

**FACTORS AFFECTING LENGTH OF HOSPITAL STAY FOR PEOPLE WITH
SPINAL CORD INJURIES AT KANOMBE MILITARY HOSPITAL, RWANDA**

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**A mini thesis submitted to the Physiotherapy Department, Faculty of Community and
Health Sciences, University of the Western Cape, in partial fulfillment of the requirements
for the degree of Masters of Science in Physiotherapy.**



May 2009

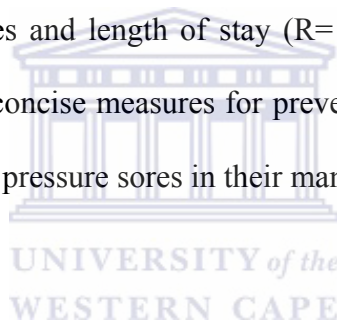
Supervisor:

Mrs. Anthea Rhoda

ABSTRACT

Spinal cord injury is a devastating condition, and its consequences impact on many facets of an individual's life. Activities of daily living such as personal care and housework might be difficult to perform post injury. The majority of spinal cord injury patients receive hospital-based rehabilitation to address these consequences. The normal length of hospital stay among spinal cord injury patients ranges from three to twelve months, and an increased length of stay are caused by development of secondary complications such as pressure sores, urinary tract infection and respiratory infection. The purpose of this study was to determine factors affecting length of hospital stay for individuals with spinal cord injuries at Kanombe Military Hospital in Rwanda. To achieve this, a retrospective study, utilising a quantitative approach was used. The records of individuals with spinal cord injuries discharged from the hospital between 1st January 1996 and 31st December 2007 were reviewed to collect data. A data gathering instrument was developed by the researcher and there after used to capture the relevant information from the patients' folders. Information collected included demographic data, information relating to the injury, occurrence of medical complications and length of hospital stay. One hundred and twenty four medical folders of patients discharged from 1st January 1996 to 31st December 2007 at Kanombe Military Hospital were reviewed for data extraction. The Statistical Package for Social Sciences (SPSS) version 16.0 for windows was used to analyse the data. Both descriptive and inferential statistics were determined in SPSS. Associations were made between demographic factors and occurrence of secondary medical complications with length of hospital stay. These were computed by means of chi-square tests. One level of significance, alpha set at 5% was used throughout. The linear regression analysis was used to determine factors affecting the length of stay. The necessary ethical considerations were adhered to during the implementation of the

study. Generally, the findings of this study indicate that pressure sores (80.6%), pain (40.3%), and urinary tract infections (37.9%) were the most common secondary medical complications that occurred among individuals with spinal cord injuries at Kanombe Military Hospital. The results also show that length of hospital stay at Kanombe Military Hospital is longer and ranged from 1-12 years with an average length of stay of 6.56 years compared to the western countries where it varies between 60 ± 38.7 days. Employment status, and the occurrence of pressure sores were the factors affecting length of hospital stay among individuals with spinal cord injuries at Kanombe Military Hospital and both factors were significantly associated with the length of hospital stay. Furthermore, the linear regression analysis showed that there is a strong relationship between pressure sores and length of stay ($R = 0.703$). There is a strong need for rehabilitation therapists to devise concise measures for prevention of development of secondary medical complications specifically pressure sores in their management strategies.



DECLARATION

I hereby declare that: “*Factors affecting Length of Hospital Stay for people with spinal cord injuries at Kanombe Military Hospital, Rwanda*”, is my own work, that it has not been submitted, or part of it, for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references

Signature:

Patrick B. BWANJUGU



Witness: UNIVERSITY of the WESTERN CAPE

Mrs. Anthea Rhoda

DEDICATION

This mini-thesis is dedicated to my parents, Catherine Mukakazana and Tharcisse Bwanjugu in recognition of their continuous love, encouragement and for their nurturing that has lead me to be whom I am.

This piece of work is also dedicated to my fiancée miss Annet Uwamahoro for her love, kindness, patience and assistance in many occasions. You made my life rich.

To my brothers and sisters for their support throughout the entire period of my studies.



ACKNOWLEDGEMENTS

This is an opportunity for me to express my gratitude to all people who committed themselves to the cause of my completing this report, and have in any other way been of assistance to me.

I would like to extend my sincere thanks to the Government of Rwanda through its branch the Students financing agency for Rwanda (SFAR) in the ministry of education for granting me with a scholarship for further education.

I would like to express my sincere gratitude to my supervisor Mrs. Anthea Rhoda, for the valuable supervision and advice. She was the one who helped me with sound advice in many a tedious spot.

Many thanks go to Dr. Charles Murego the director of medical services in the Rwanda Defense Forces (RDF) for facilitating my releasing from duty to pursue further study.

To Mr. Cloete Mansur a physiotherapist at Western Cape Rehabilitation Centre for the valuable advice and assistance in different aspects of my research.

I also extend my sincere appreciation to Mrs. Rose Umulinga, an archives officer at Kanombe Military Hospital for her assistance and availability when ever she was needed during data collection.

Finally I wish to thank all my colleagues and friends at University of the Western Cape.

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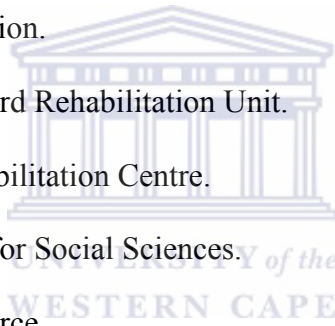
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LIST OF ABBREVIATIONS

SCI	Spinal Cord Injury.
LOS	Length of Hospital Stay.
QOL	Quality of Life
KMH	Kanombe Military Hospital.
SCRU	Spinal Cord Rehabilitation Unit.
W HO	World Health Organization.
USA	United States of America.
ADL	Activities of Daily Living.
UTI	Urinary Tract Infection.
KSCRU	Kanombe Spinal Cord Rehabilitation Unit.
WCRC	Western Cape Rehabilitation Centre.
SPSS	Statistical Package for Social Sciences.
RDF	Rwanda Defense Force.
SFAR	Student Financing Agency for Rwanda.
RDRC	Rwanda Demobilisation and Reintegration Commission
UMN	Upper motor neuron
LMN	Lower motor neuron



KEY WORDS

Spinal Cord Injury

Length of Stay

Quality of life

Rehabilitation

Kanombe Military Hospital

Rwanda

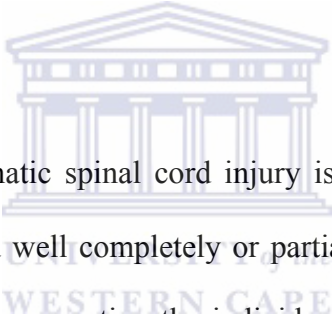


CHAPTER ONE: INTRODUCTION

1.0. INTRODUCTION

This chapter begins with a description of spinal cord injuries, the vulnerable groups likely to suffer spinal cord injuries, and the secondary medical complications that could occur in patients with SCI. The length of stay (LOS) in different parts of the world is highlighted. The statement of the problem and the significance of the study are explained and the research questions, aim and objectives of the study are stated. The definitions of terms used in the study are explained and finally the chapter concludes with an outline of the thesis chapters.

1.1. BACKGROUND



The occurrence of a sudden traumatic spinal cord injury is an unexpected event, rendering a person who was previously fit and well completely or partially paralysed (Dorsett, 2001). The event becomes a defining moment, separating the individual's life into before and after injury phases (Dorsett, 2001). A spinal cord injury (SCI) is defined as permanent paralysis, to greater or lesser extent as a result of damage to spinal cord. Depending on the level of injury, the paralysis is described as tetraplegia (or quadriplegia) referring to all four extremities of the body affected, and paraplegia referring to paralysis in the lower part of the body from approximately the waist down (Ragnarrsson, et al., Marino, 2005; Marino, Barros, Biering-Sorensen et al., 2003).

A traumatic SCI is “a personal tragedy,” and a “devastating” “catastrophic” condition occurring most frequently to young, healthy individuals around the world (Post, Dallmeijer, Angenot, Van Asbeck, & Vander Woude, 2005; Ragnarrsson, Wuermsler, Cardenas & Marino,

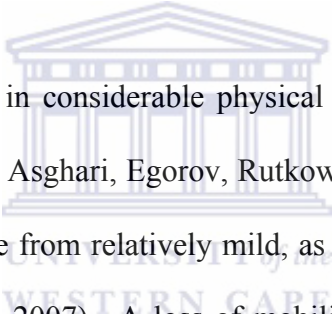
2005). Individuals abruptly become seriously disabled, with the extent of the paralysis being dependent on the level and completeness of the injury (Hamell, 1995).

Yarkony, Formal & Cawley (1997) points out that a spinal cord injury is a low-incidence, high cost disability requiring tremendous change in a person's lifestyle. In the USA, the incidence of spinal injuries is estimated at approximately 10 000 new cases per year with an approximate prevalence of 183 000 to 250 000 people with SCI (McKinley, Santos, Meade, & Brooke, 2007; Ragnarrsson, et al., 2005; Acosta, 2004; Stover, 1996).

According to Yarkony et al., (1997) the highest incidence of traumatic SCI commonly occurs among young adults, predominantly males, and in the USA, most victims are single, white males with a median age of 26 years and a ratio of four males to one female. In South Africa, it is estimated that every year approximately 400-500 South African youths sustain spinal cord injuries as a result of trauma that leads to severe physical disabilities (Quadriplegic Association of South Africa, 2000-2003).

In Rwanda, although there is no database to record incidences and statistics related to spinal cord injuries, the recent census of August 2002 indicated that the proportion of people with disabilities was 4.7%, overall and specifically ranking physical disabilities as the highest (2.2%). Illnesses (37.5%) and accidents (including war) at 12.4% were classified as the major causes of disability (Karangwa, 2004).

Through recent advances in medical sciences and assistive technologies, life expectancy of persons with SCI has increased and these young people are able to survive into adulthood. (Norrbrink Budh & O'steraker, 2007; Post et al., 2005; Chan, Lee & Lieh-Mak, 2000). In the USA, the rate of surviving a spinal cord injury has improved to approximately 88% in the first twelve years following injury, with young adults having a better chance for survival. (De Vivo, Richards, Stover & Go, 1991). In Australia, O'Connor reported 86% survival rates at 10 years after SCI injury. In a sub-Saharan country Zimbabwe, Levy, Makarawo, Madzivire, Bhebhe, et al (1998) reported a 1-year survival rate of at least 51% in their data collected 3 years following spinal cord injury.



A spinal cord injury (SCI) results in considerable physical and emotional consequences to an individual who sustains it (Murray, Asghari, Egorov, Rutkowski, Siddall, Soden, & Ruff, 2007). The physical effects of a SCI range from relatively mild, as in incomplete lesions, to disabling, as complete lesions (Murray et al., 2007). A loss of mobility is often a dominant concern for individuals with SCI, paralysis resulting into wheelchair dependence. Persons with spinal cord injuries are therefore often dependent on others for assistance in execution of daily living tasks such as toileting, bathing, dressing, grooming, eating, community access and recreational activities (Dorsett, 2001). In addition the injury also impacts on the psychological status of these individuals. The lack of physical functioning could contribute to depressive behaviours due to a sense of being hopeless and helpless (Dorsett, 2001). Individuals with SCI experience partial or complete paralysis, and altered sensation of body parts below the injured area (Murray et al., 2007). For instance individuals with spinal cord injury often face extraordinary problems including, medical complications arising from the direct impact of the disability such as pain, spasticity and infections (Levins, Townson, Mah-Jones, Bremner, & Huston, 2001). Other body systems that may

be affected include the urinary and bowel systems as well as a loss of sexual function (Liang, Wang, Lin, Wang, & Jang, 2001; Krause, 2000).

The impact of SCI on mental health and psychological function has been found to be associated with factors such as pain, lack of sleep and feelings of helplessness (Craig, Tran, Lovas, Middleton, 2008). Moreover, negative psychological states and pain intensity have been found to lower quality of life (QOL) in people with SCI and is coupled with the potential raised risks of psychological disturbance such as substance usage and risk of suicide (Craig et al., 2008). Kennedy and Rogers (2000) reported that anxiety, depression and hopelessness gradually increase from the first week post injury and continue until discharge from rehabilitation.

The devastating changes caused by SCI also predisposes individuals to develop various secondary medical complications throughout life, which may interfere with health and well-being, social activity, productive employment and quality of life (Middleton, Lim, Taylor, Soden & Rutkowski, 2004; Ackery et al., 2004). The occurrence of pressure sores is among the most common long-term secondary medical complication in persons with SCI that poses a serious health concern among health providers (Garber & Rintala, 2003).

The majority of patients with SCI receive hospital rehabilitation to address the impact of the injury on the person. The rehabilitation of patients with SCI aim to enable the fullest range of activities and active participation in all aspects of human life, maximise independence and prevent complications through provision of extensive treatment, enhancing emotional adaptation and promoting reintegration into the community (Chappell & Wirz, 2003).

In order to achieve the above mentioned range of activities, an interdisciplinary team approach is needed and involves rehabilitation physicians, nurses, and various therapists (physical, occupational, speech, recreational, and vocational) , psychologists, and social workers who individualise the program to meet the patient's needs and abilities (Chappell et al., 2003). The aim of an interdisciplinary team-based approach is to prevent the development of secondary complications, maximisation of physical functioning, and reintegration into the community (Van Langeveld, Post, Van Asbeck, Postma, Dominique, Pons, 2008).

In several countries, rehabilitation following a spinal cord injury is a challenge and presents new problems and challenges to survivors with spinal cord injury and their health care providers (Johnson, Gerhart, McCray, Menconi, Whiteneck, 1998), and greatly increases the costs of long-term care, drains limited health care resources, limits survivor's productivity, and decreases their quality of life.

The provision of rehabilitation is however challenging in developing countries especially in the transitional period after a war where rehabilitation centres do not have adequate staff, facilities or equipment to assist individuals who have spinal cord injuries (Populin, 1996). Moreover, one of the factors that become a challenge is the cost of rehabilitating patients with spinal cord injury, and the main factor influencing the cost is the length of stay.

Post et al. (2005) points out that length of hospital stay (LOS) is the duration of hospitalisation between first admission and the final discharge from the hospital or the rehabilitation centre.

LOS following spinal cord injury varies from place to place. The mean LOS for spinal cord injury ranges from 20-74 days in United States, 56-61 days in Australia, and 91-143 days in Italy (Ronen et al., 2004; Post et al., 2005). However, it depends on effectiveness and efficiency of medical services available and is mostly related to severity of injury, degree of disability on admission, age, other demographic factors and presence of medical complications such as pressure sores, respiratory infections, and urinary tract infections (Middleton et al., 2004; Savic, Short, Weitzenkamp, Charlifue & Gardner, 2000).

In the literature, factors reported to be associated with LOS in hospital for spinal cord injury patients are personal factors and hospital factors (Mawajdeh, Hayajneh, & Al-qutob, 1997; Weibtraub, Ellis, Craver, & Cohen, 1989). The personal factors include age, severity of injury and the development of secondary medical complications notably urinary tract infections, and pressure sores (Herm, Spackman & Anderson, 2000), whereas hospital factors include being public or private hospital and availability of bed and staffing levels (Simpson, Packer, Stevens, & Raftery, 2005).

Although LOS in patients with SCI in developed countries varies between 3 - 6 months (Post et al., 2005), at Kanombe Military Hospital all individuals with SCI admitted to the hospital are assumed to have unstable fractures and are therefore managed conservatively with closed reduction, appropriate posturing and immobilisation with thoraco-lumber traction for 8 weeks, followed by controlled mobilisation for a 4 week period. The nursing staff works in collaboration with physiotherapists to ensure regular turning of patients for skin and bladder care. There are no facilities available for plastic surgery (debridement, skin flaps or graft) for pressure sores. No

family members are allowed in the rehabilitation unit during the rehabilitation process except members from military services who provide care, food preparation and regular turning of patients assisted by nursing staff. While working as a clinical physiotherapist in the physiotherapy department at Kanombe Military Hospital (KMH), the researcher noted that the majority of patients with SCI admitted to the Spinal Cord Rehabilitation Unit (SCRU) in this hospital were as a result of gunshot wounds. Although, they receive treatment and rehabilitation services, they are admitted for many years. The motivation for the study is therefore to determine length of stay and personal factors affecting the length of hospital stay among patients with spinal cord injury at Kanombe Military Hospital.

1.2. STATEMENT OF THE PROBLEM

Longer hospital stay among people with spinal cord injuries leads to increased cost (Middleton et al., 2004, Scivoletto, Morganti, Ditunno, Ditunno, J.F & Molinari, 2003). It has been observed that a number of patients with SCI at Kanombe Military Hospital in Rwanda stay in hospital much longer compared to similar patients in other rehabilitation centres. This results in increased cost on the part of individuals, their families, and the Rwandan government. It is necessary therefore to determine length of stay and personal factors affecting the length of hospital stay among people with spinal cord injuries at Kanombe Military Hospital so that corrective measures could be taken.

1.3. RESEARCH QUESTIONS

1.3.1. What is the length of hospital stay for individuals with spinal cord injuries at Kanombe Military Hospital, Rwanda?

1.3.2. What are the personal factors affecting the length of hospital stay of individuals with spinal cord injuries at Kanombe Military Hospital; Rwanda?

1.4. AIM OF THE STUDY

To determine length of stay and the personal factors affecting length of hospital stay of individuals with spinal cord injuries at Kanombe Military Hospital.

1.5. OBJECTIVES OF THE STUDY

1.5.1. To identify the socio-demographic profile of patients with spinal cord injuries at Kanombe Military Hospital.

1.5.2. To identify the occurrence of secondary complications such as urinary tract infection, urinary infection, pressure sores, bladder infection among individuals with spinal cord injuries at Kanombe Military Hospital.

1.5.3. To determine the length of stay in hospital of individuals with spinal cord injuries at Kanombe Military Hospital.

1.5.4. To determine whether socio-demographic factors and occurrence of secondary complications are associated with length of hospital stay of individuals with spinal cord injuries at Kanombe Military Hospital

1.6. SIGNIFICANCE OF THE STUDY

The aim of the present study was to identify LOS and the factors affecting it. It is anticipated that the results of the study could be used to supplement the existing knowledge and understanding of

the rehabilitation professionals and other medical professionals at Kanombe Military Hospital about issues that need to be targeted by the rehabilitation professionals such as physiotherapists in addressing the factors affecting LOS through measures that could optimise the treatment and thus reducing the cost of management of patients with SCI.

1.7. DEFINITION OF TERMS USED IN THE THESIS

Spinal cord injury: Is defined as permanent paralysis, to greater or lesser extent as a result of damage to the spinal cord. Depending on the level of the injury, the paralysis is described as tetraplegia (or quadriplegia) referring to all four extremities of the body affected, and paraplegia referring to paralysis in the lower part of the body from approximately the waist down (Ragnarrsson, et al., Marino, 2005; Marino, Barros, Biering-Sorensen et al., 2003).

Length of stay: This is the duration between the date of admission to the rehabilitation unit or hospital and the date of discharge from the rehabilitation system (Post, Dallmeijer, Angenot, Van Asbeck, & Van der Woude, 2005; Burnett, Kolakowsky-Hayner, Gourley & Cifu, 2000).

Quality of life: Is 'a multi-faceted construct that encompasses the individual's behavioural and cognitive capacities, emotional well-being and abilities requiring the performance of domestic, vocational and social roles and is based on the idea of good health and experiencing personal well-being and life satisfaction that includes independence, fitness, and status (Suzie Szu-Yun Chen, 2005; Chappell & Wirz, 2003).

Rehabilitation: Has been defined by the World Health Organization as “ a progressive, dynamic, goal-oriented and often time-limited process, which enables an individual with an impairment to identify and reach his/her optimal mental, physical, cognitive and social functional level” (WHO, 2001).

1.8. SUMMARY OF CHAPTERS

In chapter one, the background of the current study is described. The description of SCI, incidence, age and gender among individuals with spinal cord injuries are highlighted. Life expectancy after SCI is also described. The impact of SCI and vulnerability of youth with spinal cord injuries are highlighted. Secondary complications due to, either the direct impact of the disability or psychological issues are also explained. The LOS in different parts of the world is highlighted. The significance, aim and objectives of the study are presented. The chapter ends with the definition of terms used in the study.

Chapter two describes the literature review which is pertinent to this study. Some of the issues highlighted include the impact of spinal cord injury. Both physical and psychological aspects affecting the quality of life of spinal cord injury patients were identified and introduced. The incidence and prevalence of spinal cord injury were highlighted. The role of different disciplines in a spinal injury rehabilitation setting has been introduced. Finally, length of hospital stay and factors affecting it are discussed.

In chapter three, the methodology of the present study is explained. The research setting, study design, and study population are described. Methodological issues, such as data collection methods, which were achieved by reviewing patient medical files. Reliability and validity of the

data gathering instrument are discussed. The study procedure, the pilot study is also described. Both descriptive and inferential statistics analysis of data and the test used were highlighted. Lastly the chapter concludes with ethical considerations that were adhered too.

Chapter four describes the results of the study according to demographic characteristics of the sample and the occurrence of secondary medical complications of spinal cord injury. The length of hospital stay is highlighted and factors affecting it are discussed, both the descriptive and inferential statistics results of the study are presented. The results are presented in the form of tables and graphs. Finally the associations between demographic data, secondary medical complications and length of hospital stay are described.

Chapter five discusses the summary of the major findings of the present study in relation to previous research literature in the field of study. It also discusses the findings of the present study and attempts to compare it with other studies. Lastly but not the least the chapter highlights limitations of the study.

Chapter six presents a summary of the study, the conclusion is drawn based on the main findings of the study, and finally the researcher makes the recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.0. INTRODUCTION

This chapter highlights the literature reviewed related to certain aspects of spinal cord injury. It explores the incidence and prevalence of spinal cord injuries and the impact of spinal cord injury on the individual. The rehabilitation process of spinal cord injured individuals and the different secondary medical complications developed after sustaining a spinal cord injury are also presented. Finally the chapter discusses the length of hospital stay and factors affecting it.

2.1. DEFINITION OF SPINAL CORD INJURY

As previously stated in chapter one, SCI is the occurrence of an acute inflammation, or traumatic lesion of neural elements in the spinal canal (spinal cord and caudal equina) resulting in temporary or permanent sensory deficit, motor deficit, and a disruption of both bladder and bowel function (Cripps, 2006, Nielsen, 2003, Dorsett, 2001). It is a severely disabling condition that in most cases occurs suddenly, and mainly affecting young males who engage in high-risk activities (Pagliacci et al., 2003, Liang, Wang, Lin, Wang, & Jang, 2001; Krause, 2000; Hammell, 1995).

The two main types of cord syndromes that result from injury to the spinal cord are paraplegia and quadriplegia (also known as tetraplegia). Injuries to the cervical area of the spinal cord generally result in quadriplegia, which is the damage to a spinal cord above the first thoracic vertebra; this affects the cervical spinal nerves resulting in paralysis of all four limbs. In addition

to the arms and legs being paralyzed, the abdominal and chest muscles are also affected resulting in respiratory problems including inability to cough effectively and clear the chest of secretions. In a person with paraplegia, the level of injury occurs below or at the first thoracic spinal nerve and paralysis resulting into loss of sensation or motor function in the lower limbs and the lower part of the thoracic or upper part of trunk (Dorsett, 2001). The degrees of impairment vary greatly depending on the level of injury and are classified as the completeness of the injury (Ragnarrsson, et al., 2005; Marino, et al., 2003).

In an incomplete, injury impulses are transmitted between the brain and the rest of the body, and there may be some sensation or motor function below the level of the injury to the spinal cord while others have motor function preserved but little or no sensation (Chappell & Wirz, 2003). In a neurological complete spinal cord injury, there is no function below the level of the injury; no sensation and no voluntary movement and both sides of the body are equally affected (Stover, 1996). As a result of the above mentioned changes due to SCI, individuals' social role and interpersonal relationships are profoundly affected (Chappell, & Wirz, 2003). There is no cure as yet for a spinal cord injury and the result of injury is permanent (Illis, Sedgwick & Granville, 1982).

2.2. INCIDENCE AND PREVALENCE OF SPINAL CORD INJURY

“The knowledge of incidence and prevalence of spinal cord injury (SCI) is important both because of their high personal, bio-psychological impact and the high socio economic consequences, both short-term as well as long-term” (Wyndaele & Wyndaele, 2006). The

incidence and prevalence rates of SCI also have an impact on health care and reflect the level of control of injury and the possible need for improved prevention (Wyndaele et al., 2006).

Acute traumatic spinal cord injury (SCI) represents one of the most devastating injuries to afflict the human body (Carlson & Gorden, 2002). The SCI has a high rate of prevalence in the younger population, creating physical and economic burdens on both the individual and society (Carlson et al., 2002).

World wide, the incidence of SCI is estimated to be in the range of 15-40 cases per million populations and occurring most frequently in persons between 16 and 30 years of age (Carlson et al., 2002; McKinley et al., 2007). For instance in Canada over half of those with spinal cord injuries were aged between 15 and 24 years at the time of their accident (Chase, Cornille, & English, 2000). Similarly in Australia, the incident rates of spinal cord injury are highest for those aged between 15 and 24 (Hamell, 1995). Approximately 10,000 new cases of acute SCI are documented per year in the United States and this number does not include those who die at the scene of crash (McKinley et al., 2007; Ragnarrsson et al., 2005; Acosta, 2004; Stover, 1996). Societal costs of managing spinal cord injuries are estimated at 10 billion dollars per year (Tator, 1996). While there are no statistics for Rwanda, it is estimated that the 1994 war and genocide that characterised the nation, left more than one million people massacred and an approximate number of 12.4% disabled including those with a spinal cord injury (Karangwa, 2004). Other African countries where physical trauma is higher includes South Africa, where it is estimated that every year approximately 400-500 South African youths sustain a spinal cord injury as a

result of trauma that leads to severe physical disabilities (Njoki, 2004; Quadriplegic Association of South Africa, 2000-2003).

Recent injury demographics demonstrate a trend toward increasing average age at the time of injury and violence-related injuries (Nobunaga, Go & Karunas, 1999). Complete injuries are more common among younger individuals and men than older adults and women (Nobunaga et al., 1999).

2.3. CAUSES OF SPINAL CORD INJURY

The causes of spinal cord injury are classified as traumatic and non-traumatic (Nicholas, Brown, & Sett, 2005). Some of the most common causes of traumatic spinal cord injury are motor vehicle accidents, falls, sports-related injuries, and violence related injuries including gunshot wounds and stab wounds, and occupational injuries, mostly in the construction industry (Cripps, 2006; Nichols, et al., 2005; & Ragnarrsson et al., 2005).

The non-traumatic SCI can be caused by inflammatory or degenerative illnesses such as multiple sclerosis or tuberculosis of the spinal cord, which can occur in all ages, most commonly from young adult age (Werhagen, 2008; Yokoyama, Sakuma, Itoh, Sashika, 2006). Nair, Taly, Maheshwarappa, Kumar, Murali & Rao (2005) state that non-traumatic SCI comprises of an approximate proportion of 40% female and most of them often have incomplete SCI than traumatic SCI. Non traumatic SCI patients frequently have other medical problems like hypertension, cardiac diseases, degenerative disorders and diabetes mellitus (Yokoyama et al.,

2006). Yokoyama et al. (2006) also maintains that due to these complications their rehabilitation is complicated as they have more medical needs than traumatic SCI.

In Rwanda, despite serious lack of information on prevalence of spinal cord injury, it is suggested that the causes of spinal cord injury are similar to those observed from other countries, although the levels of political violence, violent crimes and genocide effects could have increased the number (Thomas, 2005). The genocide of 1994 had affected Rwanda in a wide range of social, political and economic aspects and the country continues to live with the devastating effects of this brutal conflict as many people suffered serious injuries and wounds including spinal cord injuries (Karangwa, 2004).



2.4. IMPACT OF SPINAL CORD INJURY

It is clear that a spinal cord injury is a devastating problem that may substantially impact on many facets of an individual's life, including social roles, personal goals and future life expectations and quality of life (Conroy & McKenna, 1999). The resultant morbidity immediately, dramatically, and often permanently changes the survivor's lifestyle and occupation (Morris & Marshall, 1997). Rehabilitation programmes aim to enhance adjustment to life following spinal cord injury by equipping the individual with the skills and resources required for community re-integration (Conroy & McKenna, 1999). However, despite the intensive efforts of rehabilitation through education and functional skills training, people with spinal cord injury experience a range of short-and long-term physical and psychosocial difficulties once they return to the community (Kendall, Ungerer & Dorsett, 2003).

The physical, social and emotional adjustments, which determine the eventual successful outcome following the injury, vary considerably from person to person with some making satisfactory adjustments whereas others remain chronically distressed (Chase, Cornille, & English, 2000). Factors such as architectural barriers, discriminatory society attitudes and unemployment have been identified as some of the distressing physical and social adjustment problems that individuals with spinal cord injuries encounter once back in the community (Anderson & Vogel, 2002). In addition, Pruitt, Wahlgren, Epping-Jordan & Rossi (1998) note that, a variety of factors relating to the experience of spinal cord injury potentially have an effect on an individual's psychological adjustment. Some of the factors reported by individuals with a spinal cord injury include, fear of rejection by partners or peers, poor coping skills and a struggle with self-identity (Carpenter, 1994). Sexual dysfunctions following spinal cord injury have also been reported especially by men as being contributing factors to psychological trauma (Brackett, Nash & Lynne, 1996). North (1999) points out that the resultant marked changes in body image after a spinal cord injury may cause significant psychological adjustment problems to some individuals.

Depression and anxiety have been described as some of the major psychological reactions to spinal cord injury in several studies. For instance, in a longitudinal study investigating anxiety and depression over the first two years of spinal cord injury, Craig, Hancock and Dickson (1994) found that, about 30% of spinal cord injured persons had significantly raised levels of anxiety, depressive mood and feelings of helplessness in comparison to age, education and sex matched non-disabled controls. Thus clinicians always view anxiety and depression as an inevitable

consequence of spinal cord injury, given the dramatic changes that come with the injury (Brown, Maynard, Richardson & Wagner 1999).

The literature concerning the long-term psychological consequences of spinal cord injury indicates that, substance usage especially tobacco, alcohol and drugs have become an increasing area of concern among individuals with spinal cord injuries (North, 1999; Radnitz & Tirch, 1995). For instance some individuals with spinal cord injury have been found to use drugs such as marijuana and cocaine as methods of stress management and controlling spasticity (Heinemann, 1991). Heinemann, Keen, Donohue and Schnoll (1988) found that among individuals with a recent spinal cord injury a desire to be sociable was cited by the majority of SCI individuals (61%) as their main reason for drinking. According to Radnitz and Tirch (1995), individuals with spinal cord injuries face special risk factors for developing a substance usage problem, in addition to those that confront the general population. These include medical and social characteristics and intrapersonal factors unique to them. (Kolakowskyhayner, Gourley, Kreutzer, Marwitz, Meade, & Cifu, 2002).

Chappell & Wirz (2003) define quality of life as “a concept representing individual responses to the physical, mental and social effects of illness on daily living, which influences the extent to which personal satisfaction with life circumstances can be achieved”. The widespread view of good quality of life is usually based on the idea of good health and experiencing personal well being and life satisfaction (Chappell et al., 2003). Following SCI, quality of life seems to be related to physical symptoms and physical functioning, as well as psychosocial factors. Studies conducted within two years after SCI found that poor quality of life was associated with greater

pain, spasticity, incontinence, less physical independence and immobility (Lucke, Coccia, Goode, Lucke, 2004; Putzke et al., 2002), where as good quality of life was associated with satisfying relationships, maximising function, meaningful activities, and access to the environment (Lucke et al., 2004).

Studies have also indicated that factors such as physical or injury factors, psychosocial factors, and demographic factors are associated with QOL post spinal cord injury (Rahman, Forchheimer, & Tate, 2004). In terms of physical or injury related factors, differences in neurological level of injury have fairly consistently failed to yield any variations in QOL (Rahman et al., 2004; Westgren & Levi, 1998). Time since injury has, however, produced mixed results, with some researchers suggesting that increased time since injury is associated with increased QOL (Richards, Bombardier, Tate, Djikers, Gordon, Shewchuck, & DeVivo, 1999; Westgren & Levi, 1998) and others suggesting that no such relationship exists (Post, Van Dijk, Van Asbeck, & Schrijvers, 1998). One study noted that QOL changes during the first two years post-injury but is stable thereafter (Crewe, & Krause, 1990). In terms of psychosocial factors, being employed, level of education, social integration and activity, as well as extent of community access have all been found to be associated with increased QOL (Richards et al., 1999; Djikers, 1999).

With regards to demographic factors which include variables such as marital status, age, and race, the findings demonstrated that married individuals with SCI report greater QOL than those who are single (Putzke, Elliott, & Richards, 2001; Holicky, & Charlife, 1999). Increased age has been associated with lower QOL (Rahman et al., 2004).

It could be argued that people with disabilities are therefore incapable of experiencing good quality of life. For example, in the milieu of a biomedical model of disability, Kasonde-Ng'andu (1999) points out that one of the underlying values is that disability is perceived to be a 'sickness', 'personal tragedy' and object of charity. From these perceptions, further assumptions are made by both health professionals and society in general about people with disabilities including spinal cord injury. For instance people with spinal cord injury are assumed to be limited in function and role performance (Chappell et al., 2003) and as a result they are often underprivileged and ostracised from local communities.

Siosteen, Lundqvist, Blomstrand, Sullivan, & Sullivan (1990) studied 56 individuals with SCI in Sweden; they found that involvement in social activities correlated well with levels of mental well being and quality of life, outweighing levels of physical dysfunction. Siosteen et al. (1990) further determined that severe body pain is related to poor quality of life. In addition, changes in quality of life occur when a change in body pain levels interferes with day to-day activities such as work outside the home and housework for those with SCI (Gutierrez, Thompson, Kemp & Mulroy, 2007). Gutierrez et al. (2007) further demonstrated that involvement of individuals with SCI in community activities is significantly correlated with quality of life. These activities include caring for one self and participating in socially pleasurable events.

In their study on quality of life of individuals with SCI in Taiwan, Lin, Chung, Kao, Lien & Tsauo (1997) found that the level of injury and post-injury working status were the major factors influencing the quality of life. However, Clayton and Chubon (1994) found that individuals with spinal cord injury, who attained education, were associated with perceived better life quality.

These authors further argue that education increases a sense of control over life of persons with disabilities including those with spinal cord injuries and creates opportunities for social relationships to emerge.

2.5 REHABILITATION OF SPINAL CORD INJURY

As previously noted in chapter one, rehabilitation following a spinal cord injury is a challenge to those who are injured. This is even more challenging in developing countries like Rwanda especially in the transitional period after a war where there is inadequate rehabilitation personnel and lack of facilities to assist individuals with spinal cord injuries (Populin, 1996).

Rehabilitation services for people with SCI is aimed at maximisation of physical functioning and preventing secondary complications and reintegration back to the community (Illis et al., 1982). This is effectively undertaken with a multidisciplinary, team-based approach that involves a rehabilitation physician, nurse, various therapists (physical, occupational, speech, recreational, and vocational) a psychologist and a social worker, who individualise the program to meet the patient's needs and abilities (Stokes, 2004).

Rehabilitation of a spinal cord injured person aims to maximise the functional independence within the potential of the individual, provide an opportunity for leisure, to enhance employment and to improve quality of life through reduction of environmental barriers to good health and educate the patient how to prevent complications occurring through provision of extensive treatment, enhancing emotional adaptation and promoting reintegration into the community (Chappell et al., 2003; Ada, Mackery, Heard & Adams, 1999; Rimer, 1999).

Traditionally, rehabilitation has been offered under the auspice of the biomedical model where appropriate treatment is determined based on professional perceptions of need related to the causes or pathologies of disease or injury (Kendell, Ungerer, Dorsett, 2003). Increasingly, it is being recognised that the traditional, hospital-based models of rehabilitation do not offer an environment that is conducive to people with SCI (Yoshida, 1994). However, the majority of rehabilitation for people with SCI in Rwanda is still provided under the traditional hospital-based framework where community-based models have remained unexplored and people with SCI frequently spend long periods of time within the hospital setting. According to Kendell et al. (2003) extended periods of hospitalisation result in enormous health care costs, significant physical, psychological and social costs to persons with SCI in both short and long terms.



2.5.1 The role of interdisciplinary team in rehabilitation of spinal cord injury

Cooper & Fishman (2003) define an interdisciplinary team as a group of persons who are trained in the use of different tools and concepts. Among these persons there is an organised division of labour around a common problem with each member using his own tools, and with continuous intercommunication and often with group responsibility for the final outcome. The team usually consists of medical officers, nurses, physiotherapists, social workers, and occupational therapists who work collaboratively within the spinal injuries unit (Dorsett, 2001). Each of these disciplines has a valued and respected role in the provision of rehabilitation services (Saulino & Vaccaro, 2002). The disciplines work collaboratively to assist clients to maximise independence and facilitate the best possible adjustment following spinal cord injury (Dorsett, 2001).

The basic aim of SCI care and rehabilitation is to provide a comprehensive service that will prevent patients from developing medical complications and help them to return to a life worth living as useful and respected citizens in the community, despite their permanent and profound disability (Sand, Karlberg & Kreuter, 2006). The medical and nursing staff addresses the complex range of medical problems that are presented by the injury. These include bowel and skin management as well as management of the many complications that occurs due sustaining a spinal cord injury, such as autonomic dysreflexia, spasticity, and chest infections (Sand, et al., 2006).

The physiotherapists typically focus on difficulties with functional mobility, where as the occupational therapist address difficulties in accomplishing activities of daily living (Saulino et al., 2002). Furthermore, the physiotherapists or occupational therapists could assist the client to choose appropriate equipment to function effectively in the community and assess and make recommendations about home modifications. The social worker provides emotional support, counseling and advice about community resources available to the client (Sand et al., 2006). Further more, the social worker acts as an advocate for the client to community agencies in an economic environment of restricted resources. Moreover, the social worker also plays a pivotal role in the co-ordination of discharge planning for the client and works extensively with the family (Sand et al., 2006; Dorsett, 2001).

2.6 LENGTH OF HOSPITAL STAY

As previously stated in chapter one, length of hospital stay (LOS) is the duration between first admission and the final discharge from the hospital or the rehabilitation centre (Post et al., 2005;

Esato Lu & Bozat, 2002). LOS is an indicator of the quality and effectiveness of the medical care and the rehabilitation services within the hospital and also gives a clear idea about unnecessary hospitalisation, and appropriate care (Esato Lu et al., 2002; Siu, Sonnerberg & Manning, 1986).

LOS varies depending on the social security institution the hospital belongs to and the countries concerned (Esato Lu et al., 200), and these differences are influenced by differences in medical facilities, and different ways of organising medical care (Esato Lu et al., 2002). In the international literature, the two broad types of determinants of length of stay are: patient characteristics, and hospital characteristics (Esato Lu et al., 2002). On the patient side, Godfarb, Hornbrook, & Higgins (1983) contends that patient age and severity of injury or illness are very important determinants of length of stay. The hospital factors include being a public or private facility, availability of beds and staffing levels (Simpson, Packer, Stevens, & Raftery, 2005). The importance of hospital characteristics and organizational factors in determining length of stay has been established by several studies (Esato Lu et al., 2002; Cannoodt, Knickman, 1984).

2.7 FACTORS AFFECTING LENGTH OF HOSPITAL STAY

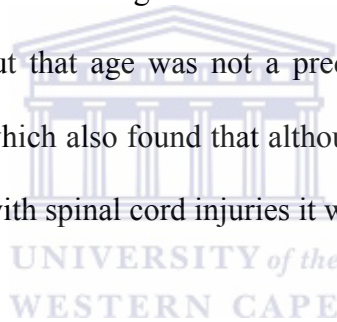
Factors affecting LOS can be categorized into patient factors and hospital factors (Dowd et al., 1996).

2.7.1 PATIENT FACTORS

Patient factors include age, gender, and marital status, presence of secondary medical complications and injury-related characteristics that may directly or indirectly influence the length of stay (Mawajhed et al., 1997).

2.7.1.1 Demographic and injury-related factors.

Several studies have shown that patient age is positively correlated with LOS (Weibtraub, Ellis, Craver, & Cohen, 1989; Dowd et al., 1996). A recent study by Scivoletto et al. (2003) on traumatic and nontraumatic SCI that matched 130 patients for etiology, time from onset, and injury characteristics reported that older patients tend to have a shorter LOS. Other studies, however, have found the opposite, with older patients having a longer LOS (Cifu, Huang, Kolakowsky-Hayner, & Seel (1999). In contrast, De Vivo, Kartus, Rutt, Stover, & Fine (1990) in their retrospective study on the influence of age at the time of spinal cord injury on rehabilitation outcome of 866 patients found out that age was not a predictor of LOS after SCI. This was confirmed by Furlan et al., 2008 which also found that although age was a potential predictor of mortality of hospitalized patients with spinal cord injuries it was not a predictor of LOS.



Among the demographic characteristics, Dowd et al. (1996) noted that females and non-white patients exhibit relatively longer length of stay. Epstein Stern, Weissman (1990) examined the impact of income, education and occupation on length of stay, and found that patients of lower socio-economic status have longer length of stay. Social support was also found to affect LOS. For instance single patients with spinal cord injuries were found to exhibit longer LOS in the rehabilitation unit than others (Mawajhed et al., 1997).

Severity of injury was also found to be a significant predictor of LOS (Pompei, Charlson, Ales, Mackenzie & Norton, 1991). For instance SCI patients with psychiatric disorders were found to exhibit longer LOS than their counterparts (Flournoy, Hinahon, Klein, Hall & Murray, 1990).

Complications arising during hospitalisation exert a significant effect toward prolonging LOS. For instance hospital-acquired infections have been shown to significantly prolong the duration of hospitalisation (Flournoy et al., 1990).

In their study on demographic and clinical correlates of length of hospital stay in a Nigerian university hospital, Ukpong & Mosaku (2008) reported that being diagnosed as having a physical impairment, including spinal cord injury, being unmarried and being unemployed significantly increased length of hospital stay.

2.7.1.2 Presence of secondary medical complications of spinal cord injury

Despite advances in prevention and treatment of spinal cord injuries (SCI), a variety of distressing complications occur both during the acute phase and post acute phase of injury (Chen, Apple, Hudson, & Bode, 1999). The most common complications include pressure sores, bowel and bladder infection, urinary tract infections, and respiratory infections.

2.7.1.2.1 Pressure sores

It is well known that pressure sores is a serious and life long complication of spinal cord injury patients (Garber & Rintala, 2003; Ash, 2002), and it is also reported that spinal cord individuals are particularly at risk of developing this complication especially in the immediate post injury phase (Salzberg, Byrne, Kabir, van Niewerburgh, Cayten, 1999). Pressure sore prevalence has been estimated at between 17 and 33% among persons with SCI residing in the community (Guihan, Garber, Bombardier, Goldstein, Holmes, Cao, 2008).

Correa, Fuentes, Gonzalez, Cumsille, Pineros & Finkelstein (2006) describe pressure sores or ulcers as a localised area of cellular necrosis and vascular destruction that results from prolonged

exposure to pressure, shearing or friction and the lack of sensibility and movement owing to the SCI that later favor the development of such lesions. They usually occur over bony prominences and are classified as stages by the degree of tissue damage observed (Correa et al., 2006). The causes of pressure sores among individuals with SCI are multi-dimensional and they include pressure; shear friction and poor nutrition (Garber and Rintala, 2003).

The factors contributing to this increased risk of pressure sores include neurological deficit, immobility, and incontinence (Byrne & Salzberg, 1996). The reported factors in literature which are associated with the development of pressure sores among spinal cord injury individuals include psychosocial factors such as inadequate personnel and financial resources as well as noncompliance with acknowledged preventative behavior, altered autonomic reflexes and severe spasticity (Garber & Rintala, 2003; Yavuzer, Gok, Tuncer, Soygur, Arikan & Arasi, 2000).

Epidemiological studies have found that 36-50% of all persons with SCI who develop pressure sores will develop a recurrence within the first year after initial healing (Guihan et al., 2008; Salzberg et al., 1999). Recurrence rates of pressure sores have been reported to range from 21% to 79% regardless of treatment (Guihan et al., 2008). Recurrence also is a major problem for veterans with SCI. Niazi, Salzberg, Byrne, & Viehbeck (1997) in their study sample of 176 veterans with SCI and a history of one or more pressure sores reported more than thirty percent of the veterans with SCI to have experienced a recurrence of pressure sores regardless of whether they had received surgical or nonsurgical treatment.

Thiyagarajan & Silver (1984) conducted a prospective study of 100 spinal cord injury patients who either had pressure sores on admission or developed them while receiving treatment to establish the relative importance of the factors that predisposed to development of the sores. Their findings revealed that spinal cord injury patients developed pressure sores because of poor facilities at home or inappropriate advice from those who looked after them.

2.7.1.2.2 Bowel dysfunction

Bowel dysfunction is a major physical and psychological problem for SCI patients (Valles, Vidal, Clave, Mearin, 2006; Singal, Rosman, Bauman & Korsten, 2006; Lynch, Wong, Anthony, Dobbs, & Frizelle, 2000). Spinal cord injury affects the physiology of the gastrointestinal tract causing problems such as delayed gastric emptying, altered gastric acid secretion caused by autonomic dysfunction, and abnormal colonic activity due reduction of gastrointestinal and anal sphincter reflexes (Han, Kim & Kwon, 1998). The patho-physiological explanation of bowel dysfunction following spinal cord injury is related to delay in colonic transit time, capacity to increase intra-abdominal pressure, increased anal resistance during the defecatory maneuver, and presence of external annal sphincter contraction when intra-abdominal pressure increases during rectal distension (Krassioukov, Claxton, Abramson, & Shum, 2008; Valles et al., 2006). It is estimated that approximately 90% of spinal cord injury patients experience bowel dysfunction and a half of them are dependent on others for their toileting procedures (Glickman, Kamm, 1996).

Depending on the level of injury, there are two distinct patterns in the clinical presentation of bowel dysfunction. Injury above the conus medullaris results in upper motor neuron (UMN)

bowel syndrome and injury at the conus medullaris and cauda equine results in lower motor neuron (LMN) bowel syndrome (Krassioukov et al., 2008; Singal et al., 2006).

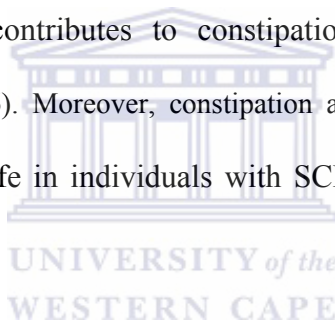
The upper motor neuron (UMN) bowel syndrome is characterized by increased colonic wall and anal tones. Voluntary control of the external anal sphincter is disrupted and the sphincter remains tight, thereby promoting retention of stool (Krassioukov et al., 2008). This bowel syndrome is typically associated with constipation and fecal retention due to external anal sphincter activity.

The lower motor neuron (LMN) bowel syndrome is characterized by the loss of centrally-mediated (spinal cord) peristalsis and slow stool propulsion resulting in the production of drier and round shaped stool (Krassioukov et al., 2008). However, this bowel syndrome is commonly associated with constipation and a significant risk of incontinence due to the atonic external anal sphincter and lack of control over the levator ani muscle that causes the lumen of the rectum to open (Krassioukov et al., 2008; Singal et al., 2006). The numerous gastrointestinal complications of bowel dysfunction, including gastric ulcers, pain, distention, and hemorrhoids that affects the quality of life of SCI (Valles et al., 2006). These distressing conditions can be exploited in establishing a bowel program (Singal et al., 2006). The bowel program is a regimen, repeated on a daily basis that can include diet, specified fluid intake, and oral medication, medication per rectum, timing, and positioning (Krogh, Perakash, Stiens, & Biering-Sorensen, 2008; Singal et al., 2006).

Previous studies have found that over half of all individuals with SCI above L2 will suffer from bowel dysfunction (Lynch et al., 2000). These authors reported that bowel dysfunction is more common in people with higher injuries compared to those with lower injuries. Furthermore,

Lynch et al. (2000) in their study reported that the majority of male paraplegics (80%) and tetraplegics (46%) ranked bowel dysfunction as their greatest functional loss after loss of mobility. The completeness of injury have a greater effect on bowel dysfunction than level of injury and this is due to the greater difficulty associated with toileting and the need for assistance among individuals with spinal cord injury (Stone, Nino-Murcia, Wolfe, Perakash, 1990).

The experience of persons with SCI reveals that the risk and occurrence of fecal incontinence and difficulty with evacuation are particularly significant life-limiting problems and associated with prolonged colonic transit time (Krogh, et al., 2008; Stiens, Bergman, Goetz, 1997). These prolonged colonic transit time contributes to constipation and difficulty with evacuation following SCI (Singal, et al., 2006). Moreover, constipation and problems with evacuation have a significant impact on quality of life in individuals with SCI (Singal et al., 2006; Stiens et al., 1997).



2.7.1.2.3 Urinary tract infections (UTI)

Urinary infection is one of the common causes of morbidity in persons with spinal cord injury after they have recovered from the initial effects of trauma (Vaidyanathan, Soni, Gurpreet Mansour, Hughes, Tun, Sett, Parsons, Davies, 2001; Chomarat, 2000; Van Kerrebroeck, Kildewijn, Scherpenhuizen, Debruyne, 1993). In an epidemiological study carried out at the centre for rehabilitation of the SCI, it was found that out 247 spinal cord injury individuals, more than 60% of spinal cord injury patients had a history of UTI (Van Kerrebroeck et al., 1993).

Urinary tract infections (UTIs) are currently responsible for about one third of all infections and approximately 80% UTIs are associated with the use of urinary catheters in SCI (Chomarat, 2000). These infections cause or contribute to the mortality of patients, and increase the duration and cost of hospitalisation. A systematic review of risk factors for urinary tract infection in adults with spinal cord dysfunction showed that persons using intermittent catheterisation had fewer infections than those with indwelling catheters (Shekelle, Morton, dark, Pathak, Vickrey, 1999).

A follow-up of 128 patients with spinal cord injury for a period of 38 months showed the number of episodes of urinary infection per 100 patients per day was 2.72 for males with indwelling catheters, and 0.41 for males who performed clean intermittent catheterisation (Vaidyanathan et al., 2001; Esclarin De Ruz, Leoni, Herruzo, 2000). Although intermittent catheterisation may be associated with fewer episodes of urinary tract infection, some patients may develop this complication as a result of frequent urethral trauma (Mandal, & Vaidyanathan, 1993). A review of 21 patients with SCI who had been performing clean intermittent catheterisation for over five years (mean length of use: 9.5 years) showed a rate of urethral trauma of 19% to cause urinary tract infection (Perrouin-Verbe, Labat, Richard, Mauduyt de la Greve, Buzelin, & Mathe, 1995).

Moreover, urinary tract infection (UTI) is the most frequent complication in patients with spinal cord injuries under self-catheterisation (Montegomerie, 1997). The increasing risk of developing urinary tract infection among individuals with spinal cord injuries include over-distention of the bladder, vesicoureteric reflux, high pressure voiding, large post-void residuals and stones in the urinary tract (Salomon, Denys, Merle, Chartier-Kastler, Perronne, Gaillard, Bernard, 2006).

2.7.1.2.4 Respiratory infections

Respiratory complications are the leading cause of morbidity and mortality in acute spinal cord injury (SCI), with an incidence of 36% to 83% (Werhagen, 2008; Berlyly & Kazuko, 2007; Smith, Evans, Kurichi, Weaver, Patel & Burns, 2007). It is estimated that eighty percent of deaths in patients hospitalized with SCI are secondary to pulmonary dysfunction, with pneumonia the cause in 50% of the cases (Berlyly et al., 2007). Indeed the impairment of the abdominal, intercostal, and diaphragmatic muscles that is associated with progressively higher lesions in the spinal cord injury results in a higher incidence of respiratory infections among spinal cord injury patients (Davies & McColl, 2002; Soden, Walsh, Middleton, Craven, Rutkowski & Yeo, 2000).

The development of respiratory complications is directly correlated with the level of injury and the degree of motor completeness among individuals with complete spinal cord injuries (Lemons & Wagne, 1994). Fishburn, Marino & Ditunno (1990) carried out a study to identify the incidence of respiratory complications based on the neurologic level of injury in motor complete spinal cord injury patients. Their findings revealed 84% of respiratory complications in persons with C1 to C4 injuries, 60% in C5 to C8 injuries and among these, sixty five percent of patients with T1 to T12 lesions experience serious respiratory complications, often related to direct chest trauma. The incidence of different respiratory complications varies with the level of injury. That is, in the C1 to C4 group, pneumonia was the most common complication, occurring in more than 63% of the patients, followed by ventilatory failure (40%) and atelectasis (Fishburn et al., 1990).

In one multicenter study of 261 patients with acute SCI, Jackson & Groomes (1994) found that the most frequent pulmonary complications were atelectasis, ventilatory failure, pleural effusion, and pneumothorax or hemothorax. Many individuals with chronic SCI experience symptomatic

breathlessness both at rest and during activities of daily living, and remain at risk for developing acute respiratory infection (Spungen, Grimm, Lesser et al., 1997). The risk of developing respiratory infections is greatest in the early period post spinal cord injury and is influenced by factors such as inability to cough effectively (Montgomerie, 1997).

In their study on the lifestyle risks for three disease outcomes in spinal cord injury namely cardiovascular disease, respiratory infection and urinary tract infections among spinal cord injury patients who received rehabilitation at Kingston General Hospital in Canada between January 1997 to December 1992, Davies & McColl (2002) found out that persons with tetraplegia were at greater risk of developing respiratory infection attributing their findings to impaired ability of individuals with a spinal injury injured to clear the respiratory tract of secretions by coughing that later leads to retention of respiratory tract secretions and infection.

In a study on the impact of respiratory complications in acute cervical spinal injury, Winslow et al. (2002), found out that the mean length of stay and hospital costs increased with the number of respiratory complications experienced and they concluded that the number of respiratory complications experienced during the initial acute care for cervical spinal injury influences the length of stay. It is clear that spinal cord injury (SCI) results not only in a devastating change to a person's physical functioning and independence, but also predisposes the individual to various secondary medical complications throughout life, which interfere with rehabilitation process (Haisma, van der Woude, Stam, Bergen, Sluis, Post, & Bussmann, 2007).

2.7.2 HOSPITAL FACTORS

Hospital factors affecting LOS include large hospitals, being public or private hospital and availability of bed and staffing levels (Simpson, Packer, Stevens, & Raftery, 2005; Lagoe, 1987). For instance large hospital and availability of beds were found to prolong hospital length of stay (Lagoe, 1987), while another study reported that large hospitals had shorter length of stay (Mawjdeh et al., 1997). Furthermore, it was found that individuals with SCI hospitalized in Veterans Administration facilities exhibited an average LOS that was five days longer than that of comparable patients treated in private hospitals (Wolinsky, Coe, & Mosely, 1987).

In the literature, other hospital related factors thought to influence LOS have been reported as; prolonged diagnosis, increased hospital acquired infections, inappropriate clinical services, prolonged decisions on admissions and discharges, staff lacking in services training, lack of outside care opportunities and doctors who are paid in accordance with the average length of stay (Esato Lu et al., 2002). Numerous studies have documented that hospital care may be inadequate in management of spinal cord injury in certain cases and situations (Mawajdeh, Hayajneh, & Al-qutob, 1997; Campion, Bang & May, 1983). Burns and Wholey (1991) found that, although both patient and hospital characteristics were important in explaining length of stay amongst acute in-patients; length of stay was also positively associated with physician workload.

2.8 SUMMARY OF CHAPTER

In this chapter, the literature review which is pertinent to the study is presented. Most of the literature reviewed focused on international studies owing to limited research on the subject in Rwanda. The literature reviewed highlight important issues that need to be focused on in relation

to factors affecting length of hospital stay for individuals with spinal cord injuries. The chapter highlighted the impact of spinal cord injuries on individuals experiencing it and its effects on the quality of life, the different secondary medical complications which develop post with spinal cord injury. The rehabilitation process and the role of interdisciplinary team in management of spinal cord injuries are highlighted. Length of hospital stay and the factors affecting it are also discussed. These factors are divided into personal and hospital factors. The present study only investigated the personal factors which could influence length of hospital. On the basis of this foundation, chapter three shall discuss the methodology utilised in the study.



CHAPTER THREE: METHODOLOGY

3.0 INTRODUCTION

This chapter outlines the methodology used in the present study. The research setting and the study design are highlighted. A description of the pilot study, data collection methods and data analysis procedure are discussed. Statistical analysis is discussed and the ethical considerations that were adhered to in the study. Finally the chapter concludes with a summary of all procedures that were undertaken.

3.1 RESEARCH SETTING

The research setting for the present study was Kanombe Military Hospital (KMH) spinal rehabilitation unit in Rwanda. Kanombe Hospital is the only military hospital and one of the referral hospitals in Rwanda. It is situated approximately 15 kilometers from the capital city Kigali. The hospital has fifteen departments namely: outpatient department(OPD), trauma and rescue unit, internal medicine, medical records, pediatrics, gynecology and obstetrics, radiology and imaging, surgery, physiotherapy, department of laboratory technology, dental department , nursing, department of ophthalmology, voluntary counseling and testing (VCT) for HIV/AIDS and the department of pharmacy. The hospital has a capacity of receiving four hundred in-patients. Being a military hospital the majority of the patients admitted are military personnel and their families, veterans and to a lesser extent people from the general population. The spinal rehabilitation unit is located with in the hospital and is managed by an interdisciplinary team comprising of physiotherapists, nurses, psychotherapists and doctors who provide rehabilitation for the patients.

3.2 STUDY DESIGN

The present study utilized a quantitative retrospective study design. Hess (2004), points out that the advantages of using a retrospective study design is that it uses existing data that have been recorded for reasons other than research that can later be used to serve a useful purpose. He further argues that it is easier to assess information where there is a long latency between exposure and disease and information are collected that represents the present and past status of different variables. However, one of the disadvantages of using a retrospective study, is that important information may not be reflected in the medical files (Hess, 2004).

3.3 POPULATION

The study population consisted of all patient records of individuals who sustained a spinal cord injury, and who were discharged from Kanombe Spinal Cord Rehabilitation Unit (KSCRU) from 1st January 1996 to 31st December 2007. These records were perused and relevant information extracted. The period 1996-2007 was preferred by the researcher because before such period, Rwanda was characterised by the 1994 war and genocide that left the country in a devastating conditions and as such the record keeping system before such period at Kanombe Military Hospital was not in place.

3.4 RESEARCH INSTRUMENTS

The researcher developed a data- gathering- instrument (Appendix H) to collect data from patients' folders based on information gained from reviewing the literature (Middleton et al., 2004; Savic et al., 2000). The final data-gathering-instrument was divided into sections A and B.

Section A documented Socio- demographic data such as age, sex, education level, employment status and the causes of SCI. The type of injury was also documented as either paraplegia or tetraplegia. Paraplegia was defined as the lesion below the first thoracic segment where as tetraplegia as the lesion at or above the first thoracic segment. Section B identified LOS and occurrence of secondary complications such as pressure sores, urinary tract infections, and respiratory infections.

3.5 VALIDITY AND RELIABILITY

To achieve content validity, the data gathering instrument was sent to experts in rehabilitation of SCI patients. These experts included one physiotherapist from the Western Cape Rehabilitation Centre (WCRC) as well as the thesis supervisor, both who are experienced in the field of the rehabilitation of SCI. To ensure the reliability of the instrument, the researcher and the research assistant compared data collected from the same five patient records prior to the commencement of the study, hence determining inter-rater reliability. According to Allison, Wall, Spettell, Calhoun, Fargason, Kobylinski, Farmer, & Kiefe (2000), the liability of data is measured as the percentage of agreement when two or more abstractors collect data from the same chart. The above process familiarised the researchers with the process and assisted them in determining the availability of the required data in the folders.

3.6 TRANSLATION

Prior to the data collection, the English versions of the data-gathering-instrument were translated into Kinyarwanda by a professional translator. To make sure that the translated Kinyarwanda

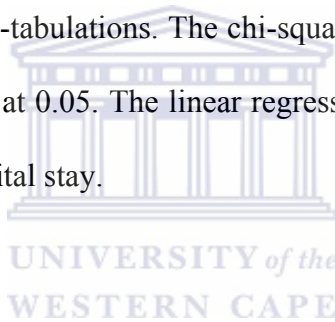
gathering tool reflects what the original English tool intended to ask, another professional translator translated the Kinyarwanda version back to English. Verification of the translated data gathering tool was made to ensure the content of the instrument.

3.7 PROCEDURE

The process of data collection started by requesting permission from the different administrative authorities. Permission was requested from Ethical clearance committee in the Ministry of Health in Rwanda (Appendix B). In responding to the request, the minister of health advised the researcher to request permission from the Ministry of Defense (Appendix C). Permission was requested from the director of medical services in the Ministry of Defense (Appendix D). Thirdly permission was requested from the director of Kanombe Military Hospital where the study took place (Appendix F). The researcher trained one physiotherapist who was not associated with the health setting where the study took place as the research assistant. This was done to avoid possible bias from staff that is conversant with the setting. Training of the research-assistant helped him understand the topic as well as the aims and ethical considerations of the study. Arrangements were made with the staff at the hospital for accessing the folders. After receiving all necessary written documents authorizing the researcher and the research assistant to carry out the study in the Military Hospital, and adhering to all the necessary ethical considerations, appointments were made with the archives officers for data extraction from patients' medical folders. The researcher and research assistant started perusing patients' medical folders on 10th December 2007 to 3rd February 2008.

3.8 DATA ANALYSIS

Data were numerically coded and captured using the Statistical Package for Social Sciences version 15.0 (SPSS) software programme for windows. Descriptive statistics of the data namely frequencies expressed as percentages were used to obtain information regarding demographic characteristics of the data. Mean as a measure of central tendencies, was used to calculate the average age of the sample, and the length of stay (LOS) which was expressed as average and ranges in years. The descriptive data was presented in the form of tables, bar charts and pie charts. Inferential statistics analysis of data was used to determine the association between demographics, occurrence of secondary medical complications with the length of stay (LOS). This was done in the form of cross-tabulations. The chi-square test was used to identify whether there was any associations (alpha) at 0.05. The linear regression analysis was used to determine factors affecting the length of hospital stay.



3.9 ETHICAL CONSIDERATIONS

Permission to conduct the study was obtained from the Higher Degrees Committee of the University of the Western Cape and Ethical permission from the Senate Research and Study Grant Committee of University of Western Cape (Appendix A). A letter from the Minister of Health in Rwanda was obtained (Appendix C). Permission was obtained from the director of medical services in Rwandan Defense Force (RDF) in the Ministry of Defense (Appendix E). Further permission was obtained from the director of Kanombe Military Hospital where the study was conducted (Appendix G).

3.10 SUMMARY

In chapter three, the study setting, which was the Kanombe Military Hospital, the study design and the study population is described. In addition, the chapter explains relevant methodological issues, such as data collection methods, which was achieved by reviewing patient medical files. The reliability and validity of the data gathering tool and the study procedures were discussed. Much attention was given to data analysis by means of both descriptive and inferential statistics and the tests used were highlighted. In conclusion the chapter describes ethical considerations adhered to in the course of the research. The results of the analysis were tabulated and presented in chapter four.



CHAPTER FOUR: RESULTS

4.0 INTRODUCTION

In this chapter, the results of the study are described. The first section describes the demographic data of the sample. The occurrence of secondary medical complications in the sample is presented. The causes of spinal cord injury and the types of spinal cord injuries are also presented. The Chi-square tests of association between demographic data, secondary medical complications and length of stay (LOS) are reported and linear regression tests that were performed to identify factors affecting the length of hospital stay. Finally the chapter concludes by presenting the summary of the results.

4.1 DEMOGRAPHIC INFORMATION OF THE SAMPLE

The information relating to the demographic status of the sample was gathered from patients' medical folders and is presented in table 4.1. It included gender, age, marital status, employment status, and level of education attained.

Table 4.1: Demographic information of the sample (N=124)

Variables	Characteristics	Frequency	%
Gender	Male	121	97.6
	Female	3	2.4
Age range	19-24	9	7.3
	25-30	44	35.5
	31-36	42	33.9
	37-42	22	17.7
	43-48	6	4.8
	49-54	0	0.0
	55-60	1	0.8
Marital status	Single	90	72.6
	Married	34	27.4
Employment status	Employed	19	15.3
	Unemployed	26	21.0
	Retired	79	63.7
Level of education	Primary	75	60.5
	Secondary	49	39.5

The mean age of the population was 32.2 years with a standard deviation of 6.31. Their ages ranged from 19 to 58 years. The majority of the sample was predominantly young adult males (97.6%) and was under the age of 42 years. Pertaining to marital status, more than seventy percent were single compared to 27.4% that were married.

4.2 THE TYPES OF SPINAL CORD INJURY

The types of spinal cord injuries among the sample were both paraplegia and tetraplegia respectively. Pertaining to the type of spinal cord injury, the majority 79.8% (99) were paraplegia. The figure 4.1 below presents the percentage distribution of types of spinal cord injury among the sample.

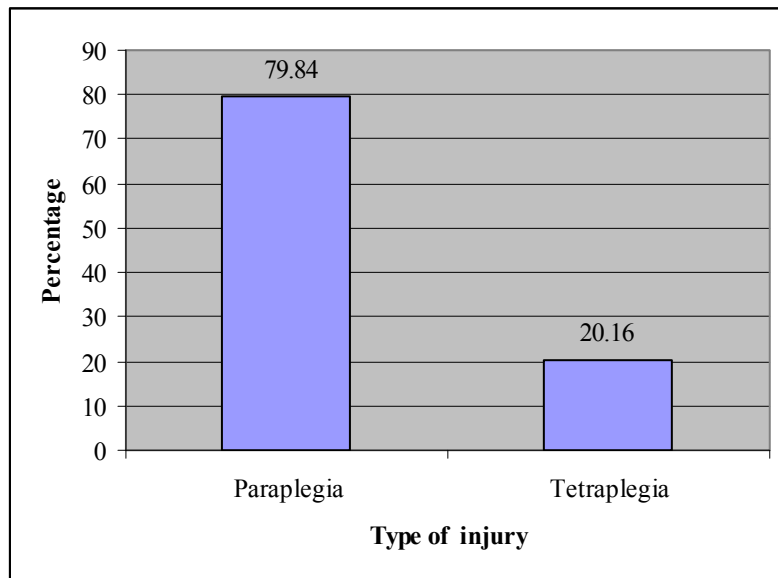


Figure 4.1: Percentage distribution of spinal cord injury among the sample (N=124)



4.3 MARITAL STATUS AMONG THE SAMPLE

The marital status that was documented with in the patients' medical folders was single and married respectively. The majority of the participants, 90 (73%) were single and had paraplegic type of injury. Table 4.2 presents the distribution of types of spinal cord injury according to marital status.

Table 4.2: Distribution of types of spinal cord injury according to marital status (N=124)

Type of spinal cord injury	Marital status		Total
	Single	Married	
Paraplegia	78 (86.67%)	21 (61.76%)	99(80%)
Tetraplegia	12 (13.33%)	13 (38.24%)	25(20%)
Total	90 (73%)	34 (27%)	124(100%)

4.4 THE CAUSES OF SPINAL CORD INJURY AMONG THE SAMPLE

The causes of the spinal cord injuries among the sample were many and ranged from gunshot wounds, road traffic accidents, falls from height and others. Figure 4.1 presents a summary of the causes of spinal cord injuries. It can be seen that gunshot wounds are the major cause of injury, accounting for 64.52% of the injuries, followed by road traffic accidents (30.64%) as the second cause of spinal cord injuries.

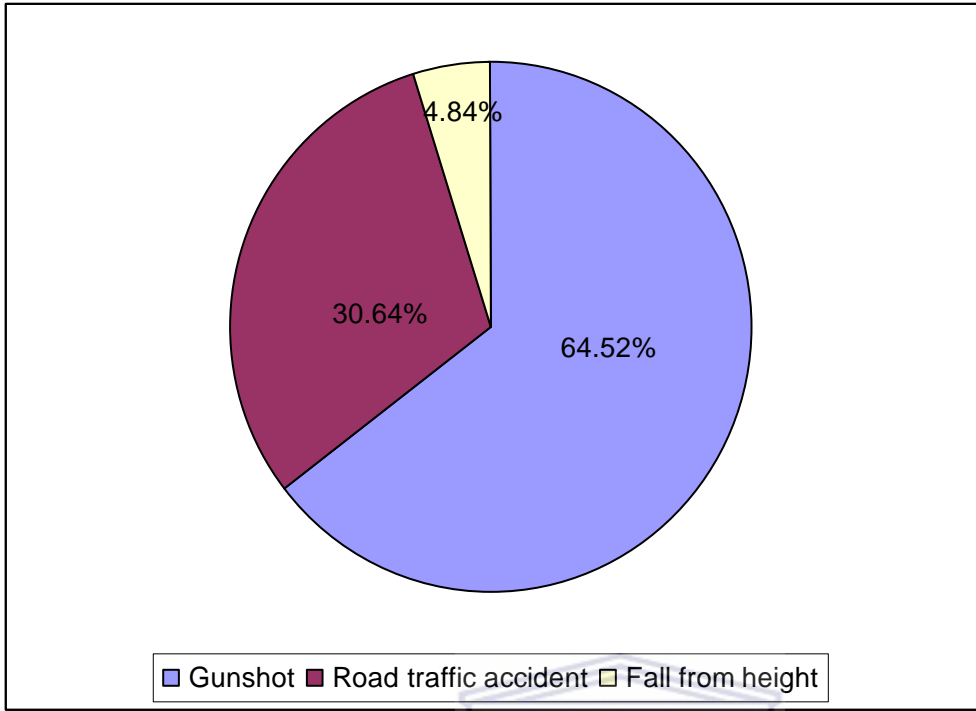


Figure 4.2: Causes of spinal cord injury



4.5 THE OCCURRENCE OF SECONDARY COMPLICATIONS

The occurrence of secondary complications among the sample included pressure sores, respiratory infections, urinary tract infections, and pain. Table 4.3 below represents the different secondary medical complications that were prevalent among the participants.

Table 4.3: Occurrence of secondary medical complications

Variables	Number	%
Pressure sores	100	80.6
Pain	50	40.3
Urinary infection	47	37.9
Respiratory infection	19	15.3

In terms of occurrence of secondary medical complications, the results showed that 100 (80.6%) of the sample were suffering from pressure sores while 37.9% suffered from urinary tract infections. Pain was prevalent in 50 (40.3%) of the participants.

4.5.1 Occurrence of more than one medical complication among the sample

With in the sample of 124 patients who were discharged from the hospital in the period 1996-2007, the majority had more than one medical complication. Pressure sores were prevalent in conjunction with other complications. Table 4.4 below highlights the percentage distribution of different medical complications.

Table 4.4: Percentage distribution of participants with more than one medical complication (n=94)

Variables	Frequency	%
Pressure sores & Urinary infections	32	17.0
Bowel dysfunction & Pressure sores	22	23.4
Pressure sores & Respiratory infections	16	17.0
Respiratory infections & Urinary infections	3	3.2
More than two complications	21	22.3

4.6 LENGTH OF HOSPITAL STAY

The length of stay (LOS) in the hospital was calculated from the first day of admission in the spinal cord rehabilitation unit (SCRU) to the date of discharge in years. The length of stay was grouped and analysed as a 6 level categorical variables (Fig 4.3). The length of stay (LOS) ranged from 1-12 years, with an average length of stay in hospital rehabilitation unit of 6.56 years and a standard deviation of 2.753. Figure 4.3 below highlights the length of stay in the rehabilitation unit among the sample.

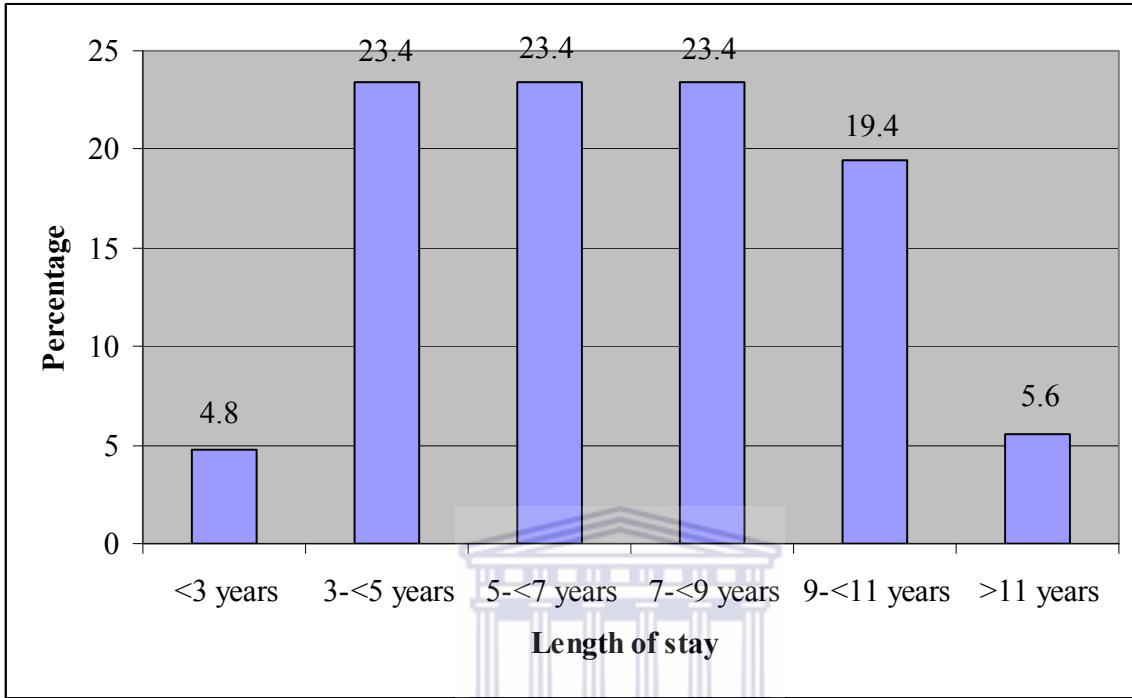


Figure 4.3: Length of hospital stay among the sample (N=124)

Table 4.5: Association between demographic data and secondary medical complications with the length of stay

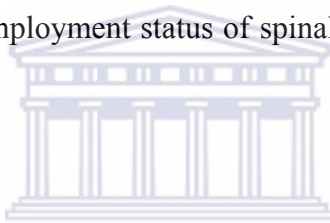
Variable	Characteristic	Frequency	X ² (df)	P-value ≤ 0.05
Gender	Male	121	2.718 (5)	0.743
	Female	3		
Age range	19-24	9	17.284(25)	0.814
	25-30	44		
	31-36	42		
	37-42	22		
	43-48	6		
	49-54	0		
Marital status	55-60	1	2.781(5)	0.734
	Single	90		
	Married	34		
Employment status	Employed	19	20.984(10)	0.021
	Unemployed	26		
Level of education	Primary	75	5.533(5)	0.354
	Secondary	49		
Type of injury	Paraplegia	99	3.461(5)	0.629
	Tetraplegia	25		
Pressure sores	Yes	100	27.124(5)	0.000
	No	24		
Resp. infection	Yes	19	1.425(5)	0.922
	No	105		
Urinary infection	Yes	47	2.622(5)	0.758
	No	77		
Pain	Yes	50	9.175(5)	0.101
	No	74		

The associations between demographic variables and secondary medical complications with LOS were computed using cross tabulation and chi-square tests. There was a significant association between employment and LOS (P-value =0.021). Another significant association revealed by the present results is the association of pressure sores with LOS (P-value=0.000). Table 4.5 above represents the findings related to the significant and non significant associations with the length of hospital stay.

4.7 FACTORS AFFECTING THE LENGTH OF STAY

The factors affecting the length of stay were analysed using the linear regression analysis on factors such as gender, age, marital status, employment status, and causes of injury, severity of injury and pressure sores.

The linear regression analysis revealed a high positive correlation between pressure sores and length of stay ($R= 0.703$). Furthermore, the analysis also revealed a moderate positive correlation between employment status and length of stay ($R = 0.575$). Pressure sores shows that there is a marked correlation between development of pressure sores and length of hospital stay and substantial relationship between employment status of spinal cord injury patients and the length of stay in the rehabilitation centre.



Other factors which were computed and analysed to determine factors affecting the length of hospital stay using the linear regression analysis revealed weak and very weak positive correlation with the length of stay are Age ($R= 0.256$), Gender ($R= 0.109$), Marital status ($R=0.001$), Causes of spinal cord injury ($R= 0.115$) and the Severity of injury ($R= 0.059$) indicating small relationship between such factors and the length of stay and thus could not be used to determine factors affecting the length of stay.

4.8 SUMMARY OF THE RESULTS

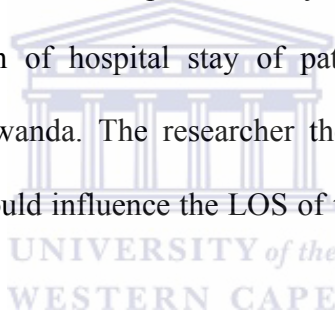
The current study aimed to determine length of stay and the factors affecting it among people with spinal cord injury at Kanombe Military Hospital, Rwanda. Length of stay in the present study is very longer compared to western countries. Factors that were both associated and affecting the length of stay among people with spinal cord injury was highlighted. The next chapter will present a discussion of the data outlined in this chapter.



CHAPTER FIVE: DISCUSSION

5.0 INTRODUCTION

The main aim of the study was to determine length of stay and the factors affecting length of hospital stay of individuals with spinal cord injuries at Kanombe Military Hospital in Rwanda. The findings are results of information gathered from patient's medical folders of spinal cord injury patients who were discharged from rehabilitation unit at Kanombe Military Hospital between 1996 and 2007. The discussion presents the findings of this study in line with research questions and compares the findings with other similar studies in the field of spinal cord injury. At the end of this chapter, limitations of the present study are put forward. In this chapter the researcher firstly discusses length of hospital stay of patients with spinal cord injuries at Kanombe Military Hospital in Rwanda. The researcher then goes on to discuss the factors, identified from literature, which could influence the LOS of these patients admitted to Kanombe Military Hospital in Rwanda.



5.1 LENGTH OF HOSPITAL STAY

The length of stay (LOS) in the hospital was calculated from the first day of admission in the hospital to the last day of discharge from the hospital (years). The length of stay (LOS) in the present study ranged from 1-12 years, with an average length of stay in hospital rehabilitation unit of 6.56 years and a standard deviation of 2.753. The reported average length of stay in international literature varies between 60 ± 38.7 days in United States and up to a mean LOS of 267 ± 171.6 days in Japan for patients with SCI who were admitted in the rehabilitation center between two weeks and six months following the onset of SCI (Post et al., 2005). In the present study, length of stay (LOS) is much longer compared to what exist in the literature; factors such

as insurance coverage, lack of employment and development of pressure sores among individuals with SCI in the military hospital in Rwanda play a significant increase in prolonging the length of hospital stay in the current study.

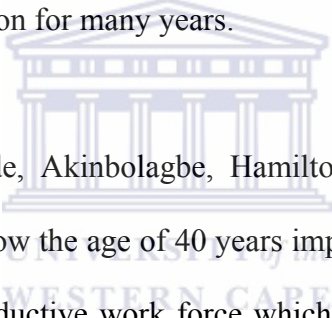
5.2 FACTORS AFFECTING LENGTH OF STAY

In the present study gender, age, marital status, employment status, and causes of injury, severity of injury and development of pressure sores were identified as factors that could influence length of hospital stay for people with spinal cord injuries at Kanombe Military Hospital.

5.2.1 DEMOGRAPHIC FACTORS AND LENGTH OF STAY

After setting the level of significant ($\alpha = 0.05$), the associations between demographics, secondary medical complications with LOS were computed using cross tabulation and chi-square tests. The results of the current study revealed a significant association between employment and LOS (P-value = 0.021) whereas other demographic data such as age, gender, education achievements and marital status revealed no significant association with length of hospital stay. Similarly Ronen et al. (2004) in their study on length of stay in hospital following spinal cord lesions in Israel reported that age and gender were not significantly associated with length of hospital stay. In another study examining the impact of socio-economic factors on length of hospital stay, Epstein, Stern, Weissman (1990) however reported that patients with a lower socio-economic status tend to have a longer length of stay in hospital than patients with high socio-economic status.

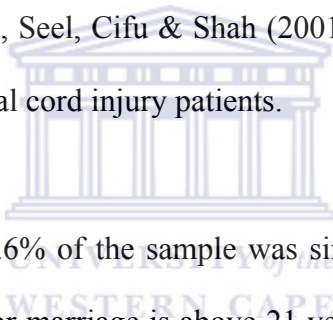
Spinal cord injury (SCI) affects many body functions and individual's who experience it are often of the younger age group (Pandey, et al., 2007). In the present study, the result indicates that the mean age was 32 years and the majority 69.4% of individuals who suffered from spinal cord injury were in the age group of 25-36 years. This is not surprising as people of this age group are most active. In the case of Rwanda, a number of young people aged between 18 and 30 years actively and voluntarily joined the army to fight against ethnicity, genocide, and oppression of the minority. The same observation was reported by Gosselin and Coppotelli (2005) in a follow-up study conducted in Sierra Leone they found out that youth with an average age of 30 years sustained injuries to spinal cord due to barbaric and devastating civil wars that characterised the West African nation for many years.



Ogunlisi, Ogunni, Ikem, Olasinde, Akinbolagbe, Hamilton and Temitope (2006) state that experiencing spinal cord injury below the age of 40 years implies an enormous premature loss of productive time and lives in a productive work force which affects the general productivity of any nation or society. The young overall age of persons experiencing spinal cord injury creates serious concerns about the impact of the injury and their subsequent loss of a productive work force in Rwanda as the nation is recovering from the effects of genocide. However, no significant relationship between patients' age and their length of stay observed in the present study ($R=0.256$).

The majority of the study results were predominantly male (97.6%). The high ratio of males to females could be partly due to the use of military medical folders or files where the majority of the armed forces are more likely to be males. Although the proportion of males with SCI

remains higher in the current study, the results are within the limits of other studies that have found the incidence of SCI among males to be more than four times than among females (Borkowitz et al., 2001). Similarly Pandey et al. (2007) in their study reported eighty five percent of their results of spinal cord injuries in India to be males. These authors attribute the high percentage of male population to be more prone to spinal cord injury as they are more engaged in outdoor work and hence being more prone to spinal cord injury. However, in the present study gender was not associated with length of stay. This is consistent with Ronen et al. (2004) in their study on length of stay in hospital following spinal cord lesions in Israel. Similarly in a multicenter study investigating gender-related differences on length of stay for a matched sample with spinal cord injury, Greenwald, Seel, Cifu & Shah (2001) reported no gender differences in rehabilitation length of stay of spinal cord injury patients.



The study results revealed that 72.6% of the sample was single while 27.4% were married. In Rwanda the legal age of consent for marriage is above 21 years (Rwanda census, 2002) but due to the effects of genocide, marriage is sometimes initiated below the stipulated age. This finding is also consistent with Go, De Vivo & Richards (1995) who reported more than fifty percent of people with spinal cord injury treated in the United States to be single at the time of spinal cord injury and 30% were married. It is possible that the physical loss of mobility induced by the spinal cord injury may limit a spinal cord injured person's opportunities to meet and attract a new partner. Crewe and Krause (1992) suggest that women who engage in post injury marriages may have unusual qualities or values that are beyond the society's stereotypes concerning engagement with a disabled person which contribute to the success of their unions. The literature suggests that women dating SCI men are inexperienced and therefore do not know

better or can not do better (Kreuter, 2000). As pertains to association of marital status with the length of stay, the results revealed no significant association. This high proportion of single individuals with spinal cord injury is of greater concern since lack of social support from family, caregivers or spouses positively affects the general adaptation and rehabilitation process of spinal cord injury patients.

The study results indicates that 60.5% (n = 75) of the sample who sustained spinal cord injuries attained primary level education while 39.5% (n = 49) had secondary education and none of the people who sustained spinal cord injury had either attended a college or a university. This is because before the war and genocide of 1994, the education system in Rwanda was very low and this was because of then exclusive policy that allowed one group of people from the ruling class to access higher education and denied the minority Tutsi (Mazimpaka & Daniel, 2000).

Go et al. (1995) suggests that low levels of educational are one of the major factors contributing to unemployment following spinal cord injury. Lack of tertiary qualifications among the study sample is serious concern for employment among individuals with spinal cord injury as the army only employs physically fit individuals capable of working in all terrains. Chayton and Chubon (1994) found in a sample of 100 individuals with spinal cord injury that education was associated with perceived life quality noting that it increases access to work and economic resources that later increases a sense of control over life of people with spinal cord injury. Even though the government of Rwanda has good policies in place to promote equal participation of people with disabilities including those with a SCI, the reality is often bleak when it comes to recruiting people with disabilities into the labour force, as most of them are insufficiently skilled. Similarly

Harrison and Kuric (1989) found in their study of 62 individuals with spinal cord injury, that only 8% were employed following spinal cord injury compared to 39% before injury. They concluded that other variables that affect the number of people taking up employment following spinal cord injury to include access to places of work, and employer's attitudes on people with disabilities including those with spinal cord injuries.

5.3 THE OCCURRENCE OF SECONDARY MEDICAL COMPLICATIONS AND LOS

The results revealed a high positive correlation between pressure sores and length of stay ($R=0.703$). This shows that there is a marked correlation between development of pressure sores and length of hospital stay. The development of pressure sores at any stage in the rehabilitation process reflects severe clinical conditions that slow rehabilitation of patients with spinal cord injury there by prolonging the length of stay. Similarly Ash (2002) carried out an exploration of the occurrence of pressure sores in a British spinal injuries unit and found out that pressure sores and the density or degree of lesion were among strong factors affecting the length of stay. Furthermore, Ash (2002) pointed that spinal cord injury patients who develop a pressure sore at any stage between injury and discharge are in hospital for an average of 177days which is 55days longer (95% CI 33-78 days). The longer length of stay observed from the present study sample may be attributed to perhaps delay in rehabilitation process.

As was the case in the present study ($p<0.05$) Allman, Laprade, Noel, Walker, Moorer, Dear, and Smith (1986) also found a significant association of pressure sores with increased length of hospital stay. This led them to suggest that pressure sores tend to increase the cost of health care among the hospitalised patients with spinal cord injuries. This is also consistent with McAleese and Odling-Smee (1994) findings who reported that the occurrence of secondary medical

complication increases the patient's length of hospital stay. Ash (2002) compared the occurrence of pressure sores with the average length of stay, his findings revealed an association between the development of pressure sores and extended hospitalisation.

Regan et al. (2006) stated that pressure sores are a long life threatening secondary medical complication of a SCI which have the potential to interfere with physical, and impact on the overall quality of life. Although preventable, they further argue that pressure sores disrupt rehabilitation and prevent individuals with SCI from working and interfere with community integration. Thiyagarajan and Silver (1984) in their study on 100 spinal cord injury patients admitted to the National spinal cord injuries centre Stoke Mandeville Hospital Scotland assessing factors responsible for the development of pressure sores, they found that 23% developed pressure sores while in hospital, while loss of sensation was their critical finding since the patients were unable to appreciate pain when the sore was developing.

Levy, Makarowo, Madzivire, Bhebhe, Verbeek and Parry (1998) in a retrospective study on the quality of life and epidemiology of spinal cord injury patients in Zimbabwe reported an incidence of pressure sores of 33% noting that there was lack of monetary resources to provide proper acute care for patients with SCI in the rehabilitation center. On the other hand Hart and Williams (1994) reported a prevalence of pressure sores of 11% in Natalspruit Hospital in South Africa. The present study results also revealed the majority (80.6%) of the sample was experiencing pressure sores which could have developed due to noncompliance among spinal cord injury patients on issues pertaining to preventive measures and possibly lack of appropriate

nursing advice. According to Dorsett (2001), pressure sores are sometimes related to self-neglect and suggest that it is an indicator of less successful adjustment outcome.

Although not significantly associated with length of stay ($p=0.922$) 15% of the present study results showed presence of respiratory infections among the sample. The reported incidence of respiratory infection following spinal cord injury in literature ranges from 36% to 83%, and is the common cause of morbidity and mortality (Berlly, Shem, 2007; Jackson, Groomes, 1994).

Cardozo (2007) states that impairments in respiration due to spinal cord injury (SCI) result into severe pulmonary infections with profound effects on cough effectiveness and on clearance of secretions, thus owing to spinal cord injured individuals being susceptible to lower respiratory tract infections. According to March (2005), the aim of interventions in prevention of respiratory complications in spinal cord injury, is to promote oxygenation, prevent hypoxia and optimise spinal cord perfusion while reducing the incidence of secondary complications. Karlet (2001) states that spinal cord injury individuals often have compromised respiratory status due to decrease in their ability to cough, and recommends close monitoring of respiratory airways. Field (2000) in March (2005) suggests that regular positioning of SCI patients utilises the gravitational effects produced by the movement that aid the redistribution of ventilation and perfusion throughout the lungs and thereby optimising oxygen transport.

Urinary tract infection was not statistically significantly associated with LOS ($p=0.758$). The study results however show that 38% of the sample experienced urinary infections. Urinary infections secondary to use of indwelling catheter is the most disabling medically, physically and

socially among individuals with SCI (Salomon et al., 2006). Middleton et al. (2004) found that urinary infections were the most common causes for seeking medical advice among persons with spinal cord injury which they attributed to the type of bladder management, while persons managed with indwelling catheter, were twice likely to experience urinary complications compared to other methods.

Klotz et al. (2002) in Middleton et al. (2004) in a large multicenter survey of 1668 persons with tetraplegia, reported that urinary tract complications were common in persons with complete lesions compared to persons with incomplete lesions. The use of illicit drugs or substance usage and alcohol after spinal cord injury and misuse of prescribed medication has been reported to predict subsequent development of urinary tract infection (Middleton et al., 2004).

Twenty four percent of the present results revealed presence of both bowel and bladder dysfunction. According to Ayas et al. (2006), bowel dysfunction with fecal incontinence, difficulty evacuation, abdominal distention and constipation are serious consequences of sustaining a spinal cord injury that increase patient's dependence from care givers or rehabilitation therapists. Lynch et al. (2000) in their descriptive study on bowel dysfunction following spinal cord injury with age and gender match control in New Zealand reported that people with spinal cord injury ranked problems of bowel evacuation as their greatest functional loss after loss of mobility. In contrast, Han, Kim & Kwon (1998) reported that bowel problems were not related to severity of neurological level of injury, noting that training of bowel programme during early stages of rehabilitation should be instituted to counterbalance the effect of bowel issues among spinal cord injury patients. Although bowel problems is not a secondary

complication of spinal cord injury, there is a need for rehabilitation professionals to include bowel training programmes to spinal cord injury patients, while reducing this serious problem that affect the general well-being of patients with spinal cord injuries.

The present study results show that 40.3% of the spinal cord injured individuals experienced pain while in hospital. This is in congruency with Felix, Cruz-Almaide & Winderstrom-Noga (2007) findings who reported more than fifty percent of their 195 sample to be possessing pain that was interfering with activities of daily living, hence suggesting implementation of treatment techniques incorporating strategies to reduce the impact of pain on emotional and physical function.

Similarly the present results concur with the findings of Rintala, Holmes, Neil Fiess, Courtade, & Loubser (2005) who studied prevalence and characteristics of pain in veterans with spinal cord injury living in Texas USA and reported that 57% of their study participants to have experienced pain interfering with activities of daily living for more than ten years. Nash (2005) points out that a large segment of paralysed SCI patients live with pain in their shoulders, arms and wrists with complaints reported to range from 35% -75% of chronic SCI. Nash (2005) further points out that because SCI individuals depend on their upper extremity for transportation, body transfers and other activities, thus she recommended treatment procedures integrating the use of exercises as a health promoting activity to be of paramount importance in reducing pain.

Latimer, Ginis, Hicks and McCartney (2004) point out that prolonged pain causes an increase in psychological stress and tension, producing emotional distress that prevents and disrupts individuals with spinal cord injury from activities of daily living (ADL). Suzie Szu-Yun Chen

(2005) points out that pain is a common secondary complication after spinal cord injury and calls for a need of developing models of pain which provide effective interventions for those at increased risk of developing pain post spinal cord injuries. Although 40.3% of the study sample experienced pain it was not a factor which significantly influenced LOS in the spinal cord injured patients admitted to the Kanombe Military Hospital in Rwanda.

Prolonged length of stay in this study may be associated with lack of enough nursing care since the majority of spinally injured patients sustained their cord injuries during the 1994 war and genocide that consumed nearly more than one million lives of people including medical personnel. The lack of nursing care could be the reason why many of the participants developed pressure sores. The existing numbers of medical personnel post war and post genocide were very low compared to the high demands from the general population and this easily explains the longer length of stay observed from the present study. Secondly, the frequency of medical complications in the present study was quite high and certain medical complications and length of hospital stay during the rehabilitation stay was significantly associated. This could possibly be because medical complications during rehabilitation leaves patients with SCI more physically disabled that later hampers the rehabilitation process thus prolonging length of stay.

In Rwanda, persons with disabilities including those with a spinal cord injury who were disabled while in military services to stop the 1994 genocide, their health insurance, medical coverage and living allowance are covered by the government in conjunction with Rwanda demobilisation and re-integration commission (RDRC). This could be another reason that explains prolonged hospital length of stay observed in this study. Celik, Celik, S, Bulut and Kisa (2001), mentioned

that socio-demographics, institution at which patients are admitted and insurance status determine unnecessary stay. Similarly Mawajdeh, Hayajneh and Al-Qutob (1997) noted that insurance status and patient factors such as socio-economic status were the stronger determinants of LOS in public hospitals compared to private hospitals.

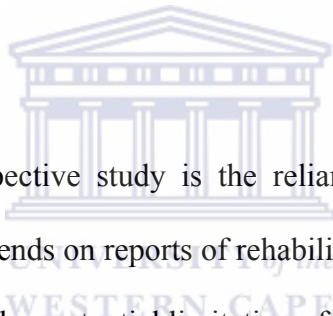
Panis, Verheggen, and Pop (2002) reported that inappropriate length of stay are associated with three factors namely lack of care facilities, delay in discharge procedures and lack of discharge settings. A reason which may contribute to prolonged hospital stay in Rwanda is the lack of discharge settings designed for care of disabled persons including those with a spinal cord injury. The only discharge settings available are for the elderly and are owned by Non-governmental organisations and volunteers from religious sector. According to Anzai et al. (2006) lack of discharge settings and a history of living alone may impact the ability of individuals with SCI adequate care to live in the community, thus rendering rehabilitation professionals not to discharge individuals with SCI to locations where care, and accessibility needs are not adequate. Similarly Brasel, Lim, Nirula and Weigelt (2007) demonstrated that lack of discharge destinations are major factors in increasing length of stay among spinal cord injury patients. The present study did not however investigate exact numbers of staff available to provide care and availability of discharge destinations for patient with spinal cord injuries treated at Kanombe Military Hospital in Rwanda.

5.4 LIMITATIONS OF THE STUDY

This is a retrospective study utilising data collected from a single rehabilitation unit. Data used does not represent the population of all Rwandans with spinal cord injury and thus can not be generalised.

Secondly, the information relating to length of hospital stay was obtained from patient folders and did not explore the individual perception both from patients and rehabilitation therapists and other medical staff concerning reasons why they are staying for such longer period in the rehabilitation unit.

Thirdly, another aspect of retrospective study is the reliance on documentation in patients' medical folders; their accuracy depends on reports of rehabilitation therapists and the presence of documentation errors could be another potential limitation of the present study.



CHAPTER SIX: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.0 INTRODUCTION

In this chapter, a summary of the main findings of the study is given. Thereafter, the conclusion is drawn. Finally recommendations based on the findings are outlined at the end of this chapter.

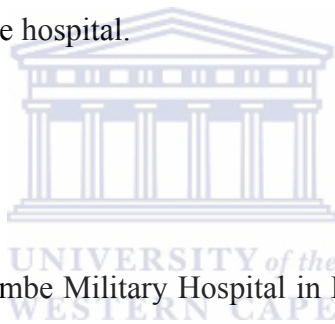
6.1 SUMMARY

The aim of this study was to determine length of stay and the personal factors affecting length of hospital stay of individuals with spinal cord injuries at Kanombe Military Hospital in Rwanda. To achieve this, a retrospective study was conducted where by 124 patients' medical folders of patients discharged from Kanombe Military hospital between 1996-2007 were reviewed to extract the data. Descriptive and inferential statistical data analysis were made possible using SPSS version 15.0, for Microsoft windows. The linear regression analysis was used to determine factors affecting the length of stay while Chi-square test were used to identify associations between demographic data, occurrence of secondary medical complications with length of stay.

Generally, the findings of this study revealed that individuals who experienced a SCI had a mean age of 32.2 years and a predominantly high percentage of 97.6% were affecting males. The demographics of the sample were predominantly young ages with their lives still before them and who were preparing to have a family. The severity of their disability suggests a number of concerns related to their social situations, including educational issues and health problems. The most common cause of spinal cord injury was gunshot wounds (64.52%) where as pressure sores (80.6%), pain (40.3%) and urinary tract infections(37.9%) were the most common secondary medical complications that spinal cord injured patients suffered from that require attention of

rehabilitation therapists. Therefore, there is a greater need of planning successful intervention programmes by rehabilitation therapists aimed at preventing occurrence of secondary medical complications and identification of factors that predisposed the development of pressure sores.

Length of stay among SCI sample in this study is longer and this is attributed by a number of secondary medical complications, notably pressure sores that was prevalent in more than eighty percent of the overall sample of individuals with SCI. A statistically significant association was found between length of hospital stay and pressure sores as well as length of hospital stay and employment status. Furthermore, the presence of pressure sores revealed high positive correlation with length of stay in the hospital.

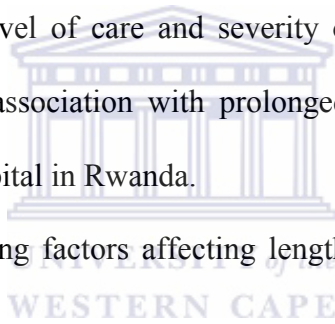


6.2 CONCLUSION

The study was carried out at Kanombe Military Hospital in Rwanda to determine length of stay and the personal factors affecting it. The main findings from the study highlight that length of hospital stay at Kanombe Military Hospital was longer compared to the western world and some of the factors such as development of secondary medical complications, notably pressures sores and employment issues, were significantly associated with increased length of hospital stay. There is a strong need for rehabilitation therapists to devise concise measures for prevention of development of secondary medical complications in their management strategies. Pressure sores make a significant independent contribution to excessive hospitalisation among individuals with spinal cord injuries at Kanombe Military Hospital in Rwanda.

6.3 RECOMMENDATIONS

1. There is a strong need to manage pressure sores at Kanombe Military Hospital and this could be addressed with the use of a multidisciplinary approach, incorporating other specialties in an effort to make spinal cord injured patients independent and free from this serious medical complication.
2. Further studies, exploring patient compliance and strategies employed by therapists in the treatment interventions of pressure sores at Kanombe Military Hospital are required.
3. A qualitative study involving both patients and rehabilitation therapists to explore other insights why spinal cord injury patients stay longer in the hospital is also required.
4. Further studies investigating level of care and severity of injury, are required to ascertain whether there is any significant association with prolonged hospital stay among spinal cord injured patients at the military hospital in Rwanda.
5. Comparative studies investigating factors affecting length of stay in different rehabilitation settings in Rwanda are required.



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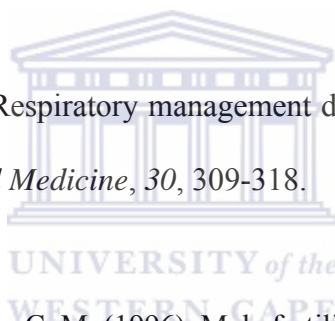
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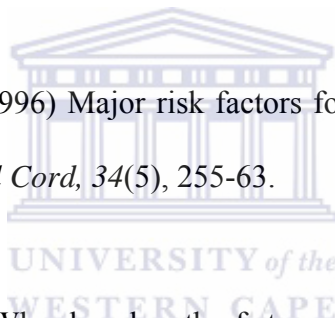


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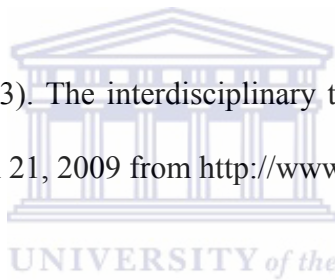
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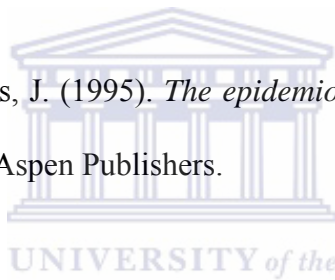
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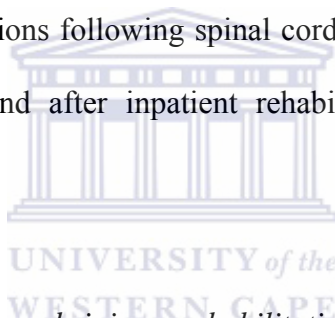
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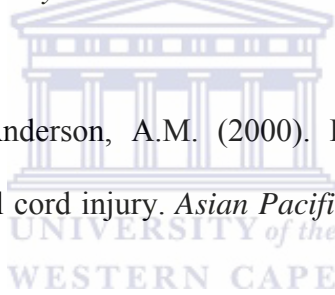
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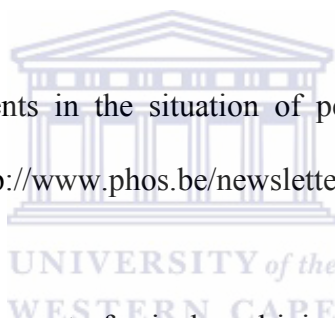
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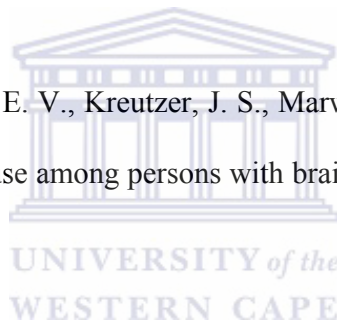
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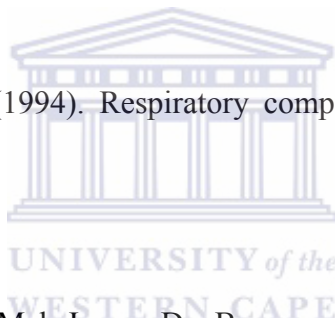
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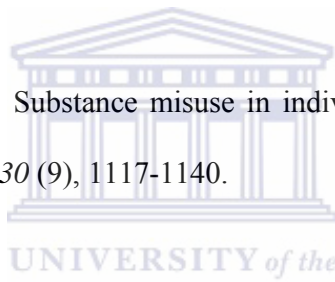
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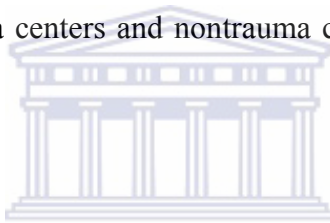
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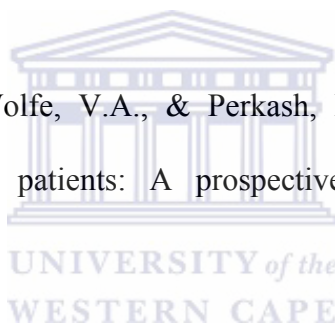
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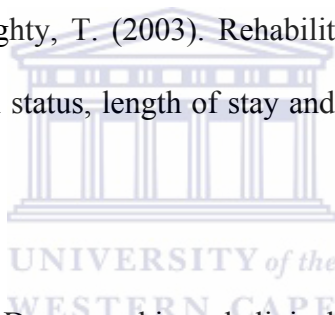
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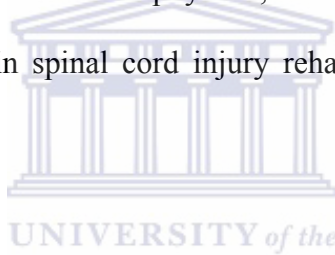
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APPENDICES



UNIVERSITY *of the*
WESTERN CAPE

APPENDIX A

FACULTY OF COMMUNITY AND HEALTH SCIENCES

Private Bag X17, Belville, 7535
South Africa
Tel: +27 (0) 21 959 2163
Fax: +27 (0) 21 959 2755
E-mail: csjohnson@uwc.ac.za

HIGHER DEGREES COMMITTEE

16th November 2007

TO WHOM IT MAY CONCERN

Dear Sir/Madam

Research Project of Mr. Patrick B. Bwanjugu (Student Number: 2758056)

This letter confirms that Mr. Bwanjugu is a registered student in the Faculty of Community and Health Sciences at the University of the Western Cape. His research proposal entitled "*Factors affecting length of hospital stay for people with spinal cord injuries at Kanombe Military Hospital, Rwanda*" submitted in fulfilment of the requirements for Masters in Physiotherapy has been examined by the Higher Degrees Committee and found to be of high scientific value, methodologically sound and ethical.

We fully support the research and kindly request that you allow him access to your organization.

Sincerely



DR GAVIN REAGON
Chairperson: Higher Degrees Committee

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UNIVERSITY of the
WESTERN CAPE

A place of quality, a place to grow, from hope to action through knowledge

APPENDIX B

DEPARTMENT OF PHYSIOTHERAPY

Private Bag X17, Bellville 7535
South Africa
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E-mail: jfrantz@uwc.ac.za
Website: www.uwc.ac.za

21st November 2007

**The Minister of Health,
Republic of Rwanda,**

Dear Sir / Madam

Re: Request to conduct a research study at Kanombe Military Hospital

I am a postgraduate Rwandan student doing a masters degree in Physiotherapy programme at the University of the Western Cape in South Africa. I am expected to conduct research project as part of the requirement for a Masters Degree in Physiotherapy. The title of my research thesis is "**Factors affecting length of hospital stay for people with spinal cord injuries at Kanombe Military Hospital, Rwanda**". Permission to conduct the study was obtained by the senate research and study grants committee at the University of the Western Cape.

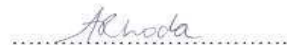
I hereby request permission to carry out the above mentioned study at Kanombe Military Hospital where the majority of people with spinal cord injuries are likely to be met. Please find attached letter of acceptance of my research proposal by the authorities of the University of the Western Cape.

I would be grateful if you would allow me to carry out the study during December, 2007 and January, 2008. Participation in this study will be anonymous and voluntary and all the information collected will be highly confidential.

Looking forward to your positive response



Patrick B Bwanjugu
Masters Student



Mrs Anthea Rhoda
Supervisor



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APPENDIX C

REPUBLIKA Y'U RWANDA

Kigali, kuwa 21 DEC, 2007

N° 20/...../MIN/07

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MINISITERI Y'UBUZIMA
B.P 84 KIGALI
Website : www.moh.gov.rw
IBIRO BYA MINISITIRI
FAX : (250) 576853
TEL : (250) 577253

Bwana BWANJUNGU Patrick B
University of the Western Cape
Private Bag X 17, Bellville 7535
SOUTH AFRICA

Impamvu: Uruhushya rwo gukora ubushashatsi



Bwana,

Mpereye ku ibaruwa yawe wanditse usaba uruhushya rwo gukora ubushakashatsi mu rwego rwa Physiotherapy mu Bitaro bya Gisirikari by'i Kanombe, nkwandikiye nshaka kukumenyesha ko urwo ruhushya ukwiye kurusaba Minisitiri w'Ingabo.

Nkwifurije akazi keza.

Minisitiri w'Ubuzima

Dr. Jean Damascène NTAWUKULIRYAYO

Bimenyeshejwe:

- Bwana Umunyamabanga wa Leta muri Minisitiri y'Ubuzima Ushinzwe Kurwanya SIDA n'Izindi Ndware z'Ibyorezo
- Madamu Umunyamabanga Uhoraho muri Minisitiri y'Ubuzima
- Bwana Minisitiri w'Ingabo
KIGALI



APPENDIX D

DEPARTMENT OF PHYSIOTHERAPY

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Website: www.uwc.ac.za

19th December 2007

**The Director Medical Services
Ministry of Defense
Kigali, Rwanda**

Dear Sir / Madam

Re: Request to conduct a research study at Kanombe Military Hospital

I am a postgraduate Rwandan student doing a masters degree in Physiotherapy at the University of the Western Cape in South Africa. I am expected to conduct a research project as part of the requirement for a Masters Degree in Physiotherapy. The title of my research thesis is "***Factors affecting length of hospital stay for people with spinal cord injuries at Kanombe Military Hospital, Rwanda***". Permission to conduct the study was obtained by the senate research and study grants committee at the University of the Western Cape.

I hereby request permission to carry out the above mentioned study at Kanombe Military Hospital where the majority of people with spinal cord injuries are admitted. The project will involve viewing patients' medical records as well as conducting interviews with patients who have suffered a spinal cord injury. Please find attached a letter of acceptance of my research proposal by the authorities of the University of the Western Cape.

I would be grateful if you would allow me to carry out the study during December, 2007 and January, 2008. Participation in this study will be anonymous and voluntary and all the information collected will be highly confidential.

Looking forward to your positive response

.....
Patrick B Bwanjugu
Masters Student

.....
ARhoda
Mrs Anthea Rhoda
Supervisor



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WESTERN CAPE

A place of quality, a place to grow, from hope to action through knowledge

APPENDIX E

REPUBLIQUE RWANDAISE
REPUBLIC OF RWANDA



MINISTERE DE LA DEFENSE
MINISTRY OF DEFENSE

January 15, 2008

Patrick B. Bwanjugu
Masters Student

Dear Sir,

Re: Reply to your request to conduct a research study in our Hospital.

Referring to your letter dated 16th December 2007 requesting me to allow you to carry out a research study at Kanombe Military Hospital; I have no hesitation to inform you that you are permitted to do your research study in our Hospital. We are ready to give you our possible facilitations needed to do this research.

Yours faithfully,



Dr. Charles Murego
Director of Medical Services

UNIVERSITY of the
WESTERN CAPE

DIRECTION DES SERVICES MEDICAUX • DIRECTORATE OF MEDICAL SERVICES
TEL./FAX : 00 (250) 83852

APPENDIX F

DEPARTMENT OF PHYSIOTHERAPY

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Website: www.uwc.ac.za

21st November 2007

**The Director Kanombe Military Hospital
Kigali
Rwanda**

Dear Sir / Madam

Re: Request to conduct a research study

I am a postgraduate Rwandan student doing a masters degree in Physiotherapy programme at the University of the Western Cape in South Africa. I am expected to conduct a research project as part of the requirement for a Masters Degree in Physiotherapy. The title of my research thesis is "**Factors affecting length of hospital stay for people with spinal cord injuries at Kanombe Military Hospital, Rwanda**". Permission to conduct the study was obtained by the senate research and study grants committee at the University of the Western Cape.

I hereby request permission to carry out the above mentioned study at the Kanombe Military Hospital. The research would involve reading patient documentation and interviewing patients with spinal cord injury.

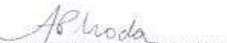
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I would be grateful if you would allow me to carry out the study during December, 2007 and January, 2008. Participation in this study will be anonymous and voluntary and the information gathered will be treated with respect and confidentiality.

Looking forward to your positive response.



Mr. Patrick B Bwanjugu
Masters Student



Mrs. Anthea Rhoda
Supervisor



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APPENDIX G

RESTRICTED

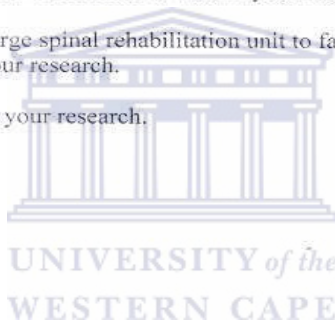
Patric B. BWANJUGU
C/O University of the Western cape

Jan 15th 2008

Dear Sir,

RE: REPLY TO CONDUCT A RESEARCH STUDY

1. Referring to your letter dated 21 November 2007 requesting to conduct a research Study entitled **Factors affecting the length of Hospital stay for people with spinal cord injuries at KMH**; I have the honor to inform you that permission has been granted.
2. The SNO and the in charge spinal rehabilitation unit to facilitate you in the possible requirements needed for your research.
3. We wish you success in your research.
4. Yours faithfully,



Dr Guido RUGUMIRE
Maj
Director KMH



RESTRICTED

APPENDIX H

Data Gathering Tool (English)

Section A

PERSONAL DETAILS

1. Gender

1.1. Male []

1.2. Female []

2. Year of admission.....

3. Year of discharge.....

4. Age.....

5. Marital status

5.1. Single []

5.2. Married []

5.3. Divorced []

5.4. Widowed []

5.5. Other status []

6. Employment

6.1. Employed []

6.2. Unemployed []

6.3. Student []

6.4. Retired []



7. Educational achievements

- 7.1. Primary []
- 7.2. Secondary []
- 7.3. College []
- 7.4. University []

8. Cause of injury

- 8.1. Road traffic accident []
- 8.2. Fall from height []
- 8.3. Gunshot []
- 8.4. Sport accident []
- 8.5. Others (please state).....



Section B

9. Duration of Hospital stay (length of stay).....

10. Spinal cord secondary complications

- 10.1. Pressure sores []
- 10.2. Respiratory infection []
- 10.3. Urinary tract infection []
- 10.4. Spasticity []
- 10.5. Bowel problems []
- 10.6. Contractures []
- 10.7. Pain []

APPENDIX I

Data Gathering Tool (Kinyarwanda)

Section A

Umwirondororo

1. Igitsina

1.1 Gabo

1.2 Gore

2. Umwaka y'injiriye mubitaro.....

3. Umwaka y'asezewe.....

4. Imyaka.....

5. Uwo bashakanye

5.1. Ingarugu

5.2. Ndubatse

5.3. Naratandukanye

5.4. Umupfakazi

5.5. Ibindi.....

6. Umwuga

6.1. Umukozi

6.2. Sinkora

6.3. Umunyeshuli

6.4. Navuye kurugerero (Gusezererwa)



7. Amashuli wize

- 7.1. Abanza
- 7.2. Ayisumbuye
- 7.3. Amashuli yimyuga
- 7.4. kaminuza

8. icyateye gukomereka

- 8.1. Impanuka z'ibinyabiziga
- 8.2. Kugwa avuye hejuru
- 8.3. Kuraswa
- 8.4. Impanuka z'asipororo
- 8.5. Ibindi.....



Section B

9. Igihe amaze m'ubitaro.....

10. Izindi ndwara zatewe nogukomereka uruti rwumugongo

- 10.1. Ibisebe
- 10.2. Indwara z'omumyanya yubuhumekero
- 10.3. Indwara z'omumyanya nyobora nkari
- 10.4. Gususumira
- 10.5. Gufunga ubura
- 10.6. Guhinamirana
- 10.7. Ububabare buhora