy**."

I understand that my participation is voluntary and I may, at any stage, without prejudice, withdraw consent and participation in the study. I have had sufficient opportunity to ask questionsI have been invited to participate and agree to participate in this study.

Participant's name: _____ (please print)

Participant's signature: _____

Date: _____

APPENDIX H:VERBAL INFORMED CONSENT – PATIENT

(Applicable for patients who cannot write due to their dominant hand being affected due to hemiplegia, or who cannot read due to language barriers or illiteracy).

The patient has indicated that he/she understands that he/she will be free to withdraw from the study at any time for any reason without having to disclose this reason. The patient has also indicated that he/she understands that withdrawal will not jeopardize his/her treatment.

I hereby certify that the patient has agreed to participate in the study: **The outcomes for upper limb mobility and personal management during the three months after onset of stroke in patients attending occupational therapy**."

Participant's name: _____ (please print)

Date: _____

Participant's thumbprint:

Left thumb | Right thumb

Researcher's name: _____ (please print)

Researcher's signature: _____

Date:_____

Witness's name: _____ (please print)

Witness's signature: _____

Date: _____

APPENDIX I: PARTICIPANT ATTENDANCE AT TREATMENT

Patient code	Admission	Discharge	1 month	2 month	3 month	Total sessions
01	1		1			2
02	1	1	1	1	1	5
03	1		1			2
04	1	1	1			3
05	1	1	1	1	1	5
06	1		1	1		3
07	1		1			2
08	1	1	1	1	1	5
09	1	1				2
10	1		1	1	1	4
11	1	1	1	1	1	5
12	1	1	1	1	1	5
13	1	1	1	1	1	5
14	1	`1	1			3
15	1		1	1		3
16	1	1	1	1	1	5
17	1	1				2
18	1		1			2
19	1		1			2
20	1		1	1	1	4
21	1		1	1		3
22	1		1			2

23	1		1	1	1	4
24	1	1	1	1	1	5
25	1	1	1	1	1	5
26	1		1	1	1	4
27	1	1	1	1	1	5
28	1	1	1	1	1	5
29	1	1	1	1	1	5
30	1	1	1	1	1	5
31	1	1	1	1	1	5
32	1	1	1	1	1	5
33	1	1				2
34	1	1	1	1	1	5
35	1	1				2
36	1	1				2
37	1	1	1	1	1	5
38	1	1				2
39	1	1				2
40	1	1				2
41	1	1	1			3
42	1	1				2
43	1	1				2
44	1		1			2
45	1	1				2

APPENDIX J: ETHICS CLEARANCE CERTIFICATE

R14/49 Ms Zukiswa Msengana

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M131036

NAME: (Principal Investigator)	Ms Zukiswa Msengana
DEPARTMENT:	Occupational Therapy University of the Witwatersrand
PROJECT TITLE:	The Outcomes for Upper Limb Mobility and Personal Management Three Months After Onset of Stroke in Patients Attending Occupational Therapy
DATE CONSIDERED:	25/10/2013
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Prof Patricia de Witt
APPROVED BY:	Professor PE Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	02/12/2013

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**.

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX K: PERMISSION FROM CHBAH

PERMISSION LETTER

The Clinical Executive Officer

Chris Hani Baragwanath Academic Hospital.

Dear Madam

"The outcomes for upper limb mobility and personal management during the three months after onset of stroke in patients attending occupational therapy."

My name is Zukiswa Msengana and I am completing my Masters of Science Degree in Occupational Therapy at the University of the Witwatersrand. As part of this degree, I am required complete a research study. The aim of the research is to determine the outcomes for the recovery of upper limb movement and independence in personal management which includes bathing, dressing, grooming, bladder and bowel control, toileting, transfer from bed to chair etc., after a stroke for patients who are attending occupational therapy at the hospital.

I am requesting permission to complete the research in the Occupational Therapy Department of at Chris Hani Baragwanath Academic Hospital with patients admitted into this hospital. Patients who will be invited to participate in the study will be identified from the wards. They will be assessed before they start routine occupational therapy, on discharge and every month on their follow up appointment for occupational therapy treatment. The research will take place over a period of three months for each participant. The assessments to be used to collect the data are the Fugl Meyer Upper Extremity Assessment (Fugl-Meyer etal.1975) and South African Data: Functional Measurements (SADFM) which will be administered by the researcher. Each assessment will take approximately 30 minutes.

This study will have ethical approval from Wits University prior to commencement. The participants will be informed of their expected role in this research and will sign consent forms. For questions or clarity please contact me at 011 933 8294/9113. Should there be any ethical queries about the research please feel free to contact the Human

Research Ethics Committee (HREC) Chairman Prof P Cleaton-Jones at 011 7171234 or anisa.keshav@wits.acc.za

Kind regards,

Zukiswa Msengana

Chief Occupational Therapist – CHBAH